Technology, SEN and EY

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## Introduction

In this chapter, we present a novel framework of musical development in the Early Years, which is informed by the now well-established Sounds of Intent (SoI) framework for the assessment of the musical development of children and young people with complex needs. Notwithstanding the novelty of the SoI paradigm, where the Special Educational Needs (SEN) world is now coming to inform the so called 'mainstream' world of Early Years (EY) education, we raise the importance of the conceptualisation of an extensible taxonomy of music-educational technologies. We suggest that the theoretical framework of Sounds of Intent in the Early Years is a robust platform on which the proposed taxonomy can sit, and propose a way forward in developing such a taxonomy. We pose that this will lead to the decoupling from current practice that is believed to be tool-centric, often industry driven, and not necessarily one that fosters critical thinking that places the child on the center of the focus.

## Sounds of Intent in the Early Years

The *Sounds of Intent in the Early Years* (*SoI-EY*) project set out to investigate the musical development of children from 0–5 years; it is an extension of the *Sounds of Intent* (*SoI*) research (Himonides & Ockelford, 2016), which explored how musical abilities and engagement evolve in children and young people with learning difficulties (see, for instance, Vogiatzoglou, Ockelford, Welch and Himonides, 2011). At the heart of both projects is a putative framework of musical development that is grounded in theory and research, and is designed to be accessible and relevant to practitioners. Embedded within an online resource, the original *SoI* framework allows the musical abilities of children with learning difficulties to be assessed, in addition to offering teachers and therapists suggestions for widening children's musical experiences and to promote progress. *SoI-EY* was set up to explore the potential relevance of the framework in the context of so-called 'neurotypical' musical development. Evidence is drawn from three sources: the psychological literature on the growth of musical abilities, observations of children engaged in musical activity, and 'zygonic theory' (Ockelford, 2006, 2013) — a psychomusicological theory of how music 'makes sense' to us all, which also underpins the original *SoI* framework.

**The Original Sounds of Intent Framework**

The original *SoI* framework conceptualises children's engagement with music as occurring in three domains. These are *reactive* (children's responses to sound and music), *proactive* (children's creation of sound and music on their own) and *interactive* (children's interaction with others through sound and music). Within each of these domains, six levels of development are identified, ranging from a child seemingly making no response to sound or music, nor creating sounds intentionally, alone or with others (Level 1), to having the skills and knowledge of a culturally aware, technically advanced and expressive performer (Level 6). This vast range of accomplishment takes in all levels of musical engagement that may be observed within the population of those with intellectual impairment, from children with profound and multiple learning difficulties to young people on the autism spectrum, for example, who show exceptional musical skill. The six stages of the *Sounds of Intent* framework are outlined in Table 3.1.

<insert table 3.1 here>

The framework of musical development is depicted as a set of concentric circles divided into three segments, one for each domain (see Himonides & Ockelford, 2016 and also www.soundsofintent.org). Level 1 of the framework is innermost; Level 6 is on the outside. Segments are labelled 'R' (for reactive), 'P' (proactive) and 'I' (interactive), followed by the number of the level concerned ('R.1', 'P.3', 'I.4' *etc.*). The circular model provides the 'headlines' that define the columns in a matrix comprising more detailed descriptors of the types of musical engagement that may be observed – four for each segment.

**The Literature on Musical Development in the Early Years**

Research to date indicates that a full account of music in the early years should begin before birth, and an understanding of how foetuses respond to music in the third trimester of pregnancy can guide practitioners and parents as they seek to introduce music into their children's lives as early as possible. From around 26 weeks, the auditory system is fully functioning, and foetuses respond both to internal and external sounds. Studies undertaken during this developmental period have used stimuli such as the mother's voice, other speech and music (see DeCasper, Lecanuet, Busnel, Granier-Deferre and Maugeais, 1994; Lecanuet, 1996; Kisilevsky, Hains, Jacquet, Granier-Deferre

and Lecanuet, 2004). Foetal learning is indicated since infants soon after birth have been shown to respond differentially to auditory stimuli presented *in utero* (DeCasper and Spence, 1986), exhibited a preference for their mother's voice (DeCasper and Fifer, 1980), and recognised music to which they were systematically exposed in the womb (Hepper, 1991; Wilkin, 1995; James, 2002; Granier-Deferre, Bassereau, Ribeiro, Jacquet and Decasper, 2011; Partanen, Kujala, Tervaniemi and Huotilainen, 2013). So even at this very early stage, we witness sound and music eliciting responses, and babies beginning to show preferences, corresponding with Level 2 of the *SoI* framework.

The literature on music perception in the first year of life offers insights into children's early cognition of musical sounds and structures. Trehub (2010) provides an overview of research in this area from the 1970s onwards and notes infants' ability for structural processing in the domains of pitch and perceived time: young children can perceive patterns and will mentally group sounds in relation both to melody and rhythm (*SoI* Levels 3 and 4). Other studies have shown that infants as young as two months can distinguish a new melody from a familiar one (Trainor, Laural and Trehub, 1992), indicating that they are 'sensitive to the sequential pattern information in melodies' (Plantinga and Trainor, 2009, p. 3). In terms of rhythmic organisation, children of seven months have been shown to be sensitive to metre (Hannon and Johnson, 2005) and exhibit preferences, but only when bounced to the pattern of twos or threes to which they are listening (Phillips-Silver and Trainor, 2005). It has even been suggested that neonates may be capable of hearing the downbeat (Winkler, Háden, Ladinig, Sziller and Honing, 2009).

As well as infant's responses to music, studies have also explored their expressive musicality, ranging from their cries to babbling and singing. For example, it has been suggested that babies' vocalising has certain melodic features (Wermke and Mende, 2009), including contours similar to those of the native language to which they are exposed (Mampe, Friederici, Christophe and Wermke, 2009). Papoušek notes the development of infants' babbling from vocal play, in which they show a 'persistent motivation to reproduce sounds discovered by chance, and to repeat and modify their vocal products with overt signs of effort, eagerness, and joy' to 'canonical babbling … characterised by a much more restricted vocal repertoire than the preceding stage of vocal expansion due to the emergence and transitory prevalence of rhythmic syllabic sequences' (1996, p. 105). This leads to 'variegated babbling … short well-structured melodies in which familiar

musical elements are creatively combined into new patterns with distinct rhythm and accent' (Papoušek, 1996, p. 106). Infant vocalisations in the context of interaction have also been explored, with occurrences of imitation between caregiver and infant being observed (Papoušek and Papoušek, 1989). Indeed, imitation has been shown to occur before five months in terms of individual pitches (Kessen, Levine and Wendrich, 1979), pitch contours (Kuhl and Meltzoff, 1982) and vowel-like harmonic resonances (Legerstee, 1990). Again, these examples of proactivity and interactivity through simple pattern-making and imitation are characteristic of *SoI* Levels 3 and 4.

The emergence of short, distinct melodic phrases in children's singing is followed by the development of longer structures, created through repetition (Welch, 2006), variation (Hargreaves, 1986) and the coherent juxtaposition of motifs from diverse sources, forming so-called 'pot-pourri' songs (Moog, 1968). These are gradually replaced by songs that have an increasingly secure tonal and metrical framework (Hargreaves, 1986). Rhythmically, the ability to synchronise to an external tempo has been seen to occur in children from the age of four (Provasi and Bobin-Bègue, 2003). In relation to the *SoI* framework, we see here a move from Level 4 (the repetition, transformation and coherent concatenation of motifs) to singing whole songs in time and in tune (Level 5).

Reviewing the *SoI* framework in relation to the literature on early years musical development as a whole, it is evident that there are no reports of children functioning at *SoI* Level 1 (no response to sound or music) or Level 6 (mature engagement). However, Levels 2, 3, 4 and 5 describe musical behaviours and forms of engagement that appear to be well-established in the young 'neurotypical' population, and the literature provides a general indication of when these phases may occur. However, the rate at which children develop musically appears to be particularly sensitive to the environments in which they live and learn (Ockelford and Voyajolu, 2015). Tafuri (2008), for example, found that the ability to sing in tune may present itself much earlier than the age of five suggested by Hargreaves (1986), given substantial exposure to high quality and relevant musical activities from the outset. This suggests that the stages of musical development may be layered rather than linear and have fuzzy rather than clear-cut boundaries.

**The Sounds of Intent in the Early Years Research**

Following the literature review, observational evidence of children in the early years engaging in

musical activities was gathered to and compared to the descriptors in the original *SoI* framework, to ascertain the extent to which new data would support, extend or contradict the old model. The observations of infants, ranging in age from ten weeks to five years, were made in a Children's Centre in South West London, serving the needs of local families with a wide range of socio-economic and cultural backgrounds. Video recordings were made of the children in action over a six-month period for two hours each week. These were supplemented with field notes that set out the broader contexts in which children's engagement with music occurred. Parental permission was granted for all children participating in the study, with an assurance of confidentiality and the opportunity to withdraw from the project at any time, if desired.

As far as possible, the researchers adopted a non-participant stance, although within the informal setting of the centre, with its emphasis on free-flow play, unsolicited interactions inevitably occurred. Data were captured on 58 children (25 boys and 33 girls), resulting in 125 separate observations. These comprised 'snapshots' of the children engaged in musical activity, either on their own or with peers or adults, spontaneously or within more structured adult-led musical activities such as circle time and informal performances by visiting musicians. Every effort was made to gather a broadly representative selection of material, without undue emphasis on particular forms or levels of engagement. The video clips were observed by a small team comprising the second and third authors and an early years practitioner at the centre, who was also the parent of one of the children, and was not a music specialist. Brief descriptions of what was seen were agreed, and these were mapped, as far as possible, onto the *SoI* elements (see Himonides & Ockelford, 2016). Initially, it appeared that there were some instances of engagement that were not captured in the *SoI* framework. Following discussion, these were resolved as comprising talk *about* music (rather than participation in musical activity), or children occupying themselves in other domains, such as dance. Hence it seemed that the *SoI* framework was sufficient to accommodate all 125 observations, although the whole framework was not used. In particular, as was found to be the case with the literature review, there were no instances of musical engagement observed at Levels 1 or 6. Table 3.2 shows some examples of the observations that were made.

<Insert table 3.2 here>

**The Sounds of Intent in the Early Years Framework**

An amalgamation of the full set of coded observations, the literature on 'neurotypical' early years musical development, the original *SoI* framework, and the principles of 'zygonic theory' (Ockelford, 2006) were brought together in a first version of the *SoI-EY* framework (Ockelford and Voyajolu, 2015). Initial feedback on the potential viability of the new framework was obtained from two seminars of early years practitioners held in London, UK during 2014. Two main findings emerged: first that the language (which was very similar to that used in the original framework) should be simplified as far as possible, since many of those who would be likely to use *SoI-EY* would not be trained musicians, and that the matrix of elements should be presented visually in a way that made the connection with the headline descriptors (set out in concentric circles) more explicit. The resulting representation of the framework is shown in Figure 3.1.

<Insert figure 3.1 here>

For example, Level 2, reactive (R.2) reads '[Children] show an emerging awareness of sound'; Level 3, proactive (P.3) reads '[Children] make simple patterns in sound intentionally'; and Level 4, interactive (I.4) reads '[Children] engage in musical dialogues using distinctive chunks of music'. Element R.3.D is '[Children] link particular sounds with events, places or people'; P.4.C is '[Children] connect different chunks of music together'; and I.5.A is '[Children] sing or play pieces with others, sharing a part'.

As it stands, the *SoI-EY* framework is related to *stage* rather than *age*: the detailed analysis of the data from the project suggest that overarching areas of development may occur within wide age bands (Ockelford and Voyajolu, in press), with younger children in some instances demonstrating more advanced musical engagement than those who were older. It seems that children's musical environments play a crucial role in the rate at which they develop musically (*cf.* Tafuri, 2008). The data also show that levels may 'overlap', whereby development at, say, Level 4 may begin for a child is fully competent at Level 3, and children may demonstrate musical engagement at more than one level simultaneously. For example:

S and H are sitting next to each other in the garden; they each have a drum. S taps her drum with a beater then reaches over and shows H how to do the same with his drum. She begins to play and H watches and copies. They play a simple duple pattern, although not always in complete synchronisation with one another (Level 3). While she plays, S starts to sing *Twinkle, Twinkle Little Star*, with the correct words, in time and in tune (Level 5). H copies the best he can, singing only portions of descending phrases, not yet using words, but following the melodic contour (Level 4).

**Musical environments and contexts**

The realisation that *environments* play a crucial role in children's musical development also reminds us that development and learning do not occur in vacuum; they take place within particular systems (or contexts) that are physically but also socially located. The existence of such systems and the various interactions and interrelations between their underlying components has been hypothesised by numerous educational thinkers, and represented schematically in different ways, with some scholars even claiming to offer theoretical 'models' of learning (i.e. therefore implying that they had fully understood, mapped and presented all underlying mechanisms). A popular theoretical approach towards understanding human actions is *Activity Theory* (AT), the development of which is originally attributed to thinkers Lev Vygotski (1980) and Alexei Leont'ev (1974), and now widely associated with the work of Yrjö Engeström (2001) and known as *Scandinavian Activity Theory*, which is a hybrid theory somewhat more systematic in its approach and more closely aligned to cognitive science. Engeström's theory has proven to be sound but also convenient to utilise within narrower foci and more specific 'systems', such as (from wider to narrower) Education (Roth, 2004), Music Education (Welch, 2007), as well as Technology Enhanced Musical Creative Development (Burnard, 2007). As Burnard (ibid.) explains: [a]s with most sociocultural theory and practices, the starting point is the principle that individual learning is a social activity mediated by psychological tools (e.g. language and other symbols) and shaped by cultural artefacts (e.g. music, literature, computers), expectations, 'rules'/conventions and norms as defined by membership of groups within a wider community (p.45). Welch (2007) similarly explains: In the upper part of the figure, Engeström presents a Vygotskian conception that the 'object' of an action by (or on) a 'subject' is culturally 'mediated' by some form of 'artefact'. This model is extended in the lower part of the figure to encompass Leont'ev's perspective of individual

and group actions being embedded in a collective, interactive activity system in which 'rules', a sense of 'community' and 'division of labour' (division of effort) are also evidenced. In this model, the 'object' of the activity is perceived as a cultural entity and the 'outcome' may or may not be the same as the intended 'object' (pp. 25–26).

*Sociotechnical systems*

In the present discourse, though, regarding the role of technology in the musical development of children in the Early Years, we propose that the focus is placed on the basis that we are essentially working with a sociotechnical system (Trist, 1981). It would therefore make sense to rehearse the application of a theory such as AT with an emphasis on the interaction between the young *people*, the various forms of *technology* (i.e. tools, skills, methods, affordances, modalities, media and channels) and *spaces* (the learning, creative, collaborative, and/or blended environments within which all activities occur).

This approach is closely aligned to Burnard's (2007) suggestion that "Through the myriad of systems exhibiting patterns of contradictions and tension, AT can make visible the relationships and structures within music participation and the roles and rules within practices. In this way, it has the potential to illustrate the key components of the relationship between creativity and technology as they develop in different learning communities" (p. 46). Charisi (this volume) suggests, though, that a need has emerged for further investigation of young children's interactions and the dynamics of their music-making processes within the new settings that technological advances have introduced.

*A conceptual synergy*

We suggest that a conceptual synergy is therefore imminent in understanding the role of technology within EY musical development. We argue that the employment of the Sounds of Intent in the Early Years framework for the assessment of musical development of children in the Early Years can facilitate the systematic classification of technology's role. This will allow the decoupling from current practice that is believed to be tool-centric, often industry driven, and not necessarily one that fosters critical thinking that places the child on the center of the focus. Therefore, instead of sustaining current practice where parents, teachers and the wider educational sector usually strive to stay abreast of technological developments (or tools) and try to be creative in utilising those with

their children, at home or school, we suggest that it would make sense to focus on understanding what is actually happening with the children's musical and creative growth, and employ, seek, develop or even aspire to conceive tools that can foster it. We also suggest that this cannot be viewed in vacuum, and that the spaces/environments within which we assess cases should form part of the new taxonomy. An exciting amalgamation of the *space* and the *tool* is also presented elsewhere in this volume (see Zanolla et al, this volume), introducing the notion of *multimodal environments*; this offers novel insights in understanding the 'system' *child–tool–space*.

This paradoxical current praxis is not necessarily placing the child on the centre of the focus. We believe that Sounds of Intent in the Early years could be used as a theoretical pegboard onto which technological solutions could be pinned, thus allowing us to form a research informed taxonomy of technology supported musical development in the early years.

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