

Promoting the Musical Engagement of Autistic Children in the Early Years Through a Program of Parental Support: An Ecological Research Study

Tania Lisboa¹ , Caitlin Shaughnessy², Angela Voyajolu²
and Adam Ockelford²

Abstract

Some autistic children display an intuitive capacity to reproduce and restyle the musical stimuli that they encounter in their environments. Music also offers a safe space for the development of social competencies and, across the spectrum, musical interventions are regarded as an effective way of promoting engagement with others. Yet, there is a lack of empirically researched music programs for parents and carers of children with autism. In this study, 11 families with autistic children incorporated music making into everyday life, supported by researcher-practitioners and framed by resources outlining musical activities based on the Sounds of Intent in the Early Years framework. Assessment of video data and interviews revealed that the new resources were flexible enough to be adapted to each child and they helped parents to build confidence to engage with their children musically. It was found that children had an increased interest and engagement in music as well as in joint play, which impacted positively on their musical and social development. The interpersonal music spaces created by the parents provided opportunities for unlocking expressiveness and interactive behavior, which in turn supported verbal development, emotional regulation and social interaction. These findings have implications for arts-in-health research and highlight the potentially crucial role of parents as mentors for their child's musical development. The study further demonstrates that specialist musical training is not a requirement to develop parent-child engagement in music making at home.

Keywords

Autism, early years, engagement, music, resources, Sounds of Intent

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Introduction

The importance of music for children with autism has been widely acknowledged as a means of creative engagement and access to culture that promotes language, learning and social interaction (Geretsegger et al., 2014). Yet, the accessibility of music programs for parents, carers, teachers and children with autism are limited. Hence there is a need for scientific studies in this area and for the development of resources that promote the use of music more widely in day-to-day life. In the current study, families with autistic children were encouraged to incorporate interactive music making into their everyday routines, supported by researcher-practitioners and guided by a framework of activities, set out in the form of an especially designed set

of cards. Based on the Sounds of Intent framework (Voyajolu & Ockelford, 2016; Welch et al., 2009), the project reported here, entitled “IMAGINE: Autism” (“Ideas for Musical Activities and Games in the Early Years: Autism”), explored (a) families’ experiences of using the new music resources to encourage their engagement in musical activities with their young child, and (b) how this

¹ Centre for Performance Science, Royal College of Music, London, UK

² Applied Music Research Centre, University of Roehampton, London, UK

Corresponding author:

Tania Lisboa, Centre for Performance Science, Royal College of Music, Prince Consort Road, London SW7 2BS, UK.

Email: tania.lisboa@rcm.ac.uk



engagement may support the musical and wider development of children in the early years on the autism spectrum.

Music and Autism

Autism affects over 1% of the population, impacting on the daily lives of 2.8 million people in the UK. They are commonly characterized by social and communication difficulties, repetitive behaviors, sensory sensitivities and strong interests (APA, 2013). Neurological differences are also regularly observed, which can lead to substantial motor and sensory difficulties (Donnellan et al., 2013; Nicolson & Szatmari, 2003). Many children with autism have a particular interest in their auditory worlds, and can demonstrate remarkable capacities to reproduce and restyle the musical stimuli that they encounter in their environments (Ockelford, 2008). From the use of musical social stories (Brownell, 2002; Pasiali, 2004) to developing musical strategies to encourage learning and neurodevelopment (Carnahan et al., 2009; LaGasse & Hardy, 2013; Osei, 2009; Simpson & Keen, 2010), and in creating musical dens in playgrounds to encourage peer interaction (Kern & Aldridge, 2006), music is regularly used as a tool to mediate the outside world for autistic children. Across the spectrum, music is regarded as an effective space for joint engagement and the development of social competencies (Geretsegger et al., 2014; Hernandez-Ruiz, 2020b; James et al., 2015; LaGasse, 2017; Simpson & Keen, 2011). This has been validated by a number of randomized control trials, which have indicated that music therapy can have a positive impact on a wide range of behaviors, including social interaction, joint attention, verbal development and non-verbal communication skills (Gattino et al., 2011; Kim et al., 2008; LaGasse, 2015; Thompson, 2012). As studies with neurotypical children have further shown, participatory music making can improve pro-social behaviors and interpersonal relatedness (Kirschner & Tomasello, 2010; Rabinowitch et al., 2013; Rabinowitch & Meltzoff, 2017). Wider research highlighting music's potential to scaffold intersubjectivity, shared intentionality and meaning making further emphasize the potential of musical spaces as motivating platforms for interaction (Krueger, 2011; Trevarthen & Aitken, 2001). As families with autistic children frequently reflect, musical interaction can offer a particularly effective means of engaging their child, and many emphasize its importance as a positive outlet for expression in their children's lives (Ockelford, 2016). Despite these widespread uses of music in improving the lives of children on the autism spectrum, much of the research has focused on specific, particularly behavioral, outcomes. This means that far less is known about the trajectories of musical development in children with autism and how music is used more widely in daily life for building resilience or regulating emotions. There have been calls, most recently by Janzen and Thaut (2018), to expand the remit of music and autism research,

exploring what neurodiverse experiences and capacities for music are, and how these might be utilized to foster wider development.

Ecological Approaches in Autism and Music Research

Although the potential of music as a communicative and regulatory tool is often recognized in music therapy, it is less explored and operationalized in informal and educational contexts. Research is only beginning to acknowledge the importance of context in understanding the role that music can play in children's lives, permeating as it does many of their everyday routines (DeNora, 2000). Both social and individual musical engagement can play a key role in regulating and promoting well-being (Bonde & Ole, 2012). Music can also be a powerful element in building resilience, a "tool for developing agency and empowerment... a way of providing meaning and coherence in life" (Ruud, 2010, p. 111). Others have highlighted music's role as an "aesthetic technology," through which regulatory, social and emotional behaviors are enacted and scaffolded within musical spaces (Krueger, 2011). Furthermore, the contexts in which music is implemented as an intervention are widening to move beyond the more traditional teaching or therapy room, utilizing the outdoors, for example, as both a space in which to make music and from which to derive natural music-making materials (Pfeifer, 2017).

In autism research, music's scaffolding capacity is often utilized more practically as a motivational tool in everyday life (Finnigan & Starr, 2010). For example, a case study by Kern et al. (2007a) demonstrated that individualized songs could be an effective way to increase independence during self-care tasks such as hand washing, toilet training and cleaning. Further research by Kern et al. (2007b) explored use of music to facilitate the transition process of morning drop-off in a childcare setting, and was successful in improving the children's independent functioning and engagement with peers. These applied contexts highlight the potential for wider applications of the benefits of music in everyday life. They are also emblematic of a growing momentum in research and education that recognizes the natural diversity of neurocognitive functioning, and that seeks support for these differences without stigma or attempts to "fix" autistic behaviors (Kapp, 2020). In early interventions, this has been incorporated by teaching those in a child's environment such as professionals and family members how to adjust to their behaviors and needs in order to encourage development (Fletcher-Watson, 2018). There is also recognition of the need for new research centered on the everyday life of autistic people (Happé & Frith, 2020). In particular, studies that investigate how to foster improvements in autistic children's quality of life are required, acknowledging environmental factors, potential stressors and special interests (Happé & Frith, 2020; Lai & Szatmari, 2019).

Musical interventions provide a unique way of incorporating approaches suited to neurodiversity. Musical play promotes interaction, helps in building relationships, fosters individual strengths and empowers individuals to express themselves creatively in non-threatening environments. Musical play throughout this article describes children's play (in a solitary or social context) with sound and music as the object of manipulation, whether that be through the use of instruments, vocalization and song, or through natural materials and everyday objects. Musical play may well be child-initiated, spontaneous, intrinsically motivated and free of external rules (Marsh & Young, 2016). However, it may also be initiated by others, with adults, for example, acting as "partners in play" (Koutsoupidou, 2020) in order to gently scaffold development through playful interaction.

The importance of caregivers as musical mediators in early childhood is widely acknowledged (de Vries, 2009; Hallam, 2010). Mothers regularly report using music to scaffold routines with babies (Custodero & Johnson-Green, 2003), and there is a wealth of evidence that highlights the role of music in mother–infant bonding in the early years (de l'Etoile, 2006; Persico et al., 2017; Vlismas et al., 2013). Increasingly, some music therapists working with autistic children are advocating parental inclusion in the therapeutic process (Gottfried, 2016; Hernandez-Ruiz, 2020a; Thompson & McFerran, 2015; Williams et al., 2012). Evidence from research that actively incorporated caregivers as part of a music intervention showed positive behavioral and interpersonal outcomes for both parent and child (Hernandez-Ruiz, 2020b). This includes both adding musical elements to complement existing intervention programs, such as ABA or SCERTS (Ayson, 2011; Lim & Draper, 2011), and involving parents as participants during family-centered music therapy (Bakan et al., 2008; Gottfried, 2016; Thompson et al., 2014; Wimpory et al., 1995). Some recent studies further adopted parent-led models, whereby caregivers were the primary implementers of the program (Williams et al., 2012; Yang, 2016); however these are not specific to autism.

These naturalistic designs often incorporate mixed methodologies and go beyond simply functionalizing music to meet behavioral outcomes. For example, Allgood (2005) developed music programs that were introduced to families to be completed at home with a significant outcome: "the parents reported greater comfort in engaging in a musical relationship, and the children increased initiation of musical exchanges with their parents" (Allgood, 2005, p. 93). A further randomized control trial found that family-centered music therapy was effective in promoting behavioral change, but also had wider impacts in promoting parent–child relationships and encouraging the use of music in everyday life (Thompson, 2012). While both these examples use a model that implements parents as participants as part of family-wide music therapy, other approaches have further identified these benefits in

contexts where parents provided the intervention strategies themselves, closely monitored by researchers. As reported by Yang (2016), a home-based music program ("Musical Bonds"), which involved parent coaching and implementation, also increased parent–child synchrony along with child-initiated communication and parental responsiveness during musical play. These preliminary studies highlight how home-based interventions can be effective in promoting outcomes that prioritize well-being and environmental accommodations for autistic children and their families. In particular, integrating parents into the delivery of interventions encourages them to respond to and support their child's musical interests and needs. As children and parents learn to communicate and play through a musical medium, it empowers families to realize the value of music as both a communicative tool and a medium of joint engagement and enjoyment. The inclusion of parents as a core part of music-intervention delivery is a small but growing field. As Hernandez-Ruiz's (2020b) most recent systematic review highlighted, current research indicates that this model can be as effective as family-centered therapy, particularly where accessibility to community services may be limited. The educational disruption and growth in home-based learning caused by the COVID-19 pandemic has further highlighted the importance of developing strategies and resources for parents at home. Creating easily accessible and implementable resources for parents and families with autistic children is therefore an ongoing area of need in the field.

Sounds of Intent and IMAGINE: Autism

This project, "IMAGINE: Autism,"¹ sought to explore the development of musical capabilities and potential of autistic children in the early years when supported by parents, using a newly developed set of resources in the form of a set of cards. "Action cards" had been successfully used in the context of supporting early years practitioners and parents in their working with and caring for children on the autism spectrum before (for example, DeLoach, 2019; Kern & Wakeford, 2007), but the new materials are unique in being based on the Sounds of Intent in the Early Years (SoI-EY) framework of musical development, which focuses on children from birth to 7 years (Voyajolu & Ockelford, 2016). The SoI-EY framework is adapted from the Sounds of Intent (SoI) framework of musical development for children and young people (through to adulthood) (Welch et al., 2009). The original SoI framework covers the widest range of abilities, from those with profound and multiple learning difficulties to those with high-functioning autism (with or without exceptional musical abilities). It recognizes that even among pupils with the most profound disabilities, almost all are nonetheless responsive to music, which suggests that, in neurological terms, elements of musical processing may be discrete (Welch et al., 2009). The framework indicates that children develop musically on a path of six identifiable levels of

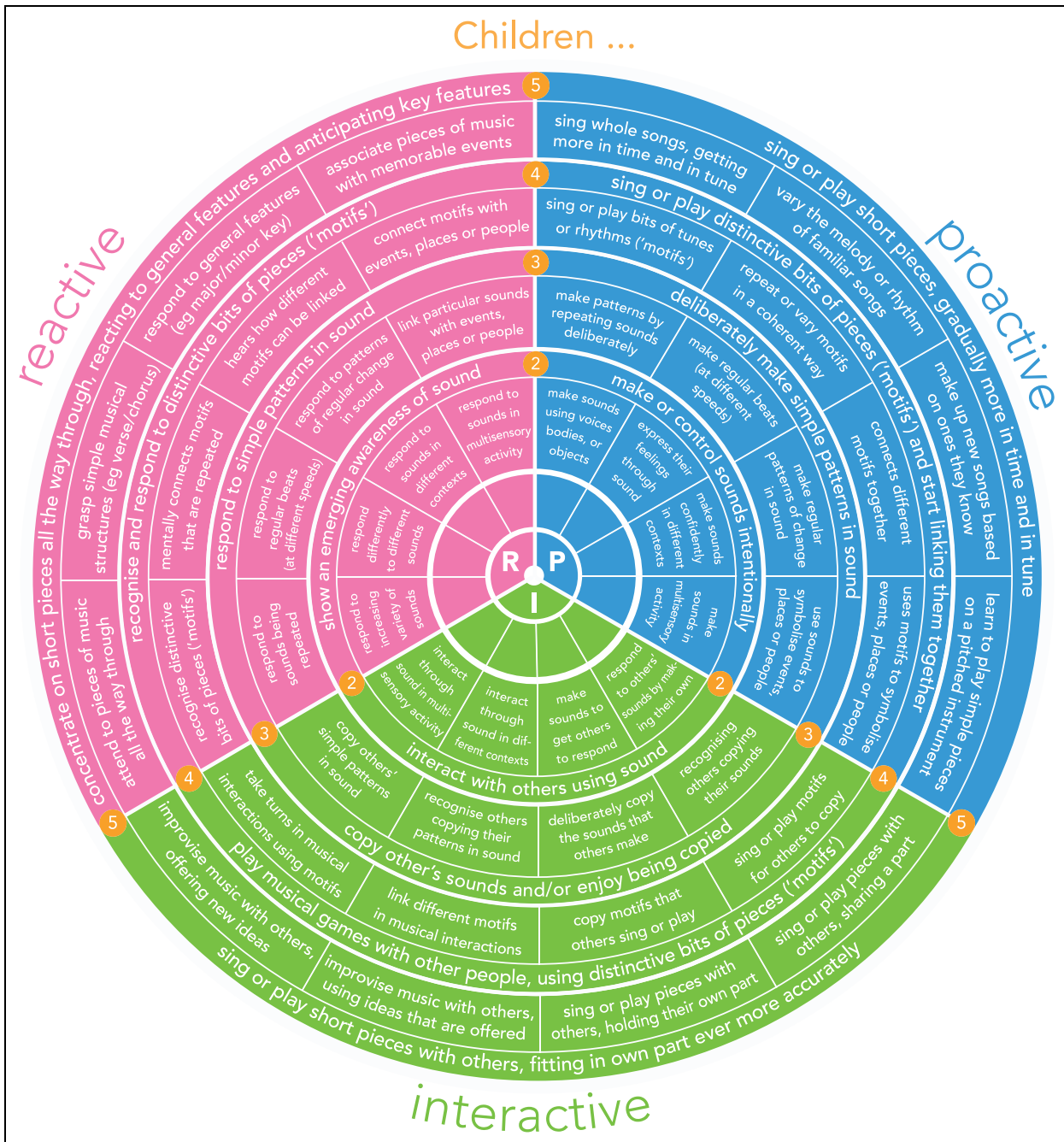


Figure 1. The Sounds of Intent in the early years framework as set out in Voyajolu & Ockelford, 2016.

musical development, extended across three domains: “reactive,” “R” (children’s responses to sound and music); “proactive,” “P” (children’s creation of sounds and music on their own); and “interactive,” “I” (children’s interaction with others through sound and music). Levels 1 and 6, while present in the original SoI framework, are absent in the early years iteration, as Level 1 refers to the developmental level that occurs before hearing starts to function, and Level 6 pertains to a mature response to music that usually evolves in adolescence. Therefore, the levels of the SoI-EY framework applied within this study are 2–5.

Figure 1 illustrates the SoI-EY framework of musical development. The framework is depicted as a set of concentric circles starting at Level 2 and moving outwards towards Level 5, with each circle divided into sections by domain (R, P, I). Each level within its respective domain is further subdivided into four segments, labelled as A, B, C and D. These segments are descriptors which break down the main “headlines” of musical engagement into more detail.

The SoI-EY model is applicable to all children in the early years, including those with and without additional

Table 1. Participants' characteristics. Abbreviations refer to occupational therapy (OT), speech and language therapy (SLT), applied behavior analysis (ABA).

Participant ID	Age	Sex	Expressive Language	Previous Musical Experience	School status, Ongoing Additional Therapies
Participant 1 (P1)	7	Male	Single words or 2/3 word utterances	None	Specialist unit in mainstream primary
Participant 2 (P2)	7	Male	Simple sentences	Occasional music therapy previously	Mainstream; SLT
Participant 3 (P3)	8.1	Female	Simple sentences (<i>unstructured</i>)	Ongoing music therapy	Specialist unit in mainstream primary
Participant 4 (P4)	3.8	Male		None	Mainstream nursery
Participant 5 (P5)	9.1	Female	No language	None	Mainstream
Participant 6 (P6)	6.4	Male	Full sentences (<i>selectively mute</i>)	None	Mainstream
Participant 7 (P7)	3.9	Male	Simple sentences	None	Mainstream; SLT
Participant 8 (P8)	4.3	Male	Single words or 2/3 word utterances	None	Mainstream; SLT, OT
Participant 9 (P9)	4.04	Male	Simple sentences (<i>unstructured</i>)	None	Mainstream nursery
Participant 10 (P10)	4	Male	Full sentences	Piano lessons	Mainstream; ABA, SLT, OT
Participant 11 (P11)	7.88	Male	Single words and some simple sentences	None	Home schooled; ABA, OT, SLT
Participant 12 (P12)	5.35	Male	No language	None	Mainstream

support needs. Its strength and applicability to this study lies in its derivation from a model which was built upon researching and observing the musical development of children with learning difficulties, including those with autism. Using the SoI-EY framework, two sets of home-based resources were previously developed for families with young visually impaired children as well as families who have children with profound and multiple learning difficulties (**references to be added after peer-review**). The current IMAGINE: Autism project followed the model of research at the core of the resources for use with blind and partially sighted children in the early years, with family-centered practice guiding the researchers in an iterative process of resource development.

The need for musical resources specifically designed for autistic children and parents echoes the findings of an exploratory study by Van Tongerloo et al. (2015), who found that parents of children on the autism spectrum want more practical advice about what they can do to support their child in the home and community. Therefore, a key aspect of the IMAGINE: Autism project was to work with families to create and refine a set of resources to encourage the integration of music into children's daily lives (see Materials section below, and Appendix I). This approach was adopted in order to incorporate the ecological principles of environmental accommodation into music-based interventions. It focuses on the development of musical skills and musical strengths, providing opportunities for families to move away from deficit-driven narratives that so frequently characterize their experiences with both their children and practitioners and instead focus on positive and enjoyable ways of interacting in family life. This project sought to explore the experiences of the parents and the feasibility of the resources, rather than establish the efficacy of the parent-

led intervention, which will be an area for future research. More specifically, this research addressed the following research questions: *What are the experiences of families using the new music-based resources? Were these new resources effective in promoting musical engagement and development?*

Method

Participants

Eleven families were recruited to the research, with 12 children taking part (one family had two children with autism), and all had a formal diagnosis of an Autism Spectrum Disorder. Participants were recruited through multiple channels, including speaking directly to national UK autism parents' groups and circulating the recruitment advert through local autism charities in London. Participant children were aged 4–9 years ($M = 5.9$), and the majority of the participant children had one or more siblings ($n = 10$). Over half of the participants were either White British ($n = 4$) or another White background ($n = 3$), along with Asian British ($n = 4$) and Black British ($n = 1$). Seven families reported receiving therapeutic interventions in the past; however, the regularity of these was not consistent across the sample and only four received other therapies during the course of the research (see Table 1). The majority of the parents had no formal musical training (10 out of 11). Table 1 shows further details of age, sex, expressive language, previous musical education, schooling and therapies during the project. University ethical approval for the project was sought and approved. The parents all gave informed written consent and where possible, verbal assent was also gained from the children.

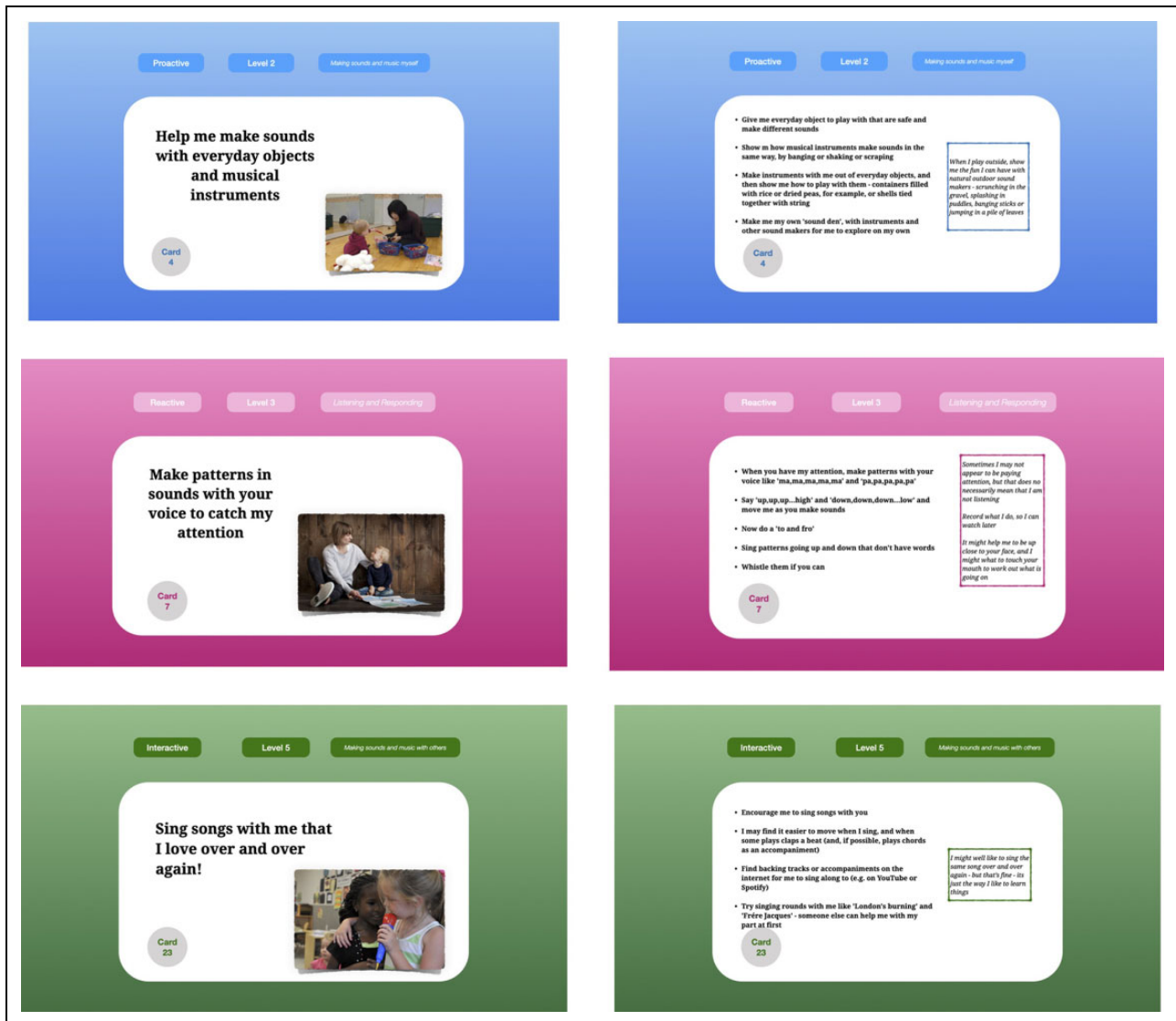


Figure 2. Examples of a proactive, interactive and reactive card.

Materials

Each family was provided with a set of 24 cards that detailed simple musical activities based on the developmental phases set out in the SoI-EY framework. Full details of the resource cards and the corresponding SoI-EY levels can be found in Appendix 1. The tasks on the resource cards were designed to be simple, short, and aimed at integrating music as part of everyday routine—for example, the “hello” and “goodbye” songs, giving ideas for how to use music to mediate joint play (e.g., “Help me make sounds with everyday objects and musical instruments”), or engaging with their child’s musical interests (e.g., “Sing songs with me that I love over and over again!”). At each level, two cards were produced for each domain: Reactive, Proactive and Interactive. Figure 2 shows examples of one of each of the double-sided cards from the three domains.

The cards detail activities that were thought to be particularly appropriate for young autistic children—for example, explaining how to encourage multisensory and multimodal experiences and with specific guidance on factors such as sensory difficulties and echolalia, both of which are common in autism (Leekam et al., 2007; Roberts, 1989). Socially interactive games such as imitation and call and response were given prominence. Other factors included appealing to the affinity for visual stimuli that is observed in autism (Ganz & Flores, 2008; Schopler et al., 1995) in suggestions such as “Record what I do so I can watch back later.” Other additions, such as “Sing short, everyday phrases to me,” were added on the evidence that sung-word processing can be preserved in autism when spoken-word perception can be disrupted (Lai et al., 2012; Sharda et al., 2015). Updates also reflected the likely technological literacy of children and included activities

involving watching recordings on YouTube and playing musical games on tablets (Mawson, 2013).

The activities set out on the cards get progressively more complex as they move through the four levels of the SoI-EY framework. For example, Card 4, entitled “Help me make sounds with everyday objects and musical instruments,” corresponds to Proactive, SoI Level 2 (Descriptor—makes or controls sounds intentionally), and Card 17, entitled “Play call and response games with me using your voice,” corresponds to Interactive, SoI Level 4 (Descriptor—engages in dialogues using distinctive groups of musical sounds/motifs). Space was given on the back of the cards for parents’ feedback, which was also collected aurally during the researcher’s home visits.

Design and Procedure

As the use of parent-mediated musical interventions for families with autistic children becomes more established, the need for clearer procedures and the wider accessibility of resources has been highlighted (Hernandez-Ruiz, 2020b). Since the aim of the project was to explore the practicality and efficacy of the resources outlined above, and recognizing the diverse nature of individuals’ and families’ experiences with autism, the project used an exploratory qualitative design that situated families’ thinking at its heart. Each family was visited three separate times over a 12-week period, and in between was encouraged to upload videos of their own home music making to a secure ethnographic cloud-based app (Salari, 2018). At the first visit, families were given a set of small percussion instruments and a keyboard, and a set of 24 activity cards. The materials on the cards were developed from the strategies for practitioners and parents in working with children and young people with special educational needs (including autism) that are set out on the Sounds of Intent website (www.soundsofintent.org) and are outlined above. The researcher showed parents how to use the music cards, and their attention was directed to the levels that appeared to be best suited to their child’s abilities. After the nature and purpose of the cards had been explained, the parents observed the researcher engaging in a play session with their child in order to model the activities detailed in the resources. During each visit, the researcher conducted musical play sessions with the children and received updates from the parents on their experiences with the instruments and cards, providing further guidance where necessary.

Semi-structured interviews were conducted at the first and last sessions of the study. The first interview served to set the context for each family’s participation in the study—that is, parents and carers reported on their experiences of having a child on the autism spectrum, their particular strengths, challenges and potential areas of learning, and their engagement in music to date (see also Table 1). The final interviews focused on the parent’s experiences of

the IMAGINE: Autism resource cards (see Appendix I)—in particular, whether they found the cards helpful and if so, how the children engaged with the proposed activities and what differences (if any) they noticed in their child’s musical engagement, as well as observations about their general development during the 12 weeks and potential improvements in the materials that could be made. This article will focus on these last sessions’ interview data.

The interviews were audio recorded, fully transcribed, and analyzed using an Interpretative Phenomenological Analytical (IPA) approach (Smith & Osborn, 2003), which allows for in-depth study of each case and implies a double hermeneutic: studying the way the participants make sense of their experiences with the child and capturing the essence of the children’s experiences (Eatough & Smith, 2008; Smith et al., 2009). Themes emerged inductively through an analytical process involving five steps: (a) the transcribed interviews were read several times for familiarity; (b) emergent meaning units for each transcript were recorded in NVivo12 qualitative analysis software; (c) the meaning units were grouped to extract emergent sub-themes that indicated the children’s reaction to the musical activities and possible impacts on their daily life and areas of development; (d) the sub-themes were integrated into a table of overarching themes and sub-themes for each individual participant; (e) after each transcript had been closely scrutinized, individual tables were integrated into one general table capturing the study’s overarching themes and sub-themes. The analysis was conducted separately by two researchers, meaning units and groupings were cross-checked and discussed to ensure agreement and a valid interpretation of the data. Final themes and sub-themes were also discussed with the broader team.

Quantitative measures, in the form of SoI-EY scores, were taken in order to assess the children’s musical development. This procedure assisted the researchers’ interpretation of the qualitative findings by providing support for parental reports of improvement or development. Videos of children’s musical play were taken during all the visits. These data were used to undertake SoI-EY measurements at the beginning and at the end of the 12-week program, which were in turn employed to inform the interpretation of the qualitative outcomes reported by the parents. The SoI-EY framework has previously been validated for its efficacy to assess musical play in Voyajolu (2021). These measures were converted to numeric scores that combined four levels of SoI-EY (2–5) with a five-stage scale of regularity—“rarely,” “occasionally,” “regularly,” “frequently,” “consistently”—within each level. This created a sensitive, cumulative scoring system that was aligned with the SoI-EY levels, and which had a minimum score of 1 for those who were interacting “rarely” at SoI-EY Level 2 to a potential highest score of 20 for those that were “consistently” interacting at SoI-EY Level 5. Each observation was given a score that corresponds with the SoI-EY domains assigned by the researchers. To establish

id	Week 1 Sol Score	Week 12 Sol Score	Improvement
1	3	9	6
2	10	15	5
3	13	15	2
4	9	15	6
5	8	17	9
6	18	20	2
7	18	18	0
8	11	18	7
9	7	17	10
10	17	17	0
11	17	17	0
12	7	7	0

Figure 3. Sol-EY assessment scores at Week 1 and Week 12 by participant.

inter-rater reliability, 40% of the videos were viewed and assessed by two researchers, who blind-coded the musical engagement of the children according to SoI-EY level (2–5) and domain (Reactive, Proactive, Interactive). Where any disagreements were found, a third researcher made the final coded assessment. The percentage of absolute agreement was used (Altman, 1991) to determine inter-rater agreement. Inter-rater agreement was 86%, exceeding the 75% recommended by Bajpaj and Chaturvedi (2015).

Results

In this section, the analysis of the interviews focusing on feedback on the resources, as well as observations of musical and functional behaviors, where appropriate linked to the SoI-EY framework, will be reported. SoI-EY assessments of the recordings will also be reported to contextualize the development observed in the participant children and provide some support for the qualitative data reported.

Sounds of Intent Measures. The SoI-EY measures taken at the beginning and at the end of the 12-week program show that the majority of children demonstrated some progress according to the SoI-EY framework, indicating development in their musical abilities. Figure 3 shows the scores in musical development (as measured by the SoI-EY assessments) and it illustrates that these generally grew between Week 1 and Week 12, although four participants showed little or no improvement across the program. As these are developmental scores, there is no outcome measure; rather the scores reflect the children’s abilities at the time of assessment. Figure 4 shows how the SoI-EY scores improved over time.

Interviews. The analysis of the interviews revealed four overarching themes from the families’ reflections and experiences of making music together: (a) Environmental Adaptation (using IMAGINE cards); (b) Musical Engagement; (c) Social and Behavioral Changes; and (d) Self-regulation. Within each of these themes, several sub-themes emerged that further clarify the direct experiences of the

families and detail particular domains of observed changes. Table 2 outlines the themes and sub-themes identified in the IPA analysis with verbatim illustrative quotations for each. The implications of these results are discussed below.

Environmental Adaptation (Using IMAGINE Cards).

The families’ feedback on the new resources was positive and it highlighted both their general reactions and observations of the resources as a whole, as well as their opinions of specific activities that needed to be adapted to each child’s challenges and styles of learning. Sub-themes that emerged included parental confidence in using the resources, the usefulness of the direction that the cards provided, and the opportunity for individual adaptations according to individual children’s needs.

Confidence: Parents reported that the musical instruments and resources allowed them to gain confidence in their own capacities to engage musically with the children, providing them with new ideas for daily music making. The activities on the cards made them aware of simple things they could do, in less structured settings, to engage their child with confidence (see Table 2). As the parent of P4 reflected: “It generated ideas for me that I might not have initially thought of . . . They gave me the inspiration.” Parents’ responses also reflected their changing perceptions of just what the nature of musical play could be. As P3’s parent commented: “it was just like little, little things but it was like ‘Oh yeah, I can do that!’” This highlights how the flexibility and simplicity of the tasks meant that parents felt more confident in engaging in musical activities with their children, while also becoming aware of the underlying benefits that underpinned the activities.

Activity direction: The feedback from the families highlighted that the flexibility of the card-based system accommodated a spectrum of behaviors, needs and abilities. The developmental aspect of the cards proved to work well, encouraging fluidity and versatility by the parents as well as allowing them to focus on basic musical skills. Comments such as “They are great because they gave really concrete examples

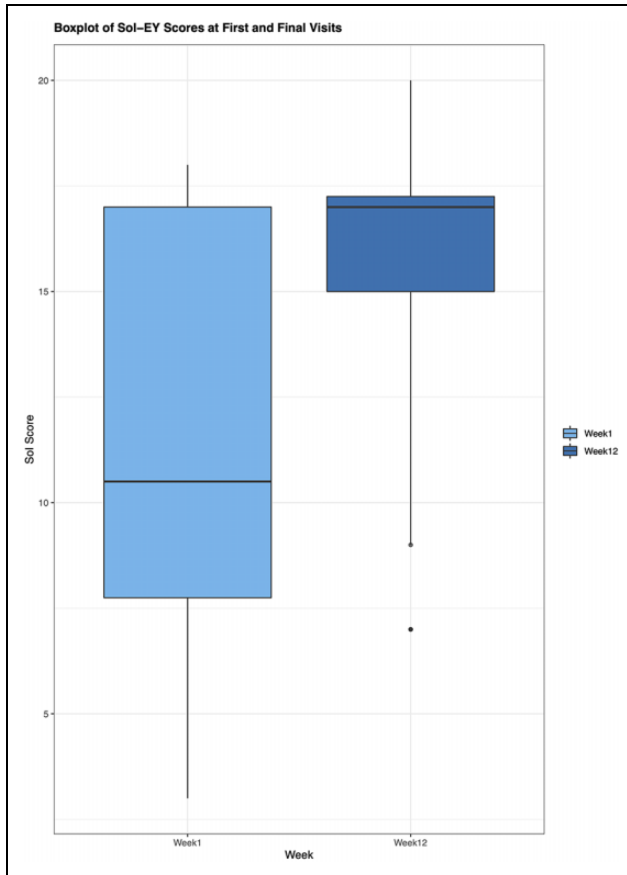


Figure 4. Mean Sol-EY scores for the whole cohort at Week 1 and Week 12.

of ways to do things” highlight the benefit of specific tasks on the cards. The ability of the parents to identify opportunities to create activities was also evident. As it was reported:

They would start playing on their own, not wanting me to join in. But as I gained their tolerance, I could repeat their sounds and they would copy back sometimes... he liked especially going up and down on the scales and let me join in sometimes. (P9 and P12 parent)

This demonstrates how families were able to build up the complexity of the activities over time, encouraging their child’s further musical development. The awareness of musical skills stemmed from their child’s abilities as gauged through the Sol-EY framework—for example, beginning by encouraging interaction through imitation and pattern making (reflective of Sol-EY Level 3), whilst also incorporating more complex forms of engagement such as singing and rhythmic tapping to complete pieces of music (indicative of Sol-EY Level 5).

Individual adaptations: Each family provided detailed feedback on the particular activities that needed to be adapted to their own child. Some also moved beyond the cards, tailoring activities to their child’s individual interests

and needs. The following example (see also Table 2) illustrates some of these adaptations:

The card that required rhythm is not something that they got yet. But, yeah, the ones that would encourage to repeat sounds, he really liked that... with another one shaping that interaction. Then asking for, like if we did something he would indicate that he would like to do this again another day. (Parent of P9)

This feedback highlights the flexibility of the activities, which functioned both as a springboard for joint play and as a scaffold for everyday interactions, and also demonstrates that parents and carers have the “expertise” to select musical activities appropriate for their own child to build on the resources, stimulating musical development.

Musical Engagement

Parents reported an increased interest and engagement in their child’s musical play. This was observed both in their joint play with others, including the researcher and family members, as well as in their child’s individual musical explorations and musical preferences. The interviews revealed how the children became more empowered in their musical interactions, further increasing their independence and skills in musical spaces. From the wider musical engagement theme, experiences grouped into sub-themes include increased interest, skill development, child empowerment and interactive play.

Increased interest: All participants reported an increase in musical interest and a developing attendance to musical stimuli, both during musical interaction and also in everyday life. The families reflected on how they became more aware of music in their environments, and many described that the children would actively seek out and develop their own musical interests independently. The change in musical interests of some of the children was striking, shifting from little engagement prior to the study to willing, active participation at the end of the 12-week period:

He enjoys it, he likes music, a lot more than before... He never used to really respond before, never. Whereas now he will happily sing along. He will even do the actions... whereas previously he wouldn’t... You wouldn’t get nothing at all. (Parent of P4)

The quotation above highlights a change from low Sol-EY engagement to singing along with others, indicating engagement at Sol-EY Level 5. Other parents also described a process of unlocking, as the children began to demonstrate enjoyment in the interactions they could receive through the music.

Skill development: The reports indicate children’s interest and enjoyment of music making at home may have impacted positively on their development of musical skills. Families described how children improved their own

Table 2. Themes, sub-themes and example quotations emerging from the final interview analysis.

Overarching Themes	Sub-Themes	Example quotations
Environmental Adaptation	Confidence	“With the cards it was just like little, little things but it was like ‘oh yeah I can do that’... Without them I wouldn’t have known what to do with the instruments.” (P4 Parent)
	Activities direction	“Very keen to repeat phrases and then independently use them with a melody. ‘Thank you’, ‘goodbye’ or ‘ok’ are his favorite.” (P9 Parent)
	Individual adaptation	“I’ve most definitely found that the ones whereby he didn’t necessarily have to follow a pattern or instruction worked better... But the other ones were very good. They gave me ideas.” (P4 Parent)
	Increased interest	“He enjoys it, he likes music, a lot more than before... He never used to really respond before, never. Whereas now he will happily sing along. He will even do the actions... whereas previously he wouldn’t... You wouldn’t get nothing at all.” (P4 Parent)
Musical Engagement	Skill development	“He is very good in music class in the school. When they are showing the screen and the notes, he tried to play and tried to play in time, in the beginning he couldn’t... In three months it has significantly developed. He’s listening... he copies the same music, the proper tunes, and sings that and tries to focus on the words.” (P6 Parent)
	Child empowerment	“She’ll say ‘No, no, no, don’t do that’ if I start a song. She’ll listen to that and be like ‘no, don’t sing that’ and make it up and be like ‘We’re getting dressed with this song instead.’” (P4 Parent) “If I try to show him something, he would try to repeat that, but that would have to be then on his terms. Like with a light recorder, we did some melodies, but then he wouldn’t want anyone else to touch it. It was his. He was just blowing into it.” (P12 Parent)
	Interactive play	“He’s been doing a lot more of that actually, and at nursery as well, they’ve been doing a lot of singing with him, so he has been interacting a lot more with it... but I do find that he does enjoy singing. So, when we do sing him humpty dumpty he does sing along and engage with us.” (P4 Parent)
	Supporting verbal development	“Overall everything, his confidence level, be able to like sing, not shying away that he’s not able to pronounce it better, so he’s trying to get that confidence to talk and to sing...” (P8 Parent). “Through the singing whereby he is saying a few more words... think most definitely the most positive is that we’ve had a few words, I think that it was definitely the most positive thing we’ve had over the past couple of weeks.” (P4 Parent)
Social and Behavioral Changes	Promoting social interaction	“Sometimes he can be grumpy or his ears hurting but when he hears or plays the piano he totally changes... also he talks more, he’s more interactive, I think that’s the main point... it makes him talk more. So I think [through the music] he has developed something which he does want to share with you...” (P2 Parent)
	Promoting eye contact	“If I sing to [-], he gives me complete eye contact. Doesn’t look away. I think there’s something to be said about that.” (P11 Parent)
	Attentional control	“His concentration... the way he can become interactive, it has changed, his focus is much better, his ability to follow instructions has phenomenally improved and progressed. His patience, his patience is so much more...” (P6 Parent)
Self-regulation	Emotional control	“We do sing a lot more, even if it’s just a silly thing we just make up little songs to go along with things, and I do find that he responds to it a bit more positively.” (P4 Parent)

musical abilities through the musical activities. Parents’ accounts illustrate increased engagement with musical patterns (SoI-EY Level 3), with playing in time with others (SoI-EY Level 5) and with singing whole songs increasingly in time (SoI-EY Level 5).

He is very good in music class in the school. When they are showing the screen and the notes, he tried to play and tried to play in time, in the beginning he couldn’t, but recently he started doing it in time... In three months, it has significantly developed. He’s listening... he copies the same music, the proper tunes, and sings that and tries to focus on the words. (Parent of P6)

Child empowerment: The reactions of the children to the musical instruments and tasks highlighted how they began

to develop through the domain of *proactive* engagement. Common among the accounts were the descriptions of seeking out the musical stimulus, and a growing recognition of their own capacities to engage in music:

He finds this Just Dance thing on YouTube “Johnny, Johnny,” and he copies and he dances with the music. He wanted his grandparents to be there and to watch him—non-stop he seems to do this... he started following Postman Pat and other things with the track. He did it by himself, he knows... he practiced it to himself. (Parent of P6)

Viewed through the lens of empowerment, these responses are particularly significant. The children’s developing abilities to regulate, orientate and engage with the

musical instruments demonstrated their growing musical empowerment.

Interactive play: The accounts above clearly describe the interactive play that took place during the sessions. For example, the child who “wanted his grandparents to be there and to watch him—non-stop” illustrates the child’s awareness of incorporating his family on his own terms. Further examples highlight how the children began to respond and seek out more joint musical play, and responded more to partners’ musical initiative requests, moving to the *interactive* domain of music making. As P3’s mother indicated:

But she’s definitely engaging with it more and tolerating you in the same space with it, although she still wants to direct you what to do. But that’s still including you, isn’t it? Yeah even if it’s not like totally co-operative, she’s letting you in. (Parent of P3)

These highlight how the musical aspects of play allowed a combination of the child being in control, whilst also tolerating and incorporating others into their games. The changes narrated by parents also demonstrated the progression from individual, proactive engagement to a realization that there can be enjoyment and value in the incorporation of others. Whilst many of the parents reflected that this was predominantly directed by the child, it demonstrates how the musical spaces become shared, and a space in which a child can both explore on their own terms and integrate others when they wanted to.

Social and Behavioral Changes

Parents regarded the musical activities as a pathway for unlocking their child’s expressiveness, which in turn had a wider impact on their interactive behavior. They also emphasized how music’s regulatory function could help divert children from overstimulating or stressful contexts.

Supporting verbal development: It was apparent that the musical activities scaffolded verbal interaction that subsequently impacted upon the children’s everyday speech. This was particularly demonstrated in the progression of feedback on the cards.

Week 1: Trying to get him to respond to “Hello” and “Goodbye” in speech is still an emerging skill. Can respond with prompts but not in song [The good morning song is introduced].

Week 4: We sing the morning song every day, he begins to point to the sky for the night-time section.

Week 8: This week I see that he is able to sing the ending to the morning song introduced over the last two months. When it’s time to say goodbye he then waves “goodbye” “goodbye” “goodbye” three times over. He looks pleased to have achieved this. He likes the sound of his voice!—so do I! (Parent of P11)

The progression of musical engagement over the course of the project from this feedback is clear, as is the perceived relationship with verbal and gestural development. These observations reflect card activities that focus on children’s ability to engage through musical motifs and their related meaning, indicative of SoI-EY Level 4, in order to harness language and communication.

Promoting social interaction: It was apparent that using musical play as a mechanism for joint attention promoted shared moments of interaction. This in turn was reported to have wider impacts, in that the behaviors practiced began to have external applications in everyday behaviors aside from music.

Sometimes he can be grumpy or his ear’s hurting but when he hears or plays the piano he totally changes . . . he talks more, he’s more interactive, I think that’s the main point . . . it makes him talk more. (Parent of P2)

The quotation above and those in Table 2 indicate that the perception of music as a socially interactive space was recognized by the parents but also by the children. There are strong links with the theme of interactive play, and it reflects the interconnections between interactive play and the promotion of social interaction.

Eye contact: Seeking out eye contact further reflects the development of communicative behaviors. Musical interactions created opportunities to stimulate more eye contact, sharing joy and attention, and this was often initiated by the child.

But in terms of him being around people and communicating, he got so much better. He’s seeking out contact. He’s really looking people in the eye and he wants to play with other people like even if he doesn’t know them very well. (Parent of P9)

The families reported that music provided them with a platform to connect more with their child and they felt that through the musical space, other behaviors were able to develop. There was pleasure in the joint attention, and this was reflected in the progression from solo to joint musical play—from the *proactive* to the *interactive*. Music created a structured space for social interaction and the children were able to learn and engage in behaviors that had wider applications in day-to-day life.

Self-regulation

Within the cohort, there was a reported improvement in self-regulatory abilities, including children’s capacity to control their behavior, to adjust and modulate their emotions and to focus their attention.

Attentional control: Some families reported that their child’s ability to engage in musical activities for a prolonged period of time significantly improved. This

contrasted with their behavior during other activities, which was characterized by frequent distractions and activity.

I thought this was really good today! It was for such a long time that she stayed with it . . . So I think we've seen a bit more of that as well. (Parent of P3)

The quotations (see Table 2) further indicate how the parents began to draw comparisons between musical behaviors and wider contextual changes. The references to patience and improved abilities to attend to tasks highlight the children's growing capacity to regulate and control their attention. This could suggest an improvement in self-regulatory capacities, but also an awareness that music can be a space to explore something of interest.

Emotional control: Music as a way to scaffold behaviors that require self-regulation, such as concentration, was also reflected in part through its use to redirect and adjust children's moods. Through this adjustment, they seemed to become calmer and able to be redirected to do things that would usually cause distress.

He is quite emotional. And he does get upset, especially if he's told things at a certain time. But like I said, you can switch it around, make it into a little song he will still do it. If you go and tell him to go and pick up something but do it in a, you know, musical fun singing way. And he'll do it without crying or getting upset. (Parent of P4)

The accounts (see Table 2) also illustrate how parents began to adapt the resources and use music flexibly according to their specific needs. The children's own engagement demonstrates how music was used as a way to regulate and sustain their moods.

Discussion

This project explored the feasibility of using new resources to encourage musical engagement and development for families with autistic children in naturalistic settings. As evident in the analysis of the interview data and supported by the SoI-EY assessments, families were successful in using the new resources as prompts to engage musically with children, and all were able to support their musical development and engagement in some way. The narratives from the parents indicate that the new resources are appropriate for promoting musical engagement and, significantly, contribute to the growing literature of parents effectively implementing a musical program at home that could be integrated into daily life without specific and specialized training (Nicholson et al. 2008; Osei, 2009; Yang, 2016). The activities on the cards, grounded in the SoI-EY framework, allowed parents to draw on their child's musical interests in order to encourage further engagement and development. Examples of parents employing musical

phrases in everyday life to scaffold language, building on a child's ability to engage through memorable musical motifs, is indicative of their capacity to engage at the higher levels of the SoI-EY framework, particularly Levels 4 and 5. The parents' reflections of the program highlight how the provision of the musical instruments and activities provided the children and families with a distinct outlet for empowered expression, creativity and skill development. Their interactions and behaviors were consistent with previous approaches that have noted the importance of musical play in the early years (Marsh & Young, 2016). Notable also was the growing control that the children took of the musical situations, highlighting how musical spaces may provide an environment in which autistic children can feel safe, in control, and interact on their own terms. The quantitative developmental measures collected further support these findings. Although some showed little or no improvement over the course of the program, it was notable that these children were already able to interact at developmentally appropriate levels with music, as indicated by their high SoI-EY scores. The narrowing distribution of the scores at the final visit further indicates a differential benefit, whereby those children who were least advanced musically improved the most.

This study highlighted the important role of parents as mentors for their child's musical development, and how music can be utilized as a communicative and social tool in everyday life for families with young autistic children. Preserving the aspect of positive collaboration and play to this approach was essential to its success, as the broad potential benefits of musical engagement that are frequently advocated (including personal and social developmental outcomes) can only occur if it is an enjoyable experience for those participating (Hallam, 2010). The impact of the resources on stimulating the wide range of musical and non-musical behaviors that have been presented above suggest that a naturalistic musical program could affect children's self-esteem, socio-cognitive development and family well-being. This project represents a promising development into how parents can incorporate the principles and values of arts-in-health research into day-to-day life, and further expands the scope of the values of parent-implemented musical programs for children with autism (Hernandez-Ruiz, 2020b). The results also highlight the extensive impact of the resources in having a positive effect on everyday musical behaviors and are indicative of the strengths of the project to empower families to utilize music for their own interactive, communicative and regulatory needs. Unlike the highly structured nature of other home interventions, the notion that the cards were "freeing" demonstrates the playful aspect of activities. It underlines the ecological validity of the cards, and their effectiveness in promoting musical interaction without the need for musical training. Significantly, it enabled families to promote behavioral change in non-clinical settings and provided a contrast to deficit-driven behavioral and developmental

narratives that often perpetuate the early years after diagnosis.

The current project demonstrates the importance of considering music's wider affordances in the design of intervention strategies. The role of music as a scaffolding function is not altogether new, as during the early years it is common for mothers to use music as way of scaffolding the environment in the early months, to provide routines and structure for the infant (Custodero & Johnson-Green, 2003). These results demonstrate similar ecological practices, with parents' use of the resources corresponding with established patterns of music making in the home, albeit with more specific outcomes. The themes that emerged from the interviews also resonate with health musicking narratives that explore the function of music in everyday life, as families began to incorporate music as an enjoyable and playful part of their daily routines. The adaptive naturalistic design further aligns with the growing recognition of how music is fashioned by individuals as a medium for building emotional well-being. As the reports of both the children's individual behavior and engagement with parents reflected, music became a space in which micro-regulatory practices were enacted as well as an "aesthetic technology" of the self (Krueger, 2011; Ruud, 2010). For the participants who previously seemed unaware of musical stimulus, this could be conceived as a process of empowerment. Children became more aware and gained confidence in how sonic stimuli in their environment can become or are musical and used this as a resource for self-regulation and cognitive development. These findings resonate with neurodiversity principles—in particular, the importance of adapting a child's environment to support their own development and flourishing (Fletcher-Watson, 2018). The growing use of music in the families' lives as a medium through which children could interact, regulate and explore on their own terms is significant. It highlights the possibility of musical spaces as shared meeting points which provide opportunities for relationship building and positive, playful interaction.

The prominence of self-directed and regulatory behaviors was an unexpected theme to emerge from the results and it raises some potential future research directions that are as yet relatively understudied, particularly in regard to individual musical empowerment. In the current study, the proactive engagement of the children themselves to the materials and the incorporation of music as an emotional and interactive tool is suggestive of a process of empowerment (Haslbeck, 2014). In providing the child and their families with the skills, combined with the physical resources (keyboard and instruments), to engage and express themselves musically, both parties were able to begin to take control and reorientate themselves in their environment. While the social and behavioral change domains observed here match general patterns in other music-intervention studies in clinical settings (see Geretsegger et al., 2014; Hernandez-Ruiz, 2020b; James et al.,

2015; LaGasse, 2017; Simpson & Keen, 2011 for comprehensive reviews), other outcomes of change in self-regulatory domains are less explored. These additional findings are supported by Janzen and Thaut's (2018) argument that the clinical scope of the outcomes for music therapy in autism needs to be broadened. The results here support their suggestion that musical spaces have wider potential for development in attentional, motor-control and emotional domains. The amount of self-directed learning and engagement that was evident in the data also has implications for future research into the role of music as a place of imaginative and self-regulated play for autistic children. It was notable that once parents began to use the resources to engage musically, the children's responses frequently occurred outside these joint play occasions, and they began to show more awareness of the musical capacities of their surrounding environment. This would suggest that during the initial joint play sessions (both with the parents and the researchers) the musical skills and techniques that the children observed and imitated were then being adopted and developed independently during their own musical explorations.

Limitations

While the small participant cohort and limited time frame of the project means that the conclusions here are limited in their scope, the evidence supports the need for more in-depth music-developmental research with the families of young children on the autism spectrum. A deeper analysis of parents' uses of the cards, combined with clinical measures of behavioral change, will further elucidate the nature of change from these interventions. Furthermore, more systematic, observational analysis of the dimensions of musical engagement is required to ascertain what specific interactive and social behaviors musical play is targeting.

Conclusion

Although only exploratory, the findings from this project are supported by a considerable amount of research within music psychology and developmental science that emphasize the wide-reaching and learning transfer effects that musical engagement can have. Nevertheless, this research clearly demonstrates that the social benefits of musical interaction that are reported with neurotypical children are equally applicable in neurodiverse contexts. The findings of this study suggest that musical spaces can be equally supportive of the play-based behaviors that are essential for child development of emotional regulation, social cognition and communication. The major contribution of this study is that parent-directed resources based on the SoI-EY framework can have an impact on young autistic children's musical and wider development. There are also important implications for practice which go beyond the creation and evaluation of tools for caregivers and parents for musically

therapeutic purposes. The development of these materials highlights their potential for wider use in educational settings and in everyday life. Within the educational contexts of the current COVID-19 pandemic, as parents and caregivers look for accessible and implementable educational tools, these findings can further assist with the curriculum design for educational spaces—in particular, how parent-directed materials can support musical education for autistic children without the need for specialized training.

Contributorship

All authors worked together on conceiving the study and on gaining ethical approval. AO created the first iteration of the resources that were used. TL, AV and CS worked on participant recruitment and gathered the data. All authors worked on different aspects of data analysis. TL and CS wrote the first draft of the manuscript, which was amended, edited and approved by all authors.

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ORCID iD

Tania Lisboa  <https://orcid.org/0000-0002-6301-2063>

Action Editor

Orii McDermott, University of Nottingham, Institute of Mental Health, School of Medicine.

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Beatriz Ilari, University of Southern California, Department of Music Teaching and Learning.

Note

1. It should be noted that this project is unrelated to initiatives with similar “Imagine” nomenclature related to both music therapy and autism, e.g., www.imagine.musictherapy.biz and “Imagining Autism” (Beadle-Brown et al., 2018)

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Appendix I. Detailed breakdown of activities on card resources by Sounds of Intent level

Tag Line	Sol Level	Reactive/ Proactive/ Interactive		Category	Main Descriptor	Behaviors	Activities
		Reactive	Proactive				
1 Make different sounds with your voice for me to enjoy	Level 2	Reactive		Sounds Interesting	Shows an Awareness of Sound	Listening and Responding	1.1 Get close to me 1.2 Let me feel and see as well as listen to what you are doing, how your tongue and lips move, the buzz in your throat 1.3 Hum and click 1.4 Bubble and squeak 1.5 Vowels and consonants 1.6 Long sounds and short sounds 1.7 Whisper and shout 1.8 Funny and sad 1.9 Play the sound and silence game—make a sound with your voice and then stop! Do it again and again 1.10 Wobble your head, wriggle your body, dance around when you make a sound and stop moving when the sound stops
2 Show me the sounds that everyday things and musical instruments can make	Level 2	Reactive		Sounds interesting	Shows an Awareness of Sound	Listening and Responding	2.1 Shaking containers with things that rattle and instruments like maracas 2.2 Banging things together: wooden spoons on pots and pans, drums, tambourines and claves 2.3 Rubbing a brush on a tray or playing a guiro <i>Remember that I may be particularly sensitive to certain sounds which I may find exciting or distressing</i> <i>—or both</i> <i>Be sensitive to my reactions and give me plenty of time to get used to new experiences. There's no rush! I may prefer to explore new things for myself (proactively)</i>
3 Encourage me to make sounds with my voice	Level 2	Proactive		Sounds Interesting	Intentionally makes or controls sound (Vocal)	Making Sounds and Music Myself	3.1 Try me with a microphone and amplifier 3.2 Let me see what I am doing in a mirror 3.4 Record what I do and let me hear it back 3.5 Try me with voice-changing apps 3.6 Let me hear how my voice sounds different in other places, such as places that echo 3.7 Encourage me to make sounds when you move me around, swinging or swaying, like “see saw” or “whoosh”

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Appendix I. (continued)

Tag Line	Sol Level	Reactive/Proactive/Interactive		Category	Main Descriptor	Behaviors	Activities
		Interactive	Proactive				
4 Help me make sounds with everyday objects and musical instruments	Level 2	Proactive		Sounds Interesting	Intentionally makes or controls sound (Applied)	Making Sounds and Music Myself	<p>4.1 Give me everyday objects to play with that are safe and make different sounds</p> <p>4.2 Show me how musical instruments make sounds in much the same way, by banging or shaking or scraping</p> <p>4.3 Make instruments with me out of everyday objects, and then show me how to play with them—containers filled with rice or dried peas, for example, or shells tied together with string</p> <p>4.4 Make me my own “sound den,” with instruments and other sound makers for me to explore on my own</p> <p>4.5 When I play outside, show me the fun I can have with natural outdoor sound makers—scrunching in the gravel, splashing in puddles, banging sticks or jumping in a pile of leaves</p>
5 Have conversations in sounds with me	Level 2	Interactive		Sounds Interesting	Interacts with others using sound (Vocal)	Making Sounds and Music with Others	<p>5.1 You can start, or wait for me to make a sound</p> <p>5.2 Sometimes I might make different sounds and sometimes I might seem to copy what you do</p> <p>5.3 You can copy me or do something different</p> <p>5.4 Whoosh me round and round as we make sounds together with our voices</p> <p><i>Get close to me so I can touch your face and make eye contact if I want</i></p> <p><i>Give me lots of time to respond to the sounds you make—be patient!</i></p>
6 Play with me making everyday sounds, inside and outside, and musical instruments	Level 2	Interactive		Sounds Interesting	Interacts with others using sound (Applied)	Making Sounds and Music with Others	<p>6.1 If I’m banging a pot or pan or tapping a glass, sit next to me and bang or tap one too! Perhaps I may let you tap or bang the same object</p> <p>6.2 Sometimes we can make a lot of noise together, playing sounds makers or instruments at the same time</p> <p>6.3 Sometimes you can help me learn to take turns by waiting until I’ve finished my go before you start</p> <p>6.4 You could copy what I do, or make different sounds for me to listen to</p> <p>6.5 Make sounds outside with me: throw pebbles in a pond, splash in a puddle with me, jump in a pile of leaves</p>

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Appendix I. (continued)

Tag Line	Sol Level	Reactive/Proactive/ Interactive	Category	Main Descriptor	Behaviors	Activities
7	Level 3	Reactive	Copy me, copy you	Reacts to simple patterns in sound (Vocal)	Listening and Responding	<p>7.1 When you have my attention, make patterns with your voice like “ma,ma,ma,ma,ma” and “pa,pa,pa,pa,pa”</p> <p>7.2 Say “up,up,up...high” and “down,down,down...low” and move me as you make sounds</p> <p>7.3 Now do a “to and fro”</p> <p>7.4 Sing patterns going up and down that don’t have words</p> <p>7.6 Whistle them if you can</p> <p><i>It might help me to be up close to your face, and I might want to touch your mouth to work out what is going on</i></p> <p><i>Sometimes I may not appear to be paying attention, but that does not necessarily mean that I am not listening</i></p> <p><i>Record what I do, so I can watch later</i></p>
8	Level 3	Reactive	Copy me, copy you	Reacts to simple patterns in sound (Applied)	Listening and Responding	<p>8.1 Make simple tapping patterns on different objects, including percussion objects</p> <p>8.2 Notice if any sounds catch my attention, and try them again using a different sound maker or instrument</p> <p>8.3 Now try patterns on the keyboard</p> <p>8.4 Make a pattern just using one note</p> <p>8.5 Now make a little tune that goes up a few notes on the keyboard...and down again</p> <p>Record what you do, so I can watch later</p>
9	Level 3	Proactive	Copy me, copy you	Makes simple patterns in sound intentionally (Vocal)	Making Sounds and Music Myself	<p>9.1 Give me the time and space to experiment with pattern-making with my voice</p> <p>9.2 Respond to the patterns in sound I make by moving, and stopping when I stop</p> <p>9.3 I might seem to get stuck in making only one pattern—in which case you could encourage me to make different ones</p> <p><i>Record what I do and let me hear it back</i></p> <p><i>Try to move me on from just being “proactive” to being “interactive”</i></p>

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Appendix I. (continued)

Tag Line	Sol Level	Reactive/ Proactive/ Interactive	Category	Main Descriptor	Behaviors	Activities
10 Encourage me to make patterns on sound makers and musical instruments	Level 3	Proactive	Copy me, copy you	Makes simple patterns in sound intentionally (Applied)	Making Sounds and Music Myself	10.1 Encourage me to transfer my interest in making patterns in sound by giving me musical instruments to tap instead 10.2 Give me a keyboard to play with too 10.3 Or give me an app that lets me play with patterns! 10.4 Help me understand the pattern of the black notes or white notes by labeling the keys with colors or letter or both <i>Some autistic children (like me!) may not need much encouragement to make patterns in sounds by tapping everyday objects like glasses and cups This is because I find the sounds they make are fascinating—perhaps more important to me than the usual function of the objects</i> 11.1 Try to move me from just making sounds with everyday objects to musical instruments 11.2 Copy the sounds that I make with my voice 11.3 Give me time to think about what I've just heard —it might take me a while to release that I'm in control 11.4 The important thing is to encourage “give and take”—so the interaction isn't just one way <i>Like lots of autistic children, I may well like to copy the sounds you make (“echolalia”)</i> <i>This is a normal stage of development, but I may stay in it for a while</i>
11 Echo the sounds I make with my voice, and give me time to copy yours	Level 3	Interactive	Copy me, copy you	Copies others' sounds and/ or is aware of own sounds being copied (Vocal)	Making Sounds and Music with Others	
12 Copy the sounds I make with everyday objects and instruments and encourage me to copy what you do	Level 3	Interactive	Copy me, copy you	Copies others' sounds and/ or is aware of own sounds being copied (Applied)	Making Sounds and Music with Others	12.1 Encourage me to copy you by making a sounds on an object or instrument I have made before...I may not need much encouragement 12.2 Sit me in a circle of three or four people; one makes sound with her voice, then next person copies...and round the sounds goes 12.3 Copy sounds and patterns I make on instruments or other soundmakers 12.4 Show me that I can control what you do 12.5 First use a soundmaker or instrument that is the same as mine 12.6 Now use a different instrument to copy the same patterns and then swap! 12.7 Gradually make the context more “musical” by using only instruments

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Appendix I. (continued)

Tag Line	Sol Level	Reactive/ Proactive/ Interactive	Category	Main Descriptor	Behaviors	Activities
13 Sing short, everyday phrases to me	Level 4	Reactive	Bits of Pieces	Recognizes musical motifs and the relationships between them (Vocal)	Listening and Responding	13.1 Listen to the communication songs with me and show me that you can sing them too... 13.2 Start with "hello!"—repeat it several times, followed by my name 13.3 Then try goodbye 13.4 Next show me how to sing "yes please" and "no thank you" <i>Try learning the phrases that you can use for people's names, activities and places</i>
14 Play me repeating patterns on instruments, sound makers and with technology	Level 4	Reactive	Bits of Pieces	Recognizes musical motifs and the relationships between them (Applied)	Listening and Responding	14.1 Play me simple patterns on a drum or tambourine, like "rat-a-tat-tat" on the drum 14.2 Play me patterns of three or four notes on the keyboard like "C-D-E, C-D-E, C-D-E" 14.3 Sing or play familiar patterns for me that I know from my favorite sounds, TV programs, adverts or toys 14.4 Make recordings of everyday patterns, then of you playing them, so I can work out the connection in my own time
15 Give me that microphone	Level 4	Proactive	Bits of Pieces	Reproduces or creates distinctive musical motifs (Vocal)	Making Sounds and Music Myself	15.1 Encourage me to sing short bursts of music I've been hearing from the communication songs 15.2 I might find using a microphone and amplifier motivating 15.3 Try pusing different effects on my voice, such as echo or reverb 15.4 Remember I want to move when I sing <i>Once I'm confident, turn it up loud!</i> <i>Record what I do and let me hear it back</i>

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Appendix I. (continued)

Tag Line	Sol Level	Reactive/Proactive/Interactive		Category	Main Descriptor	Behaviors	Activities
		Sol Level	Interactive				
16 Help me to play short musical phrases on instruments	Level 4	Proactive		Bits of Pieces	Reproduces or creates distinctive musical motifs (Applied)	Making Sounds and Music Myself	<p>16.1 Place your hand under mine and show me how to make short rhythms on percussion instruments</p> <p>16.2 Encourage me to copy what you do by looking and listening</p> <p>16.3 Show me how to play short, simple patterns on the keyboard</p> <p>16.4 Start with simple, rhythmic patterns that stay on the same note</p> <p>16.5 Now introduce patterns that use two or three notes and that start on C</p> <p>16.6 It's fine for me to use one finger to start with...then encourage me to use my thumb and other fingers too</p> <p><i>I may like to learn on my own by looking and listening to recordings of you playing</i></p> <p><i>I may find it helpful if you refer to the names of the notes (with stickers or colors)</i></p>
17 Play "call and response" games with me using your voice	Level 4	Interactive		Bits of Pieces	Engages in musical dialogues using motifs (Vocal)	Making Sounds and Music with Others	<p>Record what I do for me to see!</p> <p>17.1 When I sing short patterns of sounds, copy what I do and encourage me to do the same</p> <p>17.2 Play "call and response games"—you could use some of the communication songs, like "What's your name?...My name is Jack"</p> <p>17.3 At first, I may just copy what you do, so you could model the interaction with others</p> <p>17.4 Play the game with other people in a small circle—one person could be the leader for others to follow, or you could play "pass the pattern" from one person to another</p>

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Appendix I. (continued)

Tag Line	Reactive/Proactive/Interactive		Category	Main Descriptor	Behaviors	Activities
	Sol Level	Interactive				
18 Play “call and response” games using instruments	Level 4	Interactive	Bits of Pieces	Engages in musical dialogues using motifs (Applied)	Making Sounds and Music with Others	<p>18.1 Encourage me to make short rhythms using a drum or tambourine, and copy what I do, then swap over—see if I will copy you</p> <p>18.2 Next, instead of copying me exactly, change the pattern slightly (like a “question and answer”)</p> <p>18.3 Perhaps try rhythms on one note at first</p> <p>18.4 Then use little phrases of two or three notes</p> <p>18.5 Now take turns: I play something, you play something, I play something, you play something etc.</p> <p>—hooking the patterns together to start to make music together over time</p> <p>18.6 Start with children’s songs with actions to help make the structure clear, such as “The wheels on the bus”</p> <p>18.7 Try folk songs and working songs from your culture, like “What shall we do with the drunken sailor?”</p>
19 Sing me lots of different songs with simple structures that I can understand	Level 5	Reactive	Whole songs, in time and in tune	Attends to pieces of music, anticipating prominent structural features and responding to general characteristics	Listening and Responding	<p>19.1 Sing pop songs (which often have simple structures) like “We will rock you” and “Hallelujah”</p> <p>19.2 Try classical melodies from your culture: for example, in the West “Ode to joy”</p> <p>19.3 Gradually sing longer and more complicated songs</p> <p>19.4 Hum the songs I know and then play me instrumental versions of the same songs (available on the Internet)</p>
20 Play me recordings of simple instrumental pieces that I can follow and take me hear all sorts of music in different places	Level 5	Reactive	Whole songs, in time and in tune	Attends to pieces of music, anticipating prominent structural features and responding to general characteristics	Listening and Responding	<p>19.5 Play me instrumental pieces that have a lot of simple repetition like “Can Can”</p> <p>20.1 Let me hear street musicians and buskers and musicals</p> <p>20.2 Try relaxed performances of classical music</p> <p>20.3 Play me music that tells a story like “Peter and the Wolf” and “The Sorcerer’s Apprentice”</p> <p>20.4 Take me to children’s concerts and “relaxed” performances</p> <p>20.5 Give me lots of praise and encouragement when I sing!</p>

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Appendix I. (continued)

Tag Line	Sol Level	Reactive/ Proactive/ Interactive		Category	Main Descriptor	Behaviors	Activities
		Sol Level	Interactive				
21 Encourage me to sing songs on my own	Level 5	Level 5	Proactive	Whole songs, in time and in tune	Performs, improvises or composes simple whole pieces of music (Vocal)	Making Sounds and Music Myself	21.1 Show me that I'm in control: do the actions to the songs that I sing 21.2 Show me what fun it can be to sing for different family members Record what I do, so I can watch later 22.1 Help me play simple songs that use only a few notes like 'Mary had a li'Yle lamb', or 'Oh when the Saints' 22.2 Show me using my preferred style of learning—for example using a simple "score," written out letters or colors 22.3 Or I may prefer to just copy what you do, a bit at a time 22.4 Or I may like to watch how to play using a recording on a tablet 22.5 Once I'm confident, turn it up loud, and encourage me to play for other people!
22 Help me to <i>play</i> what I can sing	Level 5	Level 5	Proactive	Whole songs, in time and in tune	Performs, improvises or composes simple whole pieces of music (Applied)	Making Sounds and Music Myself	23.1 Encourage me to sing songs with you 23.2 I might well like to sing the same song over and over again—but that's fine—it's just the way I like to learn things 23.3 I may find it easier to move when I sing, and when someone plays xclaps a beat (and, if possible, plays chords as an accompaniment) 23.4 Try singing rounds with me like "London's burning" and "Frère Jacques"—someone else can help me with my part at first
23 Sing songs with me that I love over and over again	Level 5	Level 5	Interactive	Whole songs, in time and in tune	Performs, improvises or composes simple pieces of music with others (Vocal)	Making Sounds and Music with Others	24.1 Start by doing something together with me—it could be a tune on the keyboard, or a pattern on the drum 24.2 Then, try playing a simple accompaniment while I carry on playing my part 24.3 Try to make up new tunes together, with or without words 24.4 Encourage me to improvise 24.5 Give me the chance to make music with other children—it might be easier if they are a bit older than me at first
24 Let me join your band!	Level 5	Level 5	Interactive	Whole songs, in time and in tune	Performs, improvises or composes simple pieces of music with others (Applied)	Making Sounds and Music with Others	