

ARTICLE

Reflections on the concept of musical development

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Abstract

‘The Sequence of Musical Development’ by Swanwick and Tillman was published in the British Journal of Music Education (BJME) in 1986. This year marks its 35th anniversary and provides an occasion to look back on the article’s content and legacy. It is also an opportunity to reflect on the antecedents for the article’s underlying concepts, as well as how our understanding of children and young people’s musical behaviours and development has evolved. Alternate and more nuanced perspectives, both available at the time and since, draw on an expanding, diverse, multidisciplinary research base. These enable us to have a better grasp of the strengths of the original, as well as what continues to need investigation.

Keywords: Children; musical development; spiral sequence

Introduction

This invited article has been prompted by the 35th anniversary of the ‘The Sequence of Musical Development’, an article by Keith Swanwick and June Tillman that was published in the British Journal of Music Education (BJME) in 1986. At that time, the journal was relatively new, having been first published 2 years earlier in 1984. The Swanwick and Tillman article is considered to be a landmark study, being one of the first major research-based contributions that sought to map the nature of musical behaviour and development in children, a field which has its roots in the pioneering studies of 500 young children by Helmut Moog (1968, 1976a), and which has expanded considerably since (cf Barrett & Welch 2022).

A recent scoping review, for example, of publications in the field of children’s musical behaviour and development over the past two decades identified 1,308 articles in 16 key international journals, of which $n = 507$ articles covered the age range 0–8 years and $n = 901$ articles the ages 9–14 years (Barrett, Abad & Welch, 2022). Within the younger age phase, $n = 231$ articles had an explicit research focus. These were roughly evenly split in their methodological biases between quantitative (cf Swanwick & Tillman) and qualitative approaches, with over half of the latter being case studies that explored particular instances of musical behaviour of individuals in greater depth.

This diversity of research methodologies was reflected in the contents of that same BJME 1986 issue in which two of the articles chosen by the editorial team shared a concern with aspects of children’s musical development. These related to examples of children’s invented songs as illustrations of musical language development (Davies, 1986¹) and observed patterns in young children’s song singing development (Welch, 1986²). Furthermore, Davies (1992) suggested that vocal and instrumental music making ‘may reveal different aspects of children’s musical understanding’ (p. 2) and that invented songs are an essential feature of young children’s sense-making of their world (p. 358) – a point that has been echoed subsequently in the extensive case study reports of children’s song-making by Barrett (cf 2019). As such, these two BJME 1986 singing-related reports provide a counterpoint to the landmark ‘sequence’ article on children’s instrumental improvisation.

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‘Stages’ of development

One interpretation of Swanwick and Tillman’s article is that it was characteristic of its time – the 60s, 70s and early 80s – when there was a trend in pedagogical and sociocultural theories, often grounded in psychology, that children’s learning could be promoted more effectively if teaching could be matched somehow to the ‘natural’ development of the child (*cf* Zimmerman, 1971/2011, 2003). The concept of ‘readiness’ was prevalent (such as in Goal 1 of the US Six National Education Goals of 1990, *Readiness for School*, Katz, 1991 and Goal 4 of the United Nations (2015) Sustainable Development Goals³), implying that children are more able to learn if pedagogical content were appropriate to their ‘stage’ of development, a concern that continues today (e.g., see review by Sabol & Planta, 2017; Pan et al., 2019). There was also a growing awareness that age and experience were important factors in children’s observed musical behaviour, such as exemplified by a study of 3-year-olds who tended to reproduce three target songs in the original learned key, whereas slightly older children (aged 5 and 6 years) were less accurate in terms of their absolute pitch imitation, but more able to abstract the songs’ key features and reproduce these more in terms of contour and interval (Sergeant & Roche, 1973).

This notion of discrete phases of development (‘stages’) was a likely outgrowth of the widespread psychological and educational interest arising from the child development studies of the Swiss psychologist, Jean Piaget (d. 1980). The prime focus for Piaget’s research and writing was on how the child makes sense of their world, suggesting that this evolves through a series of developmental ‘stages’ from early childhood through to adulthood (e.g., Piaget, 1954). Development-related studies in music also became more evidenced around this time, such as reviewed in the major music psychology monographs authored by Sloboda (1985) and – in particular – Hargreaves (1986), as well as in the edited collection by Peery, Peery and Draper (1987).

Subsequently, aspects of the UK-based doctoral research that underpinned the Swanwick and Tillman BJME article (Tillman, 1987) were replicated in a related doctoral study in Cyprus (Stavrides, 1995). According to Swanwick (1991; 2011), the Cypriot data supported the components of the theorised general developmental framework in the original article, albeit with a different methodology and in a different cultural setting. Notwithstanding these related findings, it seems important to recognise that, rather than being ‘The Sequence of Musical Development’ as in the original title’s use of the definite article, this widely cited study is actually ‘A Sequence of Musical Development’, being one of several possible sequences and – in this case – related to a particular form of musicking – composing with simple tuned and untuned percussion instruments by children in a single school, recorded by a single researcher (as noted by Tillman, 1987, vol2:57/103). The diversity of musics in the world and their cultural specificity and distinctiveness – such as exemplified in the five major distinctive forms of Chinese traditional music⁴ (Yang, 2011) – imply that there may be many different sequences of musical development related to context, task, and whatever counts as local and regional musical behaviour. This was a possibility acknowledged by Tillman in her doctoral thesis (1987, vol. 2: 78–79), which was completed 1 year after the BJME article and reflected in her careful choice of words in the actual thesis title: ‘Towards a Model of the Development . . .’.

Alternative perspectives on development

Other authors have adopted different conceptual perspectives related to how children make sense of music. According to Hargreaves and Lamont (2017), such theories can be clustered into six general theoretical approaches, which themselves can be subdivided into 10 distinct groups in the music development literature. These are based on *developmental stages* (e.g., Swanwick & Tillman, 1986; Hargreaves & Galton, 1992), *learning and cognition* (e.g., Serafine, 1988; Gordon, 1979, 1997), *symbol systems* (e.g., Bamberger, 1991, drawing on the research with

Howard Gardner and colleagues in Project Zero – cf Perkins, 1974), *music theory* (e.g., see recent summary by Ockelford & Welch, 2021), *social factors* (e.g., Welch, 2007; Welch & Ockelford, 2016) and *neuroscientific* studies (e.g., Costa-Giomi, 2015; Ford Thompson & Schlaug, 2015). The last of these include applied neuroscientific studies, such as by Verney (2013) linking reading, dyslexia and rhythmic perception, and Pocwierz-Marciniak and Harciarek's (2021) literature review concerning early auditory experience and the mother's voice.

Furthermore, Davies (1992) cautions against the impression created by a spiral's visual portrayal of linear progression, reporting that several young children in her study were demonstrating several different types of musical thinking concurrently in terms of the spiral's elements – a possibility that had been noted earlier by Tillman (1987, vol. 2: 105). This potential weakness in a spiral conception of development has also been flagged in alternate models of curriculum design because 'learning is not always linear' (Ireland & Mouthaan, 2020: 11). Additionally, with regard to age, Davies noted that her data analyses suggested that young children at pre-school level, despite their age, were able to demonstrate 'an implicit understanding of music's structural relationships and a sense of form' (1992: 382). This particular finding is echoed in recent example case study evidence from Australia which reports that young children 'are likely to arrive at formal schooling [already] with a rich repertoire of music, [and] a capacity to engage in embodied musical experience' (Barrett & Welch, 2021: 1239).

Geneses for the BJME article?

The geneses for Swanwick and Tillman's (1986) article were likely to be various. These included Tillman's soon-to-be-completed doctoral studies, based on her empirical investigations of children's instrumental-based music making in her Primary school in South West London (Tillman, 1987, vol2). On a personal note, in writing this reflective article, I am reminded that Tillman's (1987) doctoral research was undertaken just two miles away from the three Primary schools in my own (1983) South West London doctoral fieldwork – albeit unknown to each other at the time – and reported in the same BJME 1986 issue, as mentioned earlier. Our child participants shared a common inner-city background representing a wide variety of ethnic backgrounds and maternal language groups, living and schooled in areas of relative socio-economic disadvantage, but with pockets of relative affluence.

Within her literature review, the thesis referenced a recent book on the nature of aesthetic development in the arts by Ross (1984), as well as reports of a pioneering large-scale study of young children's singing by Moog (1976a; 1976b), which had drawn on Moog's own 1963 thesis. In addition, Swanwick – Tillman's doctoral supervisor – had recently returned from a visit to New York where he had been impressed by the conceptualisation and realisation of the Manhattanville Music Curriculum Project (MMCP), which was itself based on a spiral concept of curriculum development as proposed by Bruner (1960).

The MMCP had been conceived in the mid-1960s as a major innovative pedagogical project that was focused on the design of an alternate music curriculum for Grades K-12 (Primary to High school) using 'discovery approaches' and 'a meaningful sequence of musical concepts' (Moon & Humphreys, 2010: 76). The MMCP was seen more as a music education process – a way of making music, of acting like a musician – than a prescribed curriculum, designed to draw on music's building blocks of sound, such as rhythm, pulse, metre, duration, pitch, timbre, volume, form, texture, expression and style (Fisher, 1968). These were subsequently refined in a final publication (Thomas, 1970) as a music curriculum based on five core elements: dynamics, timbre, form, rhythm and pitch, to be used in combination and not in isolation from one another, and repeatedly revisited by students at 'increasingly sophisticated levels' (Moon & Humphreys, 2010: 80), often in the form of musical problem-solving. The influence of Bruner's spiral curriculum concept was explicit, with the process of music education being founded on students' musical

compositions, and with their creativity being enriched through encounters with how sonic materials were used by established composers, including musical idioms from the 20th century.

Prior to the 1986 BJME article which echoes MMCP elements and its emphasis on creativity, Swanwick had earlier written about his ideas on the essential ingredients for music education (1979) which included composition as well as performance. Subsequently, he reported that he was working on understanding the role of play in musical learning by drawing on Piaget's concepts of mastery, imitation and imaginative play (Piaget, 1952, 1962; Swanwick, 1991) – elements which are also common to MMCP and which underpin the nature of the empirical data that form the basis for Swanwick and Tillman's (1986) conceptualisation of creative musical development. The significance of play also surfaces in Swanwick's (1994) view of the importance of improvisation in instrumental teaching.

Around that time, I can remember sitting in a seminar at the Institute of Education in London and being particularly intrigued by the notion of a spiral curriculum – also termed a helix (e.g., Swanwick, 2011); Swanwick was sharing his impressions of the MMCP, which was shown as a looped continuum in which experiences could be linked horizontally and vertically (ascent/descent) as the child/young person makes sense of new musical encounters by assimilating and accommodating these – in a Piagetian sense – into existing conceptualisations and understandings of their sonic world. This was a time when Piaget's and Bruner's theories, based on their grounded observations of young children, were highly influential in suggesting that learning develops in the light of pre-existing perception and cognition (e.g., Piaget, 1962), and also through social experience with knowledgeable others (e.g., Bruner, 1985).

This child-centred view of the world was (and is) particularly important as a way of challenging a more overtly teacher-directed, subject-based pedagogy which assumed that there was (is) a 'canon' of existing knowledge into which the child needs to be inducted – a perceived weakness of the 1960's US school music curriculum which the MMCP was designed to address. Whilst music repertoire-related knowledge is important, it can ignore (and be ignorant of) what the learner brings to the activity and so be less effective as the basis for an approach which actually promotes learning by allowing for a sense of agency on the part of the learner. This tension is echoed in the Department for Education's (DfE) new 'Model Music Curriculum' (2021), which contains selected examples from the musical canon – albeit with some examples from the wider world of music for each phase of schooling. Rather more positively – in the sense of making explicit reference to the perception and cognition of music, a new research-based review of music by Ofsted (2021) – the national inspection body for schools in England – also appears to steer an uneasy line between the need for an induction into music's 'elements' (the 'domain' of music) and how people learn best. In places, there is a view of the music learner that is biased towards an expert perspective, rather than what an individual might bring to the task⁵, although there is a recognition elsewhere of the need for explicit music curricular space for creativity and innovation.

The MMCP was important because, at its core, it had a learner-centred ('child-centred') approach in which 'the child is not seen as a spectator in music, but as an active participant' (Walker, 1984: 27). The cultural and pedagogical antecedents for this can be traced back to those early pioneers of learning through exploration and play, such as Froebel (d. 1852⁶) (cf Liebschner, 1992) and Pestalozzi (d. 1827) (cf Silber, 1973), and – later in the 20th century – by Piaget (1962), Vygotsky (1967), Bronfenbrenner (1979) and Bruner (1986). More recently, others have continued to stress the importance of play, both in general development, such as by Pellegrini (2009), Fagan (2010), Bruce (2011) and Zosh et al. (2017), and also in the diverse spaces where musical development occurs. These contexts include school and community playgrounds (Marsh, 2008; Hardwood & Marsh, 2018; Saltari & Welch, *in press*), in the home and local community (Wu & Welch, 2022), with online media (Veblen & Kruse, 2020), and in sites of transition, trauma and conflict (McFerran, 2022).

However, there is a potential difficulty if we assume that a developmental curriculum is identical to what we might expect in a child's development. A curriculum that is based on a concept of

development presumably needs to take account of possible individual variations if it is to have the widest applicability. And, as pointed out by Anderson (2019), a curriculum that is sequenced in some way is not necessarily well matched to the variations and idiosyncrasies of a particular child's learning. Consequently, it seems important first to explore the nature of children's development, both more broadly, as well as in relation to how they make sense of music and develop musically.

Understanding sonic sense-making in context

In a recent book, Mark Reybrouck (2021) reports on his lifelong interest in what he calls 'musical sense-making' (2021: xvii), being related to the experience of music as sound. Musical experience is seen as a dynamic, active process of 'sense-making', which is both essentially subjective and peculiar to the individual, as well as social, being an appreciation that we are social, communal beings and open to influence by others.

A related perspective is offered by Nina Kraus (2021) in her new book where she reviews a lifetime of research into understanding the central significance of sound in the human condition. 'Our sense of hearing is always on' (p. 1). Kraus (op. cit., p. 96) argues convincingly that the 'sound mind' – those areas of the brain engaged in our sonic experience – 'is vast, engaging our cognitive, motor, reward, and sensory networks'. Within this neurological landscape, Kraus' emphasis on reward is particularly important in any consideration of children's musical behaviour and development, because it is a pertinent reminder of the significance of emotion in all our human experience, including music.

Emotion (self-perceived as 'feelings' when consciously labelled) is a core feature of our human design. Nearly 50 years ago, the pioneering neuroscientist and pharmacologist, Candace Pert, had discovered the brain's opiate receptor. Subsequently, Pert drew on this ground-breaking research to propose a concept of the human 'bodymind' (1988) as a way of signalling how our three, core internal bodily systems – nervous, endocrine and immune – function in an integrated, holistic manner and communicate with each other. As such, in the same way that we cannot switch off hearing (*cf* Kraus, 2021), we cannot switch off emotion (*cf* Pert, 1988).

The research literature on musical development, including my own on children's singing development, tends to employ simple musical tasks which can be used to make comparisons across large groups of individuals. However, such data gathering also needs to acknowledge the central importance of emotion and engagement, including in musical preferences. For example, a major, externally funded longitudinal study of children's singing development in the early 1990s was structured around simple children's songs as target models against which learning and development in singing could be measured (Welch, Sergeant & White, 1996, 1997, 1998). However, our concept of what should count as singing was challenged by an incident at the end of a morning's fieldwork visit to one of the project's 10 Primary schools. The young inner-city participant, aged 7 years, had been recorded in each of the two previous school years at ages 5 and 6 years. He dutifully sang that year's specially chosen project song for our digital database. With lunchtime approaching, and as a way of filling the morning's visit, the researcher kept the tape running and asked the boy if he would like to sing something else of his own choice. Immediately, he began to sing Michael Jackson's 'Heal the World', demonstrating a level of singing skill and sophisticated performativity which was much in advance of his more childlike rendition of the earlier target research song. He had been able to acquire and reproduce the cultural features of Jackson's song through listening at home, singing with an appropriate vocal timbre and a sensitivity to the original key and phrasing. This performance of 'his' song was of quite a different quality to his performance of the adult chosen 'research' song that had been recorded just 5 min earlier.

Thus, we need to take account of the extent to which a child's sense of agency is allowed for in the nature of the research tasks that we are using to map their musical behaviour and development. This example was a salient reminder of how it is possible to have many 'musics' inside us,

but that we may only be asked to use one of these when required to participate in a particular research task, and this may or may not be typical of our overall level of musical competency and our musical identity. This young boy's example resonated with the research team and subsequently informed the fieldwork design in an (ongoing) longitudinal research study of highly skilled female choristers from one of England's leading cathedrals. Whenever possible, the research team have taken the opportunity to gather different genre examples of these adolescent girls' singing, including their own songs – the music that they listen to when on their own, or with friends – as well as sung examples from their formal cathedral repertoire (*cf* Welch & Howard, 2002).

Both Reybrouck and Kraus argue for the centrality of emotion in the experience of sound, including organised sound that is labelled as music. Welch and Preti (2019) applied a similar understanding to children's singing and vocal development with their focus on singing as communication, being both intra- as well as interpersonal. At a more fundamental level, a new, genetics-based, review by Navarro, Martínón-Torres and Salas (2021) echoes the importance of sonic experience, whilst also seeking to understand the role of music in basic biology. The authors' main premise is that human knowledge begins through sensation and perception. They argue for a new research discipline in what they conceptualise as 'musical sensogenomics'. This would investigate the mechanisms and potential of sound-based sensory activation on the genome and – in turn – seek to understand how this activation might subsequently impact gene expression. Navarro et al. report on the identification of genes in various recent studies in music, such as related to the perception of rhythm, absolute pitch, aspects of music performance and music listening. The authors suggest that 'complementary approaches from social sciences, neurosciences, psychophysiology, and genetics have demonstrated the importance of nature and nurture in our characterisation as musical beings' (Navarro, Martínón-Torres & Salas, 2021: 14). Musical development is, therefore, shaped by our encounters with sound and our basic human design, both for making sense of our soundworld and also for acting within it.

This emphasis on the prime importance of the senses in perception chimes with research in the field of special education and musical development (Ockelford & Welch, 2021), as well as in the early years (Ockelford & Voyajolu, 2021; Voyajolu & Ockelford, 2016). In these publications, Ockelford argues that an infant's first experience of music is as a confusion of sound, then gradually through extrapolating features, patterns and structures that are available in their soundworld. This theoretical perspective forms part of the conceptual underpinning of the Sounds of Intent project, a series of applied research studies into the musical behaviour and development of children and young people with complex needs, including profound and multiple learning difficulties (PMLD) and severe learning difficulties (SLD). Grounded in hundreds of observations in real-world contexts in special schools and participant children's homes, analyses of the research data concluded that musical behaviour can be conceived as occurring in three complementary domains: reactive (responding to sound), proactive (initiating sound) and interactive (making sound with others) (*cf* Ockelford & Welch, 2012; Welch et al., 2009). Furthermore, extensive empirical data suggest that musical behaviour and development are not even across the three domains (e.g., Ockelford et al., 2011), but that there does appear to be a hierarchy within each domain towards growing accomplishment, although development for an individual child is not necessarily linear, but rather multifaceted (Ockelford & Welch, 2018; see Wilde, Ockelford & Welch, 2016, for an overview of how the Sounds of Intent framework was developed).

Relatedly, Reybrouck (2021) echoes Piaget's theoretical position in believing that sense-making derives from sensorimotor interactions with the environment, allied to a circularity between action and perception. This leads to enactive and embodied cognition – cognition as an active process, shaped by and shaping behaviour, and which is informed by the individual taking the role of an observer in an observed system.

Such sociocultural influences remind us of the important theoretical insights which underpin the writings of Vygotsky (d.1934) and, more recently, Bronfenbrenner (1979) and

Engeström (1999). Several authors have sought to apply social and cultural psychology to studies of musical behaviour and development, such as exemplified by Barrett (2005) in terms of young children, and (separately) to composers (Love & Barrett, 2018), and also Perkins (2013) concerning undergraduate musicians. Moreover, studies are not confined to Western classical-type musics, as there are a growing number of examples of how children's musical development is situated in the particulars of local contexts elsewhere across the musical spectrum. These include studies by Campbell (2007) into the diversity of children's musical cultures, as illustrated by Akuno and colleagues (2022) concerning musical learning communities in four sub-Saharan regions, by Wu and Welch (2022) related to young children growing up in the Chinese diaspora in London, and in the research by Treloyn and colleagues (2022) on children growing up with the musics of indigenous communities, being exemplified in the northwest of Australia. In other examples of musical learning in a specific cultural context, Welch (2007, 2011) and Stewart (2021) both drew on Engeström's cultural-historical activity theory (CHAT) to understand the cultural shaping of female chorister development in the previously all-male tradition of English cathedrals and major chapels.

Collectively, these are illustrations of what Barrett (2011) and Hargreaves (2022) see as the power of culture in shaping children's musical development, both of individuals and groups. Furthermore, another contextual variable needs to be considered, that of technology use. Children and young people have virtual access from modern electronic media to a wide diversity of musical cultures within and beyond the immediate family. In England, for example, the antecedent of this was the advent of the gramophone in the early 20th century which allowed previous generations of children to access a diverse range of musics for the first time, both in the home (biased towards popular musics) and in school (Western classical). This innovation was closely followed by BBC radio broadcasting which was aimed specifically at promoting music and movement for children (pioneered by Ann Driver, 1936). Children's radio for schools also included singing, particularly folk songs, as found in the 'Singing Together' programme that was broadcast from 1939⁷, and 'Time and Tune' for younger children from 1951⁸. In the 21st century, the advent of new technologies has allowed young children to experience music across their everyday lives (*cf* Vestad, 2010): in the home, whilst travelling, at school, during family shopping, and elsewhere in their wider communities, through television and film, as well as the web and apps on smartphones and tablets, and often as an integral part in the design of their toys. Research has illustrated how children's musical development can be facilitated by such technology (Fredrikson et al., 2011; Gower & McDowall, 2012; Howell, 2017; Myllykoski, Paananen & Saarikallio, 2010), including for deaf and partially hearing children (Welch et al., 2015, 2018). Webster (2016) offers a recent summary of such technology and provides several examples from real-life situations of children and young people using computer-based technology for musical creation. In the same chapter, he also lists a wide range of exemplar software to aid their musical development. Overall, the plethora of available technology applications adds another significant contextual, as well as cultural, variable into any research quest that seeks to define and make sense of children's musical development in general, and musical creativity in particular.

Conscious and other-than-conscious musicking in musical development

Part of the challenge in supporting children and young people's musical development embraces the concept of consciousness and how this might relate to musical behaviour. Reaction time studies inform us that we can consciously react to a stimulus usually in not less than between .2 and .4 of a second, although it can be slightly less in elite athletes and skilled musicians, believed to be because of enhanced neural connectivity derived from repeated practice (Landry & Champoux, 2017). Much of an infant's general learning, such as related to controlled movement, use of language, and through their senses such as vision and audition, will involve trial-and-error and play in relation to environmental stimuli and embrace multiple variations in such stimuli, often multi-sensory. These are processed in fractions of a second that are outside conscious

awareness (*cf* Marchman, & Fernald, 2008). Perception embraces some form of concatenation ('chunking') of elements, in which an overall impression of the stimulus, or particular salient features, are noted. Perceptual salience may not be the same as intended salience from a pedagogical perspective, as the nature of any such correlation will depend on what the child (as perceiver) brings to the task.

Seth (2021a, 2021b) distinguishes between three different types of consciousness: conscious 'level' – 'how conscious you are', such as related to wakefulness; conscious 'content' – 'what you are conscious of'; and conscious 'self' – 'the experience of being you', 'of being me' (2021b: 46–47). Davies' (1992) case studies of young children's invented songs demonstrate a form of self-expression and musical creativity which appears to be 'in-the-moment' and outside conscious control, seemingly combining elements of Seth's concepts of content and self as a form of playful expression which draws on, and combines, their experiences – sonic and otherwise – and views of the world. Furthermore, being able to create successful pieces in song form appears to have little formal relationship with the ability to sing standard song repertoire in-tune (*op.cit.* p. 384). Thus, the implication is that – given the widespread neural bases for musical behaviour, shaped by cultural experiences and networked within and across various modules in the brain (*cf* Hodges, 2019; Janzen & Thaut, 2019; Särkämö & Sihvonen, 2018) – we should continue to be cautious about seeing one aspect of musical behaviour (e.g., composing) as operating at the same developmental level as another (e.g., singing repertoire, or improvised singing).

In terms of conscious content and singing, for example, there is an extensive literature that, when some young children in Western cultures are asked to learn a new song, they perceive the lyrics as having the greatest salience rather than any of the song's particular musical features (other than rhythm), such as the constituent pitches and melody (Rutkowski, 1984, 1990, 2019, Welch, 1986, 2016; Welch, Sergeant & White, 1996, 1997). In the past, such children were assessed and labelled as being 'tone deaf', in the sense of being unmusical. As I reported in 1979 and 1994, this bipartite view of musical behaviour can become reified in the language of popular culture through the use of such labels as 'growler', 'grunter', 'monotone', 'tone deaf' (Welch, 1994), 'tone idiot' (= *Onchi* in Japan, Welch & Murao, 1994), rather than seeing children on a potential journey towards greater competency if their environment is sufficiently nurturing.

Subsequent large datasets on children's singing (e.g., longitudinal data: Welch, Sergeant & White, 1997; comparative data: Welch et al., 2012), involving many thousands of children in total, reveal that the proportions of children who are less than tuneful in their singing commonly decreases with age, such that there are virtually no girls who are classified as 'out-of-tune' singers by the age of 11 years, and only a small proportion of boys (Welch, Saunders, Papapegorgi & Himonides, 2012). Furthermore, if the singing task is focused purely on a song's musical elements and not combined with the lyrics, both sexes are much more pitch accurate vocally and virtually identical in their developing competency (*cf* Welch, 2019). Thus, our notions of children's singing behaviour and development and the assessment of these are highly context-related, with key variables of age, sex/gender, musical task, intentionality and assessment methodology and tools. The mapping of musical behaviours is itself socially located.

Gradually, over time, most children will learn to sing 'in-tune' related to a cultural stimulus, although – at the level of the individual – differences are still likely to be evidenced, depending on the assessment criteria employed. These might embrace being in-tune throughout, or in-tune for the main pitch anchor points – tonic/dominant – but with other pitches being more variable, or related to the evenness in the quality of vocal timbre. Furthermore, this challenge in making sense of the child's musical behaviour is inherently intertwined with the nature of the rater's perception, that is, the person responsible for making a judgement of the child's musical behaviour and its relative development. Judgement embraces various facets, including what counts as salient for the rater. Even when the criteria for assessment appear to be explicit, it is often only through multiple judgements that a more robust picture is likely to emerge, irrespective of whether the assessment is human- or technology-based.

For example, a study by Buckton of 6-year-old singing in New Zealand (1982) revealed that, when asked about the proportion of 'out-of-tune' singers in their class, the teachers' responses varied from 'none' – when actually most of the children sang out-of-tune on an assessed criterion song in her class – to 'over 50%' – when, in reality, virtually all the children were in-tune in this teacher's class. The teachers involved were generalists and not specialists in children's singing. Their craft knowledge approach, based on experience, was often significantly at variance with a more 'objective' measure. Furthermore, if behaviour in singing is on the basis of the application of speech science, the commonly based algorithms which underpin acoustic measures have traditionally been derived from adult male vocal function and may not necessarily be valid and reliable in the assessment of children's singing (Welch, 2003). Consequently, it is clear that reliability of research data is multifaceted, such as being related to the number of participant children involved and the number of raters, as well as the nature of the criteria and the contexts in which data are being gathered.

Conclusion

New initiatives in tracking individual musical behaviour and development, such as in the Sounds of Intent project in the context of complex needs (Welch et al., 2009) and its recent adaptation as Sounds of Intent in the early years (Voyajolu & Ockelford, 2016), suggest that we should be responsive to and celebrate the internal musical worlds of individual participants as well as their multiverse contexts. This is especially important if we hope that others will be able to understand and apply the trends, nuances and limitations of our data in their quest to underpin music pedagogy with a robust evidence base.

Furthermore, the latest research trends concerning early childhood musical behaviour and development suggest that investigators are becoming increasingly aware of the significance of development *in* music and also *through* music. The multi-sited nature of musical behaviours at a neurological level demonstrate an interconnectedness between diverse brain regions (e.g., Schlaug, 2015) and engagement in sound sense-making is likely to involve reciprocal development across different neurological networks. Thus, children's musical development is likely to be interwoven with their other-than-musical development, as well as their emotional wellbeing. The role of the teacher is to understand these possible/actual relationships in creating successful scaffolded musical activities in which children's current expertise can be made manifest, celebrated, shared and developed.

It is evident that the Swanwick and Tillman (1986) conception of one important aspect of musical development (creating) in a spiral form has had a strong historical impact. It continues to have a positive contemporary resonance in reminding us that musical behaviours can – and often do – change with age and experience. Subsequent studies have provided more detailed insights into how such development is shaped by contextual factors, which can be both nurturing and inhibiting, at individual as well as group levels. Perhaps the spiral's greatest legacy is in its underlying message that the development of musical behaviours *is* possible rather than being fixed in some way.

Despite advances over the past 35 years, it is clear that we are still in the early stages (phases?) of a journey to understand the complexities of musical behaviour and what counts as development, as well as how this might be nurtured most effectively for all children and not just some. We are musical by design – our pedagogical challenge is to use this knowledge to enable each individual to realise their musical potential.

Notes

- 1 The Davies (1986) article was part of a case study dataset for her subsequent DPhil thesis at York, 1992.
- 2 The Welch (1986) article drew on his recently completed 1983 London PhD into the impact of feedback on observed levels of singing competency in young children.
- 3 In September 2015, world leaders gathered at the United Nations to set ambitious goals for the future of the global community. Goal 4 of the Sustainable Development Goals (SDGs) sought to ensure 'inclusive and equitable quality education and promote lifelong learning opportunities for all' (UN, 2015, see <https://sdgs.un.org/goals>). Recently, the OECD (2021: 30) reminded us that this goal (SDG4) reaffirms the importance of children's participation in 'high quality early childhood development, care and pre-primary education so that they are ready for Primary education'.
- 4 These are (1) opera, embracing 400 types of local opera; (2) local singing-narrative, with 300 examples reported; (3) folk song, with over 400,000 recorded; (4) Ci song and Qu (songs set to strict tonal and rhythmic patterns) and (5) religious recitatives – such as Buddhist, Taoist, Muslim, and each influenced by regional dialects (Yang, 2011: 31). In addition, there will be many diverse forms of Western-type and Chinese popular musics, as well as Western style classical music.
- 5 For example, in the section on Expressive quality, the statement 'Musical expression in performance is dependent on the highly developed technical expertise of the performer' (2021: 17) appears to ignore the evidence that pre-school children are more than capable of performing music on their own terms (e.g., Barrett, 2019).
- 6 For example, see the Froebel Trust's *The power of play* <https://www.froebel.org.uk/about-us/the-power-of-play> as well as Jacob Liebschner's extensive review of the importance of play in Froebel's educational theory.
- 7 <https://www.bbc.co.uk/news/magazine-30210485>
- 8 http://www.broadcastforschools.co.uk/site/Time_and_Tune

References

- AKUNO, E. A., ADDO, A. O., ANDANGO'O, E. A., EMBERLEY, A., DAVHULA, M. & MATIURE, P. (2022). In M. S. Barrett & G. F. Welch (eds.), *The Oxford Handbook of Early Childhood Music Learning and Development*. New York: Oxford University Press. [Chapter 26].
- ANDERSON, A. D. (2019). *Happy Accidents? Music Teacher Perceptions of Curriculum Design at Key Stage 3 in the English Secondary School*. Unpublished doctoral thesis, Birmingham City University, Birmingham.
- BARBERGER, J. (1991). *The Mind Behind the Musical Ear: How Children Develop Musical Intelligence*. Cambridge, MA: Harvard University Press.
- BARRETT, M. S. (2005). Children's communities of musical practice: some socio-cultural implications of a systems view of creativity in music education. In D. J. Elliott (ed.), *Praxial Music Education: Reflections and Dialogues* (pp. 177–195). New York: Oxford University Press.
- BARRETT, M. S. (ed.) (2011). *A Cultural Psychology of Music Education*. New York: Oxford University Press.
- BARRETT, M. S. (2019). Singing and invented song-making in infants' and young children's early learning and development: From shared to independent song-making. In G. F. Welch, D. Howard & J. Nix (eds.), *The Oxford Handbook of Singing* (pp. 471–487). New York: Oxford University Press.
- BARRETT, M. S., ABAD, V. & WELCH, G. F. (2022). Researching music early learning and development: mapping methods and techniques, locations, problems, and theories. In M. S. Barrett & G. F. Welch (eds.), *The Oxford Handbook of Early Childhood Music Learning and Development*. New York: Oxford University Press. [Chapter 7]
- BARRETT, M. S. & WELCH, G. F. (2021). Music early learning programs: Enduring outcomes for children and their families. *Psychology of Music*, 49(5), 1226–1241.
- BARRETT, M. S. & WELCH, G. F. (eds.) (2022). *The Oxford Handbook of Early Childhood Music Learning and Development*. New York: Oxford University Press.
- BRONFENBRENNER, U. (1979). *The Ecology of Human Development*. Cambridge, MA: Harvard University Press.
- BRUCE, T. (2011). *Learning through Play: Babies, Toddlers and Young Children* (2nd ed.). London: Hodder Education.
- BRUNER, J. (1985). Models of the learner. *Educational Researcher*, 14(6), 5–8.
- BRUNER, J. S. (1960). *The Process of Education*. Cambridge, MA: Harvard University Press.
- BRUNER, J. S. (1986). *Actual Minds, Possible Worlds*. Cambridge, MA: Harvard University Press.
- BUCKTON, R. (1982). *Sing a Song of Six-Year-Olds*. Wellington, New Zealand: Council for Educational Research.
- CAMPBELL, P. S. (2007). Musical meaning in children's cultures. In L. Bresler (ed.), *International Handbook of Research in Arts Education*. *Springer International Handbook of Research in Arts Education*, 16. Dordrecht: Springer. doi: 10.1007/978-1-4020-3052-9_60
- COSTA-GIOMI, E. (2015). The long-term effects of childhood music instruction on intelligence and cognitive abilities. *Update*, 33(2), 20–26.
- DAVIES, C. (1986). Say it till a song comes (reflections on songs invented by children 3–13). *British Journal of Music Education*, 3(3), 279–293.
- DAVIES, C. (1992). *Young Children as Song-Makers*. Unpublished doctoral thesis, University of York, New York.

- DRIVER, A. (1936). *Music and Movement*. London: Oxford University Press.
- ENGESTRÖM, Y. (1999). Activity theory and individual and social transformations. In Y. Engeström, R. Miettinen & R. L. Punamäki (eds.), *Perspectives on Activity Theory* (pp. 19–38). Cambridge, UK: Cambridge University Press.
- FAGAN, R. M. (2010). Play and development. In P. Nathan & A. D. Pellegrini (eds.), *The Oxford Handbook of the Development of Play* (pp. 83–100). New York: Oxford University Press.
- FISHER, R. B. (1968). Learning music unconventionally. *Music Educators Journal*, **54**, 61.
- FORD THOMPSON, W. & Schlaug, G. (2015). The healing power of music. *Scientific American Mind*, March/April, 33–41.
- FREDRIKSON, M., LIVARI, N., TIKKANEN, R. & HEDBERG, H. (2011). Building a community of musical practice for children in a child-centered way – JamMo singing game for 3–6 aged children. In H. Ruokamo, M. Eriksson, L. Pekkala & H. Vuojärvi (eds.), *Social Media in the Middle of Nowhere – NBE 2011 Conference* (pp. 39–47). University of Lapland Publications in Education 25. Rovaniemi: University of Lapland.
- GORDON, E. E. (1979). Developmental music aptitude as measured by the primary measures of music audiation. *Psychology of Music*, **7**, 42–49.
- GORDON, E. E. (1997). *Learning Sequences in Music: Skill, Content, and Patterns: a Music Learning Theory; Study Guide*. Chicago: GIA Publications Inc.
- GOWER, L. & MCDOWALL, J. (2012). Interactive music video games and children’s musical development. *British Journal of Music Education*, **29**(1), 91–105. doi: [10.1017/S0265051711000398](https://doi.org/10.1017/S0265051711000398)
- HARGREAVES, D. J. (1986). *The Developmental Psychology of Music*. Cambridge: Cambridge University Press.
- HARGREAVES, D. J. (2022). Cultural diversity and the explanation of musical development. In M. S. Barrett & G. F. Welch (eds.), *The Oxford Handbook of Early Childhood Music Learning and Development*. New York: Oxford University Press. [Chapter 12]
- HARGREAVES, D. J. & GALTON, M. (1992). Aesthetic learning: Psychology theory and educational practice. In B. Reimer & R. A. Smith (eds.), *1992 N.S.E.E. Yearbook on the Arts in Education* (pp. 124–150). Chicago: N.S.S.E.
- HARGREAVES, D. J. & LAMONT, A. (2017). *The Psychology of Musical Development*. Cambridge: Cambridge University Press.
- HARWOOD, E. & MARSH, K. (2018). Children’s ways of learning inside and outside the classroom. In G. E. McPherson & G. F. Welch (Eds.), *Music Learning and Teaching in Infancy, Childhood, and Adolescence: An Oxford Handbook of Music Education* (Vol. 2, pp. 102–120). New York: Oxford University Press.
- HODGES, D. A. (2019). Music through the lens of cultural neuroscience. In M. H. Thaut & D. A. Hodges (eds.), *The Oxford Handbook of Music and the Brain* (pp. 18–42). New York: Oxford University Press.
- HOWELL, G. (2017). Exploring intersections of technology, play, informality, and innovation. In A. Ruthmann & R. Mantie (Eds.), *The Oxford Handbook of Technology and Music Education* (pp. 249–253). New York: Oxford University Press.
- IRELAND, J. & MOUTHAN, M. (2020). Perspectives on curriculum design: Comparing the spiral and the network models. *Research Matters*, **30**, 7–12.
- JANZEN, T. B. & THAUT, M. H. (2019). Cerebral organization of music processing. In M. H. Thaut & D. A. Hodges (eds.), *The Oxford Handbook of Music and the Brain* (pp. 88–121). New York: Oxford University Press.
- KATZ, L. (1991). Readiness: Children and Schools. *Striving for Excellence: The National Education Goals*. United States Department of Education, Educational Resources Center [ERIC]. EDO-PS-91-4.
- KRAUS, N. (2021). *Of Sound Mind – How Our Brain Constructs a Meaningful Sonic World*. Cambridge, MA: MIT Press.
- LANDRY, S. P. & CHAMPOUX, F. (2017). Musicians react faster and are better multisensory integrators. *Brain and Cognition*, **111**, 156–162.
- LIEBSCHNER, J. (1992). *A Child’s Work: Freedom and Play in Froebel’s Educational Theory and Practice*. Cambridge: Lutterworth Press.
- LOVE, K. & BARRETT, M. S. (2018). Signature pedagogies for musical practice: A case study of creativity development in an Orchestral Composers’ Workshop. *Psychology of Music*, **47**(4), 551–567. doi: [10.1177/0305735618765317](https://doi.org/10.1177/0305735618765317)
- MARCHMAN, V. A. & FERNALD, A. (2008). Speed of word recognition and vocabulary knowledge in infancy predict cognitive and language outcomes in later childhood. *Developmental Science*, **11**(3), F9–F16.
- MARSH, K. (2008). *The Musical Playground: Global Tradition and Change in Children’s Songs and Games*. New York: Oxford University Press.
- MCFERRAN, K. S. (2022). Music with young children in sites of transition, trauma, and conflict. In M. S. Barrett & G. F. Welch (eds.), *The Oxford Handbook of Early Childhood Music Learning and Development*. New York: Oxford University Press. [Chapter 34]
- MOOG, H. (1963). *Beginn und erste Entwicklung des Musikerlebens im Kindesalter. Eine empirisch-psychologische Untersuchung* (Beginning and first development of musical life in childhood. An empirical-psychological investigation). Thesis, Köln.
- MOOG, H. (1968). *Das Musikerleben des vorschulpflichtigen Kindes* (The musical life of the pre-school aged child). Mainz: B. Schott’s Söhne.
- MOOG, H. (1976a). The development of musical experience of children of pre-school age. *Psychology of Music*, **4**(2), 38–45.
- MOOG, H. (1976b). *The Musical Experience of the Pre-school Child*. London: Schott & Co.

- MOON, K. S. & HUMPHREYS, J. T. (2010). The Manhattanville music curriculum program: 1966–1970. *Journal of Historical Research in Music Education*, 31(2), 75–98.
- MYLLYKOSKI, M., PAANANEN, P. & SAARIKALLIO, S. (2010). ‘JamMo’ mobile music making software: Composition games for 3–6-year-old children. In G. Mota & Y. Aiqing (eds.), *Proceedings. ISME 23rd Research Commission Seminar* (pp. 102–106). Changchun, China: North East Normal University.
- NAVARRO, L., MARTINÓN-TORRES, F. & Salas, A. (2021). Sensogenomics and the biological background underlying musical stimuli: Perspectives for a new era of musical research. *Genes*, 12, 1454. doi: [10.3390/genes12091454](https://doi.org/10.3390/genes12091454)
- OCKELFORD, A. & VOYAJOLU, A. (2021). The development of music-structural cognition in the early years – A perspective from the Sounds of Intent model. In A. Ockelford & G. F. Welch (eds.), *New Approaches in Applied Musicology* (pp. 13–63). London: Routledge.
- OCKELFORD, A. & WELCH, G. F. (2012). Mapping musical development in learners with the most complex needs: The sounds of intent project. In G. McPherson & G. Welch (eds.), *The Oxford Handbook of Music Education* (Vol. 2, pp. 11–30). New York: Oxford University Press.
- OCKELFORD, A. & WELCH, G. F. (2018). Mapping musical development in learners with the most complex needs: The sounds of intent project. In G. McPherson & G. Welch (eds.), *The Oxford Handbook of Music Education* (Vol. 2, pp. 7–27). New York: Oxford University Press.
- OCKELFORD, A. & WELCH, G. F. (2021). *Essays in Applied Musicology: A Common Framework for Music Education and Psychology Research*. London: Routledge. [with Voyajolu, A., Grundy, R. & Trower, H.]
- OCKELFORD, A., WELCH, G. F., JEWELL-GORE, L., CHENG, E., VOGIATZOGLOU, A. & HIMONIDES, E. (2011). Sounds of intent, phase 2: Approaches to the quantification music-developmental data pertaining to children with complex needs. *European Journal of Special Education*, 26(2), 177–199. doi: [10.1080/08856257.2011.563606](https://doi.org/10.1080/08856257.2011.563606)
- OECD. (2021). *Education at a Glance 2021*. Paris: Organisation for Economic Co-operation and Development. doi: [10.1787/b35a14e5-en](https://doi.org/10.1787/b35a14e5-en)
- OFSTED (2021). *Research review series: music*. London: Office for Standards in Education.
- PAN, Q., TRANG, K. T., LOVE, H. R. & TEMPLIN, J. (2019). School readiness profiles and growth in academic achievement. *Frontiers in Education*, 4, 127. doi: [10.3389/educ.2019.00127](https://doi.org/10.3389/educ.2019.00127)
- PEERY, J. C., PEERY, I. W. & DRAPER, T. W. (eds.) (1987). *Music and Child Development*. New York: Springer.
- PELLEGRINI, A. (2009). *The Role of Play in Human Development*. New York: Oxford University Press.
- PERKINS, D. (1974). Probing artistic process: A progress report from Harvard project zero. *The Journal of Aesthetic Education*, 8(3), 33–57.
- PERKINS, R. (2013). Learning cultures, creativities and higher music education institutions. In P. Burnard (ed.), *Developing Creativities in Higher Music Education: International Perspectives and Practices* (pp. 223–233). London: Routledge.
- PERT, C. B. (1988). The wisdom of the receptors: Neuropeptides, the emotions, and bodymind. *Advances*, 8(8), 8–16.
- PIAGET, J. (1952). *Play, Dreams and Imitation in Childhood*. New York: W W Norton & Co.
- PIAGET, J. (1954). *The Construction of Reality in the Child*. (M. Cook, Trans.). Basic Books. doi: [10.1037/11168-000](https://doi.org/10.1037/11168-000)
- PIAGET, J. (1962). *Play, Dreams, and Imitation in Childhood* (C. Gattengno & F. M. Hodgson, Trans.). New York: Norton. (Original work published 1951).
- POCWIERZ-MARCINIAK, I. & HARCIAREK, M. (2021). The effect of musical stimulation and mother’s voice on the early development of musical abilities: A neuropsychological perspective. *International Journal of Environmental Research and Public Health*, 18, 8467. doi: [10.3390/ijerph18168467](https://doi.org/10.3390/ijerph18168467)
- REYBROUCK, M. (2021). *Musical Sense-Making – Enaction, Experience, and Computation*. London: Routledge.
- ROSS, M. (1984). *The Aesthetic Impulse*. Oxford: Pergamon Press.
- RUTKOWSKI, J. (1984). Development of a Rating Scale to Assess Individual Children’s Use of the Vocal Instrument. Unpublished manuscript, State University of New York at Buffalo, Buffalo, NY.
- RUTKOWSKI, J. (1990). The measurement and evaluation of children’s singing voice development. *The Quarterly*, 1(1–2), 81–95.
- RUTKOWSKI, J. (2019). Assessing singing voice development. In T. S. Brophy (ed.), *The Oxford Handbook of Assessment Policy and Practice in Music Education* (Vol. 2, pp. 628–652). New York: Oxford University Press.
- SABOL, T. J. & PLANTA, R. C. (2017). The state of young children in the United States: School readiness. In E. Votruba-Drzal & E. Dearing (eds.), *The Wiley Handbook of Early Childhood Development Programs, Practices and Policies* (pp. 3–17). Malden, MA: John Wiley & Sons.
- SALTARI, R. & WELCH, G. F. (in press). Exploring the culture of Greek children’s musical games in the school playground: An ethnographic study. *Research Studies in Music Education*.
- SÄRKÄMÖ, T. & SIHVONEN, A. J. (2018). Golden oldies and silver brains: Deficits, preservation, learning, and rehabilitation effects of music in ageing-related neurological disorders. *Cortex*, 109, 104–123.
- SCHLAUG, G. (2015). Musicians and music making as a model for the study of brain plasticity. *Progress in Brain Research*, 217, 37–55.
- SERAFINE, M. L. (1988). *Music as Cognition: The Development of thought in Sound*. New York: Columbia University Press.

- SERGEANT, D. & ROCHE, S. (1973). Perceptual shifts in the auditory information processing of young children. *Psychology of Music*, 1(2), 39–48.
- SETH, A. (2021a). *Being You: A New Science of Consciousness*. London: Faber & Faber.
- SETH, A. (2021b). The hard problem of consciousness is already beginning to dissolve. *New Scientist*, 3350, 4th September 2021. <https://www.newscientist.com/article/mg25133501-500-the-hard-problem-of-consciousness-is-already-beginning-to-dissolve/>
- SILBER, K. (1973). *Pestalozzi: The Man and His Work* (3rd ed.). London: Routledge and Kegan Paul.
- SLOBODA, J. A. (1985). *The Musical Mind: The Cognitive Psychology of Music*. New York: Oxford University Press.
- STAVRIDES, M. (1995). *The Interaction of Audience-Listening and Composing: A Study in Cyprus Schools*. Unpublished doctoral thesis, University of London Institute of Education, London.
- STEWART, C. (2021). *The Impact of the Introduction of Girl Choristers at SALISBURY and Its Influence on Other British Anglican Cathedral Choirs*. Unpublished doctoral thesis, University of London Institute of Education, London.
- SWANWICK, K. (1979). *A Basis for Music Education*. Slough: NFER-Nelson.
- SWANWICK, K. (1991). Further research on the musical development sequence. *Psychology of Music*, 19, 22–32.
- SWANWICK, K. (2011). Musical development. Revisiting a generic theory. In R. Colwell & P. R. Webster (eds.), *MENC Handbook of Research on Music Learning: Volume 1: Strategies* (pp. 140–172). New York: Oxford University Press. doi: 10.1093/acprof:osobl/9780195386677.003.0004
- SWANWICK, K. & TILLMAN, J. (1986). The sequence of musical development: A study of children's composition. *British Journal of Music Education*, 3(3), 305–339.
- THOMAS, R. P. (1970). *MMCP Synthesis: A Structure for Music Education*. Bardonia, NY: Media Materials Inc.
- TILLMAN, J. B. (1987). *Towards a Model of the Development of Musical Creativity: A Study of the Compositions of Children Aged 3–11*. Unpublished doctoral thesis, University of London Institute of Education, London. [2 volumes]
- TRELOYN, S., EMBERLY, A., CHARLES, R. G. & UMBAGAI, L. (2022). Early childhood and music in indigenous contexts: Approaches to teaching and learning in an indigenous Australian community. In M. S. Barrett & G. F. Welch (eds.), *The Oxford Handbook of Early Childhood Music Learning and Development*. New York: Oxford University Press. [Chapter 26]
- UNITED NATIONS. (2015). *Sustainable Development Goals*. New York: United Nations Department of Economic and Social Affairs. <https://sdgs.un.org/goals>
- VEBLEN, K. K. & KRUSE, N. B. (2020). Children's musical play in a digital era. In N. J. L. Waldron, S. Horsley & K. K. Veblen (eds.), *The Oxford Handbook of Social Media and Musical Learning* (pp. 529–545). New York: Oxford University Press.
- VERNEY, J. P. (2013). *Rhythmic Perception and Entrainment in 5-Year-Old Children*. Unpublished doctoral thesis, University of Cambridge, Cambridge.
- VESTAD, I. L. (2010). To play a soundtrack: How children use recorded music in their everyday lives. *Music Education Research*, 12(3), 243–255. doi: 10.1080/14613808.2010.504811
- VOYAJOLU, A. & OCKELFORD, A. (2016). Sounds of intent in the early years: A proposed framework of young children's musical development. *Research Studies in Music Education*, 38(1), 93–113.
- YIGOTSKY, L. (1967). Play and its role in the mental development of the child. *Soviet Psychology*, 12, 62–76.
- WALKER, R. (1984). Education in thoughts too definite for words. *Bulletin of the Council for Research in Music Education*, 77, 20–30.
- WEBSTER, P. (2016). Computer-based technology. In G. McPherson (ed.), *The Child as Musician* (2nd ed., pp. 500–519). New York: Oxford University Press.
- WELCH, G. F. (1983). *Improvability of Poor Pitch Singing: Experiments in Feedback*. Unpublished doctoral thesis, University of London Institute of Education, London.
- WELCH, G. F. (1986). A developmental view of children's singing. *British Journal of Music Education*, 3(3), 295–303.
- WELCH, G. F. (1994). The assessment of singing. *Psychology of Music*, 22(1), 3–19.
- WELCH, G. F. (2003). *Voice Development, Assessment, Education and Care in Childhood and Adolescence*. ESF Standing Committee for the Social Sciences, Exploratory Workshop, End-of-award report. http://www.esf.org/index.php?eID=tx_nawsecured&u=0&file=fileadmin/be_user/research_areas/social_sciences/documents/Voice_Development_Assessment_Education_and_Care_in_Childhood_and_Adolescence.pdf&t=1341654241&hash=5df88d13dc5e8db8f714c8ffid3674baeb06dfc31
- WELCH, G. F. (2007). Addressing the multifaceted nature of music education: An activity theory research perspective. *Research Studies in Music Education*, 28, 23–38.
- WELCH, G. F. (2011). Culture and gender in a cathedral music context: An activity theory exploration. In M. Barrett (ed.), *A Cultural Psychology of Music Education*. (pp. 225–258). New York: Oxford University Press.
- WELCH, G. F. (2016). Singing and vocal development. In G. McPherson (ed.), *The Child as Musician: A Handbook of Musical Development* (2nd ed., pp. 441–461). New York: Oxford University Press.
- WELCH, G. F. & HOWARD, D. M. (2002). Gendered voice in the Cathedral Choir. *Psychology of Music*, 30, 102–120.
- WELCH, G. F. & MURAO, T. (eds.). (1994). *Onchi and singing development*. London: David Fulton.
- WELCH, G. F. & OCKELFORD, A. (2016). The role of the institution and teachers in supporting learning. In S. Hallam, I. Cross & M. Thaut (eds.), *The Oxford Handbook of Music Psychology*, (2nd ed., pp. 509–526). Oxford: Oxford University Press.

- WELCH, G. F., OCKELFORD, A., CARTER, F. C., ZIMMERMANN, S. A. & HIMONIDES, E. (2009). 'Sounds of Intent': Mapping musical behaviour and development in children and young people with complex needs. *Psychology of Music*, 37(3), 348–370.
- WELCH, G. F. & PRETI, C. (2019). Singing as inter- and intra-personal communication. In: G. Welch, D. M. Howard & J. Nix (eds.), *The Oxford Handbook of Singing* (pp. 369–391). New York: Oxford University Press. doi: [10.1093/oxfordhb/9780199660773.013.73](https://doi.org/10.1093/oxfordhb/9780199660773.013.73)
- WELCH, G. F., SAUNDERS, J., EDWARDS, S., PALMER, Z., HIMONIDES, E., KNIGHT, J., MAHON, M., GRIFFIN, S. & VICKERS, D. A. (2015). Using singing to nurture children's hearing? A pilot study. *Cochlear Implants International*, 16(S3), S63–S70. doi: [10.1179/1467010015Z.000000000276](https://doi.org/10.1179/1467010015Z.000000000276)
- WELCH, G. F., SAUNDERS, J., PAPAGEORGI, I. & HIMONIDES, E. (2012). Sex, gender and singing development: Making a positive difference to boys' singing through a national programme in England. In S. Harrison, G. F. Welch & A. Adler (eds.), *Perspectives on Males and Singing* (pp. 37–54). London: Springer.
- WELCH, G. F., SAUNDERS, J., WILDE, E., MASON, K., MAYNARD, L. & KNIGHT, J. (2018). Sounding Out: A research-based evaluation of a specially designed music programme for young Hearing Impaired (HI) adolescents. In E. K. Orman (ed.), *Proceedings, ISME Research Seminar*, Dubai, UAE 8–13 July 2018 (pp. 183–194). Dubai: Canadian University Dubai. ISBN 978-0-6481219-5-4 (print); 978-0-6481219-6-1 (ebook).
- 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 factors in singing 'in-tune' during the first years of schooling. *Bulletin of the Council for Research in Music Education*, 133, 153–160.
- WELCH, G. F., SERGEANT, D. C. & WHITE, P. (1998). The role of linguistic dominance in the acquisition of song. *Research Studies in Music Education*, 10, 67–74.
- WELCH, G. F. (2019). Singing and vocal development. In G. F. Welch, D. M. Howard & J. Nix (eds.) *The Oxford Handbook of Singing* (pp. 509–532). New York: Oxford University Press.
- WILDE, E., OCKELFORD, A. & WELCH, G. F. (2016). Muziekonderwijs voor kinderen met speciale onderwijsbehoeften (Education in music for children and young people with special needs). *Cultuur+Educatie*, 45, 56–77.
- WU, Y. T. & WELCH, G. F. (2022). Early childhood and musics of the diaspora. In M. S. Barrett & G. F. Welch (eds.), *The Oxford Handbook of Early Childhood Music Learning and Development*. New York: Oxford University Press. [Chapter 25]
- YANG, Y. (2011). *The Challenges Inherent in Promoting Traditional Folk Song Performance and Pedagogy in Chinese Higher Education: A Case Study of Hua'er*. Unpublished doctoral thesis, University of London Institute of Education, London.
- ZIMMERMAN, M. P. (2003). Developmental research and the music curriculum. *Bulletin of the Council for Research in Music Education*, 155, 53–74.
- ZIMMERMAN, M. P. (2011). Musical characteristics of children. *Visions of Research in Music Education*, 17. Originally published (1971) by Music Educators National Conference. Retrieved from [~http://www-usr.rider.edu/vrme~/](http://www-usr.rider.edu/vrme/)
- ZOSH, J. M., HOPKINS, E. J., JENSEN, H., LIU, C., NEALE, D., HIRSH-PAREK, K., SOLIS, S. L. & WHITEBREAD, D. (2017). *Learning through Play: A Review of the Evidence (White Paper)*. The LEGO Foundation, DK.