Music House
FOR CHILDREN

How do young deaf children respond to different sounds? Exploring children's responses within the context of a music session

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All the names of participants in this research document have been changed.
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Abstract

The purpose of this research was to observe the responses of young deaf children to different instrumental sounds, and to examine how these sounds can play a part in young deaf children's musical learning, communication and interaction with others.

Research on deaf children's response to sounds has focused largely aural communication through development of electronic aids (Sommers et al, 2008). In the absence of accessible literature there appears to be a gap in researching young children's ability to enjoy musical experiences without the focus being on aural communication. With this research I explored new avenues in encouraging communication through musical experiences, and to help inform future practice in this field.

Keywords: cochlear implants, deaf, deafness, sound-making, movement, young children.

Introduction

Research on deaf people and sound making have been carried out, mainly with a focus on mechanical hearing support that 'enables deaf children to perceive sound by stimulating the auditory nerve with electrical pulses' (Hopyan, 2010). Cochlear Implants (CI) and hearing aids have evolved with a primary motive to providing users with the ability to aurally communicate, and to decipher others vocalising around them. An insight into the technological development in hearing aids is necessary, with particular reference to the impact that musical programmes may have on responses.

Hearing aids

Analogue hearing consists of a microphone, a pre-amplifier, a means processor, and amplifier and a receiver (Lopez, 1998:3). Digital hearing aids are made up of additional components including an analogue-to-digital converter, a digital signal processor and a digital-to-analogue converter. The basic difference is in the clarity of sound received from a digital aid, in addition to the fact that these aids are tailored to the individual's hearing loss via input of computer-generated information.

Cochlear Implants

A cochlear implant (CI) is a ‘surgically inserted biomedical device designed to provide sound information…’ (Dornan, 2010:6). CI’s are recommended after diagnosis of hearing loss, and usually after hearing aids cease to provide adequate support, or hearing declines further.

CI's are continually improving to include a greater range of frequencies and streaming of sound waves. These have enabled a CI user to decipher sounds heard, later leading to musical recognition. Studies on the impact of music on CI's carried out by Oxenham explores auditory streaming and pitch segregation:

‘The process by which successive sounds from one source (such as a violin or a person talking) are perceptually grouped together and separated from other competing sounds is known as stream segregation, or simply “streaming" (Oxenham, 2008:316). This describes in part, complexities involved in enabling music appreciation for deaf people.

Parallel to the development of aids, pre and post care supports families in hearing diagnosis, again with aural communication as a priority. Before the advent of newborn screening in the late eighties, families tended to fall into two stereotyped camps (Hutchinson, 2011:RNTNE):

a/ A deaf child is put into mainstream education and encouraged to ‘swim with the tide’. The child may experience restrictions in communicating and learning development and significant adults were often ill equipped to deal with deafness.

b/ A deaf child is placed into a deaf and dumb school where British Sign Language (BSL) is the main language of communication and musical activities were thin on the ground (Hutchinson, 2011:RNTNE). These children grew up to remain within a resolute and relatively comfortable 'club' where there was mutual understanding, but little vocalisation.

Engaging deaf children in music was perceived as a paradox. That music could support deafness only really came to public notice in the UK with profile deaf musicians such as Evelyn Glennie and Paul Whittaker. “…there's something far more fundamental involved, and that is heart and soul and emotion” (Whittaker, 2006).

Review of relevant literature

Less research on music making and aural responses with very young children is available then with older children and adults (Gfeller et al, 2005). Exploring musical behaviour and responses in young children requires different mechanisms to monitor responses since communication is more frequently non-verbal, requiring visual clues over a period of time. Access to young children involves significant others (parents, nursery staff), and research options presented may not be easily understood. With young children space and time has to be allowed to build up trust, familiarity (of the researcher), and observation of relevant responses.

People who experience deafness later in life (Rosen et al, 1989) resist the opportunity to upgrade to digital or CI's since, as music - previously seen as a pleasurable pastime or as a profession becomes an unpleasant experience. 'Subject 1 maintains he cannot carry a tune and has difficulty recognising even the most familiar tunes' (Bartel, 2011:11). One of the reasons that is attributed to older peoples struggle to adjust is Oxenham's suggestion that, 'less access to individual harmonies provides little or no representation of individual harmonies...' (Oxenham, 2009:109). A research by Bartel explores musical responses – this time from five adults all wearing cochlear implants. Despite musical exploration he reminds us that, 'the cochlear implant is primarily designed to optimise speech perception.' (Bartel, 2011:3).

Most of the participants in this research project were either wearing CI's or had just been fitted with one during the time of the project. With references to the variety of instrumental sounds experienced it is notable that the streaming process of CI's and digital aids could have had an impact on children's responses to different sounds. One example is Alexi (who wears digital aids) who demonstrated an aversion to the guitar sounds each time he heard it being played. He made distressed sounds and moved behind his mother (Hutchinson, 2011:CJ). The complexities of mixed notes may have been too much information in his digital aids, and for his brain to decipher. It is notable that Alexi is resistant to unfamiliar activities. This could be a contributory factor in his responses.

Comparative studies

Studies involving CI's music programmes are continuously evolving. In order to assess appropriate development, deaf children are often compared with hearing children. Dornan researched hearing responses with 29 children 'with a range of sensorineural hearing losses and amplified with either hearing aids or cochlear implants'... Their responses were compared with 29 children with full hearing (Dornan et al, 2010). I wanted to move away from providing analysis in comparative terms since the complexities of each participant's hearing loss and their age at the time of CI/hearing aid fittings had a bearing on responses to the different, live sounds. My conclusions were based on each child's characteristics, preferences to sounds, the support of significant adults and aesthetic, or emotional engagement (as with Alexi earlier in this page).

Adjusting to new aids

Deciphering specific sounds with analogue aids is generally harder then with digital aids because programmed computer specification to the individual's needs was not possible. Now, when changing over to digitally fitted aids and highly tuned electronic programmes, the older user's brain has to incur major adjustment, with the sensorimotor cortex requiring patience and support to enable aural information changes positively - particularly with music appreciation (Bartel, 2005:8).

Evidence suggests that early intervention improves life chances, and earlier implantation is linked to 'better performances (in speech and literacy) then with children after 3 years old (Sommers and Lim, 2008:2)'. Automatic otoacoustic emissions testing (pp.v) is now a normal part of post-birth checkups. Graham suggests that plasticity within the cochlear is far greater when younger and CI's are harder to adjust to, the older the child gets (Hutchinson, 2011:RNTNE). Families are sign-posted to specialist units such as the Speech Hearing and Language Centre, London (pp.vi) to develop aural and communication skills. All the children in this research were the recipients of early detection (between 3 weeks and 2 years old), and maximum support.

Little research appears to be available on young deaf children in musical exploration. Post-fitting support tends to be given on a one to one basis with specialists in a clinical environment. A more holistic, organic study could help to provide information on responses to electronic music programmes, and how spontaneous musical experiences could support deafness. In this respect I wanted to find out whether deaf children had a preference to different sounds, to see how the characteristics of each child responded, made a choice (to respond to the sounds heard), and the impact that particular sounds could have on a deaf child's engagement with the world around them.

The method

The objective of this research project was to look at how young deaf children responded to the different sounds experienced by real instruments that could be seen, touched and experienced in semi-structured sessions. The questions drawn up to assist in gleaning information from all data evidence included:

What particular sounds did each child respond to and how did they respond?
Were there links to these sounds and any physical responses?
What - if any- were the preferences to the sounds heard?
Did external influences such as adults and the environment have an impact on responses?
Were responses related to their specific hearing loss?

To facilitate this research, initially one existing deaf group was invited to be the subject of this research. The parents, children and I had already experienced regular music sessions for two years prior to this research. My interest in exploring musical responses in deaf children had deepened from this experience. The children and parents knew me well, so absorbing the project as part of ongoing sessions, with the addition of new instruments was straightforward, and the Cathnor staff was happy to continue with music making using a larger variety of instruments.

Although my initial research outline was to involve only the Cathnor group, after 2 sessions it became evident that if I was to realise all the aspects of research criteria as originally outlined, I needed to explore responses by children who did not have the same level of support that these children had from specialists, their parents and at home. Investigation into a second group led to a deaf academy with an adjoining Pre-School. I gave two introductory sessions. These enthused the Pre-School, and helped the children to get to know me.

A final adjustment to the original research proposal was to observe three children from the Cathnor group experiencing free musical play in a home and nursery environment with the same instruments, but without adult intervention.

Data collated
Within a framework of six sessions I analysed and collated information from video evidence, interviews with specialists, and jottings taken from conversations and practical observations with the participating adults and the children.

a/ Jottings were taken during observational study in all four settings. These were referred to, and used as part evidence together with the video data and interviews.

b/ The Cathnor group and the Pre-School group had video data taken in the early, and then later stages to enable settling in time - i.e. getting used to the sessions. Analysis was then made of each videoed session to measure responses against external influences such as visitors, the weather, and the shifting framework, as well as the instruments used. The home group had one session in total. It was videoed, and jottings taken.

To analyse video evidence I examined the responses of each child in each video recording with headings taken from the original outline of research in mind. Four children out of nine participating became the main focus for this research since they attended the majority of all six sessions, or participated in more then one group (Audi).

c/ A recorded interview with a CI specialist (London, UK) provided me with information on UK research in hearing technology. Comments from this recording were used to clarify or support analysis made.

d/ An interview with the headmaster of Exeter Academy for the Deaf (UK) helped me to appreciate some of the histories of deafness. Comments from the recording were used to clarify or support analysis made.

The memory and life experience of very young children is less cluttered, so likely psychological issues experienced by older people (as explored by Bartel, 2007) were not applicable to this research project. With the two groups, and through video evidence, jottings and conversations with key adults I tried to draw out the following musical observations:

a/ Focus (of different pitches – frequencies)
b/ Memory recall and response
c/ Vocalisation
d/ Melodic responses in groups
e/ Multi-layering of sounds
f/ Aesthetic appreciation
g/ Segregation and recognition of different sounds

These musical headings acted as a foundation to enable me to build my research paper with a focus on these headings, and linking to sub-headings such as sound preferences, influences (parent and environment), hearing loss (type of) and physical responses, (pp.7).

Analysing data
I considered several headings from which to bring together all the data evidence. With the quantity of footage, communication (with significant adults) and jottings collated, I defined key areas from which to focus and to assess responses so as to retain clarity in my findings and subsequent conclusion.

Musical instruments

The material used was pivotal to providing responses and engagement in the research. To this end a variety of un-tuned instruments were carefully chosen for their differences in sounds, shape, visual presentation and textures. The pictures and a description of each instrument (pp.vii-viii) gives an idea of the sounds and visuals experienced by all the participants.

Un-tuned instruments
Balimaraca
Jingliejingles
Shaker ball
Pingpong
Kenari shaker
Shaker Scraper
Tik tok
Ocean drum
Large bodhran
Tambour
Large 3 inch deep hand drum
Metal double agogo (like wooden agogo)
Metal cowbell
Wooden claves

Tuned instruments
French horn, Trumpet, Cornet, Penny whistles, Fife, Guitar, Ukulele, Chimes.

The un-tuned instruments were appropriate to the age group and chosen for the textures of sound and touch. They were largely made of natural fibres - coconut, wood, seeds, rope. They emitted a range of sounds depending on the way they were moved. The shift away from the initial framework (pp.12) meant that space and time was made available for children to explore chosen instruments, thus enabling observation of fine motor movements, and choices made. As the leader I used tuned instruments to facilitate the framework of activities; and allowed time for the children to have a go on the same instruments. Musical observations in free-play was possible since the seemingly haphazard sessions demonstrated musical intuition and responses that may not have manifested themselves had the framework been rigid.

Framework of activities

The Cathnor and the Pre-School sessions framework acted as a springboard for musical responses to move from. This consisted of:

Welcome
Warm-up activity
Group movement and sound based activity (musical game)
Group Instrumental play
Moving through the space
Listening (to sounds or a piece of music)
Farewell

By facilitating a move away from this framework and encouraging the other adults to also quietly observe, I could acknowledge the more subtle responses that took place. Changes in activities also occurred through influences such as the weather (moving outdoors), absence of key children, and visiting specialists. The development of children's responses in instrumental sounds was also noted through videoing specifically chosen weeks at the two main groups.

Adults were present at all sites but only fully participated at Cathnor and the Pre-School groups. This research project was established with myself as the researcher actively playing specifically chosen instruments, and then later, deciphering information from video evidence, conversations with significant adults, and jottings, that collated with key headings chosen from which to base my research findings. From using the aforementioned framework as a springboard, and then allowing movement away from this structure I was able to notice the following:

1/ The children became the leader/s (Hutchinson, 2011. PS:4a).
2/ Less variety of instruments then anticipated were used due to preferences of sounds

One of the strengths of this kind of qualitative research design is that its flexibility enabled more depth in key areas such as child-led activities, spontaneous play, and choices made. The project can change if circumstances demonstrate that a pre-designed aspect of the study is less appropriate than initially thought. By allowing the framework of each session to move, or to disappear on occasions, the children were given more, and independent space to musically voice preferences. In addition, I could refer to the musical framework as outlined on p.12.

Places of study

Cathnor Children's centre

Music making within a structured and moveable framework

Cathnor children's centre is a state funded site providing activities and support for families with children from newborn to five years old. Seven children between 2 and 5 years old (pp.ix) participated with two children (2 years and 10 months respectively) having normal hearing. Four children had CI's in one or two ears. All but one child had at least one CI put in at diagnosis of hearing deficiency at between 15 months and 2 years old. All the children had at least one parent in attendance throughout. The centre provided two key workers who attended all the sessions.

Each session was a maximum of 30 minutes in duration and took place just after lunch. I then remained to observe any spontaneous musical play, and to converse with key adults. The Cathnor group knew me as their regular music teacher, and they were enthusiastic about the idea of 'filming' some sessions ("ooh!" and lots of waves by Katy). The children were encouraged by myself as the researcher/teacher to see themselves on video, and were clearly used to having one as part of their home life (family videos etc, as testified by conversations with parents). The video remained in a fixed place and at no time did the children appear to be uncomfortable with its presence. On one occasion Sami picked up the video and pretended to video the group with obvious enjoyment, before putting it aside (Hutchinson, 2011:CJ). I offered the group a copy of the video recording once the research study was completed. This was acknowledged positively.

These sessions were seen as a continuation of weekly sessions, but with the addition of different instruments being brought in, and the framework that shifted and evolved over the course of six weeks. The environment was bright and cheerful, with a central mat on top of a wooden floor used to bring children and adults together in musical activities. There were various soft toys and books in the same room, and these were put away prior to the music sessions.

Exeter Pre-School

Music making within a structured and moveable framework

This nursery is parent funded and part supported by the academy. Two children with profound hearing loss participated in the six week, 30 minute music sessions at the Pre-School, together with at least nine hearing children. Oli is profoundly deaf and wears CI's. Sash has cytomegalovivus (pp.v) and cerebral palsy affecting her right side movement. She also had global developmental delay (pp.v) is profoundly deaf, and wears CI's in both ears. Sash had a Special Educational Needs (SEN:pp.vi) teacher with her throughout each music session. Each session was a maximum of 30 minutes and took place mid-morning.

I had not worked with this nursery before and gave the nursery two trial sessions, the results of which were positive since the children demonstrated enthusiasm for more. The staff was supportive and at least one participated each week. The SEN teacher for both deaf children was present, however neither were

consistent, and supply replacement meant that engagement on the part of the adult was sometimes haphazard.

The environment was also bright and cheerful and the room carpeted throughout. There was a lot of nursery furniture around, so the space we used was in a corner, surrounded by cushions. We also moved around the nursery space when appropriate. Data was recorded through the use of a video camera and as with Cathnor, I placed emphasis on showing the children the video, and allowing each one to 'play' and to touch it. There was no apparent negativity demonstrated in the use of the video recorder. The deputy head teacher commented on parents using their own video recorders frequently, so the children were comfortable with it being present. I offered a copy to the Pre-School once the study was completed, and the staff and children were enthusiastic about this idea.

Vanessa nursery
Unstructured sound making with no adult participation
Vanessa is a state funded, mainstream nursery school with 45 registered places. Jonny was the only deaf child at the nursery at the time of this study. As a former participant of music sessions with Cathor, he was comfortable in my presence and I was able to observe him in musical free-play with 8 playmates. Jonny had an SEN (pp.vi) support worker called Emma, who was supportive of this research, and helped me to document any responses through jottings. We discussed different ways of approaching musical play and agreed on an outdoor and indoor space to offer musical time. Musical instruments were chosen for their specific sounds and/or way of playing each week.

Week 1 Glockenspiels
Week 2 Drums - a variety of sizes
Week 3 Whistles
Week 4 A variety of tuned and un-tuned instruments

The total number of free musical play observed was four. All four sessions were documented through rough jottings and later transferred to computer copy.

At home
Unstructured sound making with no adult participation
Erna's home was warm and homely. Musical free-play took place in the sitting room. Erna and Audi (pp.x-xiii) were observed with Erna's two hearing siblings (2 and 9 years old respectively). A variety of instruments (un-tuned and tuned) were available for exploration:

Blowing instruments - cornet, penny whistle, fife
Tuned - Chimes, glockenspiels, ukulele
Un-tuned - a variety of beaters, shakers and scrapers (pp.v-vi).

I observed from a corner of the room, jotting specific responses, with the video camera running throughout (fixed in one place). These children participated in the Cathnor group, so were used to the video being present. It is notable that all four environments were safe, familiar, light and cheerful spaces for musical activities to take place in. Trovesi comments on the importance of the environment in supporting deaf children - 'success or failure depended on the child's environment' (Trovesi, 2008). This research was also as much about observing parental engagement where possible, as well as the children's environment.

Making sounds – children's responses to pitch

How did these deaf children respond to the pitched instruments presented? We may refer to pitching complexities where users of CI's hear a melody, but struggle to repeat the melody at the same pitch. Katy is aurally pitching approximately a fourth below the same melody heard played by a B flat trumpet, but with the interval between two notes being correct to what she heard at a minor third (Hutchinson, 2011:C1a). Is this response as a result of auditory input or vocal ability? Or perhaps Katy is simply not yet ready to imitate pitch.

Methods such as Kodaly advocates pitch placement as a priority for beautiful singing. Other singing methods would encourage pitching to occur at a child's individual developmental pace. Claus Bang writes 'the major third...is the interval most easily remembered by hearing impaired pupils' (Bang, 2008:129). If this is the case then the pitched notes that Katy heard could be reflected in her understanding and ease at imitating, yet auditory (CI's) support hears it differently.

In the same example I examine Katy's response on video. She demonstrated a clear understanding of the melodic question, the shape of the melody, with confidence in her timing and vocalisation. Her melodic confidence has been supported by the fitting of a CI at an early age (pp.xi-xii), since she showed no sign of anxiety in 'tuning in' to what she musically heard, unlike earlier example of deafened adults struggling to adjust to new implants. Oxenham suggests that pitch is important for speech and music perception, and may 'also play a crucial role in our ability to segregate sounds that arrive from different sources' (2008).

Another recipient of this study called Sami (pp.xi) is observed spontaneously making sounds. Or perhaps is she responding as a result of the trumpet sound (Hutchinson, 2011:C2a). She could even be 'talking to us' since her vocal clarity is poor. Are we looking at a more primitive form of spontaneous singing (BjØkvold, 1992), or is Sami compelled to vocalise as a result of what she thought she heard? Sami sings, "oohheeee?" As a recent recipient of CI transplantation, Sami's birdlike response is a significant step forward from her usual vocal silence. 'This type of song, with its fanciful glissandi, micro-intervals and free rhythms is quite different from what we adults traditionally identify as song' (BjØkvold,1992:68).

Composition in pitching

Within a home environment I observed Katy vocally 'playing around' with "if you're happy and you know it clap your hands" – a well known British children's song (Hutchinson, 2011:H). Katy has taken this song and made it all her own. I note that Katy knows the song well. Katy is playing a ukulele – strumming it in time to singing, and moving also. Her singing is synonymous with playing and moving. Katy's pitching of the melody is - to a music purist - 'all over the place'. But the repeat strumming and subsequent regular beat, the singing and, moves all makes perfect sense to Katy. Katy's range of pitching is notably awesome since she sings from a high note to an octave below.

Examples of interval-based songs a dominant interval such as a major third is demonstrated again, in a welcome tune ("hello Sami" using soh, mi, soh soh, mi) played by myself on the trumpet to Sami, encouraged singsong, not just from Sami, but also from the others. Further evidence was noted (Hutchinson, 2011:CJ) in the use of 2 chime bars (Alexi) with a major third interval being used in response to a sung melody. He heard and responded, but without vocalising. Alexi was engaged in linear focus where he responded using just one sense (touch).

I sang a welcome song ("sing hello to…") using the guitar as an accompaniment. No children sang apart from Audi who recognised the song from the vocal sounds, after it was repeated without the guitar. This song was in the format of "doh doh doh re mi, doh". Was it the closeness of the note intervals or the guitar a problem in melodic recognition? Perhaps the contextual harmonies (or multi-layering) made this difficult.

In another example of response noted with the same welcome song, Sami responded to the trumpet's rendition of 'sing hello to…' by patting her knees exactly in time to the melody just played (Hutchinson, 2011:C1b). In this example we could be experiencing internal, or physical singing of the song since her vocality at that time was poor.

Musical development through melodic experiences

All the Cathnor children had at least one parent throughout the 6 weeks, unlike at the Pre-School where the ratio of child to adult was approximately 1 - 5; apart from with Sash and Oli. Parental input with the Cathnor group repeatedly demonstrated positive impact on child participation. Together they sang, danced, and were tactile with their child who in turn imitated, were able to remember through parental interaction. The children wanted to join in since their parent was seen to be having a good time, and they wanted to be part of this.

Katy (from Cathnor) was diagnosed as profoundly deaf as a baby (pp.ix). She has had support from SLHC, AVUK (Auditory Verbal UK (pp.v), music with The Music House for Children (pp.vi) and pro-active parents. I played the “hello” song on the French horn, again consisting of 3 notes - doh, re, mi (from mid-B flat) in dotted rhythm (Hutchinson, 2011:CJ). This melody was played twice, after which Katy responded, “its the hello song". I then sing, “donkey, donkey, where are you?" Katy responds, “Here I am”. I then play the same tune on the trumpet. Katy responds by singing “here I am” (Hutchinson, DVD:C1c). Katy has demonstrated three key skills:

Hearing and recognising an instrument with different frequency ranges
Responding musically
Being confident

Katy's musical experience has prompted musical speech. Musical speech is essentially singing - or are we trying to encourage Katy to speak? We note as before, Katy’s vocal pitching is not the same as the pitched melody played. Is pitching the main focus of singing, we are perhaps observing vocal responses again, at her pace. Her response "here I am" musically imitates the interval what she has apparently heard - but not at the correct pitch. Kodaly advocates appropriate musical experiences for young children, focusing on pitching, - always playfully directing a young child’s singing voice towards a chosen pitch. ‘The child must be taught to hear and reproduce the starting pitch accurately’ (Forrai,1998). But perhaps it is enough that a deafened child responses orally, without the musical perfection as well. Undue pressure to achieve musically may have restrained other deaf and hearing children’s desire to vocalise. Creating vocal sounds with sounds through instrumental play - whether in listening (to me play) or self-initiated, is spontaneous and fun. Orff comments that instruments are a significant part of assisting communication (Orff cited by Salmon, 2008). I would suggest that Katy is also developing her aesthetic musicality.

The majority of all young participants were users of CI’s and most had little speech ability. Over the study period of six weeks snippets of singing and vocal utterances were noted. Any musical experiences could therefore be supporting the development of speech and language prior to the acquisition of this skill ((BjØkvold, 1992).

Graham suggests that the openings for cochlear implantation ‘shut down completely after 13 years old'. “Neural pathways close because they are not used". He also comments “...the ability of plasticity within the cochlear is far greater when younger.” (Hutchinson, 2011: RNTNE). By offering early musical experiences such as specific instrumental sounds, we could be helping to keep musical pathways open, and assisting with strengthening and fine-tuning of hearing residue that young deaf children may have. Neural pathways discussed by Braun and Bock refers to the early input of experiences to develop functional ability (Braun and Bock, 2008:33-4).

Out of the 9 deaf children attending regular music sessions throughout this study the children demonstrating vocal response more frequently were those who had CI's as babies. Notable too, was the positive influence of parental support. However, despite being a later CI user Katy's diction was markedly clearer then others in the Cathnor group. Unlike statistics in CI studies as earlier mentioned, her later implantation did not appear to prevent vocal response or active participation. Katy's responses suggests to me that together with supporting technology, the right environment and positive parental input she feels and sings the music as it happens, with confidence and joy.

Moving in response to pitch based sounds appears to help ‘track’ the different pitch based sounds, out of which vocality can happen. Equally, within a positive environment children can feel empowered. They are able to ‘have a go’ without peer restriction, or feel that they are about to ‘do something wrong’. Observing utterance as a result of movement is often unconscious and joyful. Bang is right when he states (as does Dalcroze in much of his writings) ‘Music and movement are inseparable’ Bang C (2008).

Movement with music, and music with movement

When exploring evidence of responses I noticed different sounds encouraging physical responses that were clearly musical. I examined a video clip with Oli from the Pre-School (Hutchinson,2011:PS4b). There is clear leadership and turn-taking patterns taking place as a result of a self-initiated idea. Oli is profoundly deaf (pp.ix) with CI's in both ears. Bet, aged 4 years has full hearing ability. Oli sits next to Bet. Oli has a large tambour drum. Bet has a G and E chime bar with one beater. I encourage a 'stop and start' activity where the group plays and then stops.

Oli and Bet do not look at each other. Although Bet is a vocal child, neither Oli, nor Bet makes any vocal sounds. They are both focused on their instrument and responding to a 'conductor' (Hutchinson, 2011:PS4c). They appear to be randomly playing and stopping, however on closer inspection I notice that they are playing together, and in response to each other (Hutchinson, 2011:PS4d). They play a duet, stop, wait a moment, and then its Oli's turn - or perhaps he wants to 'catch the music'.

Oli then discards his drum and chooses a large ocean drum. He continues to strike with the same physical intensity as before. Oli does not shake this, evidently preferring the tactile striking approach. He then pushes the ocean drum like a wheel uttering "aaaaaaheay" for as long as the drum rolls (Hutchinson, 2011:PS4e). A little later, Bet puts her chimes to one side (Hutchinson, 2011:PS4f) uttering something like "yeeerisayt."

These children's physical responses collate to Young's comments on 'expressive, inventive forms of playful singing' or 'vocalising' (Young, 2002:82) by way of exploring spontaneous sound making that is neither structured, nor adult taught (as with singing or 'appropriate' speaking according to a specific culture). Oli and Bet are demonstrating a clear parallel of responses in

i/ A deaf child who is mainly non-verbal and
ii/ A chatty, hearing child

They are both creating sounds as a result of moving their instrument away. I suggest that this demonstrates linear focus – or 'one line' – engagement. The linear focal point for both children is their respective instrument. The later vocal sounds are uttered as a result of movement. When a 'linear' focus comes to an end I observe both children moving on. Bet puts her chimes to one side. Oli's eyes follow (another sensory aspect at play) the direction of the drum. Bet leaps up from a seated position. Deafness and full hearing appears not to change this instinctive and sensory driven activity.

Logan looks at building 'on the success in the speech recognition community by investigating how applicable it is to use the dominant features for modeling speech to model music.' (Logan; 2000:8). In Oli's activity are we observing his responses to his cochlear implants, or was his vocal utterance as a result

of moving? The earlier samples could suggest that Oli's movement elicited a specific response, rather then what he heard. Their musical free-play indicates that there are several sensory elements at play, and all are relevant to feed off, and to help to engage the other. Oli's voice in this respect appears to be his body.

Young writes of a similar example of shared musical composition with a set of bongo drums and two children (Young, 2009:99). The difference is the children are both hearing. However, responses appear to be similar. Communication is not just vocally, but by look, by movement, by feeling (Oli banging, Bet beating). It is possible that sound vibration too, compelled the next activity and focus.

The significance of body responses to the sounds heard was evidenced more and more, as the study evolved, and was analysed. Most sounds made would result in a physical response. Moog (1976) discusses sensory perception in musical experience. I suggest that if we hear, we see, we understand. If we don't hear, do we therefore see, then hear in order to understand? I note Sash's actions with the jumping activity (Hutchinson, 2011:PS6d). There are parallels in Sami, Jonny, Katy and Oli's responses at other times, as they move in an apparent reaffirmation of what they have seen, maybe linking sounds heard with it's locality, to enable their own responses with confidence.

These children would also move before a sound was made. The perception of experiences of sounds could refer to Edwards and Hodges idea that 'the act of making music is so intensely physical'...'the sensorimotor cortex is responsible for interpreting incoming sensory information and controlling the muscles throughout the body' (Edwards and Hodges, 2008).

Responding to rhythm or melody?

I now look at the combinations of different musical aspects to see if deaf children are responding to a specific musical idea. Claus Bang in his work with music therapy refers to music and movement being 'inseparable' (Bang, 1980). In his study of music and deaf children he also writes of 'infants recognising the melodic element before they catch the rhythmic structure of the song. Deaf children are no exception'. However, I noted differing responses with Sash (in the Pre-School group) to melodic recognition since her rhythmic responses seemed to be more prominent. Sash has two CI's (pp.ix) and, according to her nursery teacher and key worker, one is ineffective. Movement in her legs and arms are restricted. During this research I noted several moments of rhythmic, not melodic responses by Sash to musical sounds from:

A large tambour drum
A trumpet
A cornet
General bead based wooden shakers - calabash (origin Africa), bento and kamira shakers (origin Bali).

Sash is hovering near the group ready to march to "The Grand old Duke of York" (Hutchinson, 2011:PSJ). When I played an elongated G (mid-range) on the trumpet Sash's right knee went up in the air, then down together as I began the song. Sash was bended her arms up and down in time to a strong beat. In her response Sash has demonstrated instinctive movement to rhythmic waves of sound penetrating the air - she had a 'musical waves' experience with lines of sound. I refer to this as a 'sound wave express train', since the impact on Sash was so immediate. There was however, no evidence of melodic recognition noted.

Another example of melody compelling physical response took place with the Cathnor group. I observed the group playing un-tuned percussion instruments together me on the trumpet. I played "A ram sam sam", a Moroccan children's song (Hutchinson, 2011:C2c). Katy gets up and begins to dance. She moves her fists, and crosses her legs. Then she dances before stopping in a shape at the end of the melody. She keeps very still, with her hands splayed out in front. This is repeated with the trumpet. Then Katy cries, "GO" in a deep and meaningful tone. She now moves her torso in a syncopated rhythm. Whether or not she recognises Katy is moving rhythmically, and in syncopation, and is 'with' the music. I then follow Katy with her trumpet (Hutchinson,2011:C2c) - Katy's sense of beat is strong and her legs and arms create wild, syncopated shapes.

Here, we see another line within the melodic line - the rhythmic and movement line - a sort of musical multi-layering. The emotive line came through clearly since Katy's command was deeper then her normal vocal pitch. She was in charge, and was passionate. The need for Katy's existing 'musical lines ' to continue in motion to sounds heard was crucial in order to achieve a sense of completion. It is notable that Katy's character is one that does not dwell on showing off, but demonstrates an innate confidence to do as she

wished. Katy was given the space and time to do so, with spontaneous cheering sounds from the surprised and delighted adults.

Jaques-Dalcroze talks of the 'two fundamental elements of rhythm, space and time, as inseparable' (Dalcroze,1921). In this case, Katy was given all of this. Are we observing an instinctive response to a melody, or the rhythmic element of the music which 'reaches Katy's body' before her ears catch the tune? The trumpet has a resonant, and sometimes abrasive tone. In this example Katy is not looking at the trumpet. Her body is in full swing. As Dalcroze suggests, rhythm is essentially physical…'(Flohr, 2005:99). Whether or not Katy has heard the trumpet piece in its entirety, the rhythmic element of the trumpet piece has penetrated a space around Katy – enough for her to be upstanding and moving – unlike the rest of the group who are seated.

Responses to sounds through play

Moving away from the framework encouraged resulted in the emerging power of play through a musical idea that presented itself spontaneously, as the framework became more relaxed, or 'taken over' by the children. During a session at the pre-school, the framework was dismantled unexpectedly since the group decided to jump from a climbing frame using the trumpet sound. Sash observes her classmates up onto the small climbing frame. Each takes in turn to jump to the floor with the trumpet playing following the movement of the jump with a high to a low note.

Each note is played on the motion of the jump and on the landing action. Thus, the first note was as long as the child waited to jump. Sash 'boinged' her knees down and up straight after a classmate jumps with the trumpet (Hutchinson, 2011:PS6a). As the trumpet moved up in pitch, her hands moved around, her body bent down, and finally, her hands rolled around (Hutchinson, 2011:PS6b). Throughout this video example Sash made no vocal or instrumental sound. Yet there are musical nuances bursting out of her.

Sash is both melodious and rhythmic. We know that children love to learn through play - whether or not they are hearing impaired. ...'play is the oldest form of learning'... (Braun and Bock, 2008:41). We can attune Sash's musical responses to functional brain imaging which 'engages observer's 'active, conscious interest in spite of the enforced immobility of the situation...'(Flohr and Trevarthen, 2008:69). Sash saw her classmates jumping. She may have 'felt' the trumpet sounds and felt part of the activity. In the doing of the activity she then became an active participant throughout - despite severe disability (pp.xiii).

Dalcroze comments 'Rhythm plays as important a part in music as sound...the ability to induce a love of music even in those for whom its sound has little meaning...they will like it for the very experience of movement which it reinforces, and because, for them, movement is a natural and familiar thing' (Dalcroze, cited in Bachmann,1991).

According to Sash's key worker (Hutchinson, 2011:PSJ) Sash is engaging rhythmically because she wants to. She saw, was interested and participated. During another instrumental activity one child was the 'conductor'. The others played a variety of ethnic shakers (Instruments:vii-viii). Sash held a large, Balinese egg shaker in both hands (Hutchinson, 2011:PS6c). Sash demonstrated enjoyment by clutching her egg shaker (tactile - feeling the beads moving inside), moving (sensory motion - beating the egg on her chest, perhaps to feel the movement of the beads), stopping (visual) and then shaking again (memory recall).

Here, rhythm, beat and physical motion are all engaged – with the chosen instruments creating enjoyment. Sash's responses to these different types of sound – from high to low, using singular pitched sounds to multi-shaker sounds, suggests that in participating, she feels a sense of musical whole. I note that her body seems to be the listening and responding tool, and her actions are giving us clear signs of emotive pleasure.

Logan states ‘music like speech, is non-stationary’ (Logan, 2000:4). If we add physical movement to create sounds with a variety of instruments, then sound making is impossible without movement. Deaf children and hearing children are alike in this respect, although later examples demonstrated from other deaf children indicates powerful use of movement which compels instrumental sounds, or the utterance of sound (vocal).

There is a moment when the Pre-School teacher communicates with one of the hearing children (Sam) in sign language. Sam wants the drum. The teacher signs that he can ‘have a go’ with the chime bar and then it will be his turn. Sam agrees (without vocalising) and takes the chime. Bet is continuing to play the drum and Oli parps a horn. This example of musical play shows mutual and shared communication and sound making with a seemingly unrefined array of noises and children – only one of which is profoundly deaf (Oli). Yet, there are infinite harmonies and ‘orchestral-like’ responses within which Oli is focused and engaged, and the others are too.

Which child’s sounds are more prominent? Is Oli responding to what he hears or what he is doing? Sam and Bet (both hearing) are as comfortable with signing as with aural or musical communication. In awakening all the senses through instrumental play deaf and hearing children are able to musically engage.

Spontaneous music and sound play, and what we can discover.

When families provide planned musical experiences for young children, the motives for musical activities is not always about active learning, but more on enjoyment and a shared, happy experience for the group. Examples of planned musical activities may include a concert or musical outing. By allowing spontaneous musical play and subsequent responses, practitioners and specialists are often given clues to support aural development and communication.

For the same reasons as relaxing a framework in order to assess child-led responses, I established non-adult intervention by observing just one deaf child making musical choices with a variety of instruments to see how sound responses would evolve. Jonny wears bi-lateral hearing aids in both ears (pp.ix). In the familiar environment of his nursery I chose a range of tactile instruments (pp.vii-viii) including bigger items such as ocean drum, cornet and whistle, and place them randomly in three of the following spaces over a period of 4 weeks:

a/On a carpeted space within the nursery space
b/ On a rubber mat on the ground outside (Weather permitting)
c/ In a separate and small nursery room on the lino covered floor

Jonny has had private speech sessions, literacy and aural sessions at the SHLC and the RNTNH. All sessions have been adult led. Jonny was comfortable with musical exploration as explained by his SEN teacher. He was happy to participate with his new friends (he began at the nursery in January 2011) - all of whom were hearing.

Jonny's SEN teacher commented on Jon's struggle to communicate with his contemporaries. He preferred to be in charge. She and I jotted Jonny's responses to different instruments. I did not use a video recorder since there were too many children around to make this possible. During musical play Jonny's playmates chose instruments and made lots of random sounds, ignoring Jonny completely. This was foreign to Jonny's carefully orchestrated 'other', one to one and specialist activities with adults. Here we observe:

'Jonny puts his head on the drum. Then he takes his head off the drum and beats it. He then beats the drum in time with his friend's drums. He lies down on top of his drum whilst his friends are beating their drum. Jonny shouts "Stop". No one stops. Jonny scream's, "stop". His friends continue with a cacophony of drum beating. Then Jonny is tactile with the skin of the drum. He touches it, then plays it whilst feeling it's beat with his tummy still on top of the drum' (Hutchinson, 2011:CJ).

Jonny's response is physical. Despite, or perhaps because of his friends' apparent disinterest in him, Jonny is finding new pathways in the 'Me'. Through the drum sounds made with his friends, he makes deep bass

sounds - to himself, and to nobody else. He continues to do so in a rhythmical, regular beating pattern. His physical motion now appears to feed his musical desire. This is further is noted with 'Jonny singing "la, la, eee eye, ee, ah" (up and down in pitch) as he plays the ocean drum. He seems to be fascinated by the beads slowly moving as he moves the drum. He watches, and makes them move more slowly.'

Jonny's action refers to Young's exploration of spontaneous singing as part of everyday life where singing is 'expressive, and impossible to pin down, or to put into a structural frame' (Young, 2003). Jonny is watching, hearing, feeling and doing simultaneously. Does he enjoy musical experiences because of the engagement of all three senses? As with Oli, Katy and Sash, the trio engagement appears to be inseparable. Later, we note a change in Jonny's mood:

'He picks up a recorder and blows it really hard, making a high, squeaky sound. He discards the recorder, bangs the cowbell (high, 'dingy' sounds), then shakes a maraca ('shhs shhh shhh'). Now he tries the chimes (a G and C pitched resonance). Finally he picks up the triangle before discarding it (no sound at all).' (Hutchinson:VJ)

He appears to be restless and then picks up the cornet and blows a loud, mid-range note. Still, no-one pays attention - they are still all too busy exploring their own instrument. His teacher and I observed Jonny's physical changes in the use of such a wide variety of instrumental sound making. He is clearly empowered by his experiences of choosing, playing and disregarding instruments, but now he wants his friends to pay attention. He is aware that loud sounds (drum bashing and cornet blowing) had not commanded attention.

'Musical experience is an immensely rich sensory, physical and personal experience which relies on many more components than on hearing.' (Altenmueller, 2008:242)

Sound preferences

Jonny's interest in the ocean drum was different to his interest in other instruments. The ocean drum was a way of communicating to - himself. On the other hand, Sami used the trumpet as her communicator (Hutchinson, 2011:C2d). She appeared to like the trumpet since it's sounds absorbed her, and provoked response. I played it quietly, with the bell pointing downwards, with little movement. Sami is quiet, head to one side, listening, waiting. Without a change in movement, I then played quick, repeated notes at a higher pitch. Sami is immediately alert, playing her claves quickly, but not in time. Her association with the trumpet is absolute – she is comfortable and happy. Her chosen instruments with its regular, high-pitched clicking sound empowers Sami and she is able to enjoy a new skill, and to share her knowledge of sound transformation with the group.

The ability to be tactile in using instruments, and to make their own sounds, choose their own instruments gives parents and key workers different layers of information in how deaf children can perceive and be empowered by sounds. Alexi (Cathnor group) family is bi-lingual and he is moderately deaf (pp.x-xi).

Unlike his negative response with the guitar; when I played the cornet Alexi sat still and watched. He is demonstrating preferences for different sounds that potentially influenced his ability to decipher, and to enjoy other sounds. His speech therapist recommended that learning support should include familiar and quiet spaces (pp.x-xi). Braun and Bock comment that "the auditory system develops earlier than the visual system, but also at a slower rate since, due to its continuous improvement in detecting and distinguishing language signals it is critically involved in the process of speech learning and, related to this, later in development also for learning to read and write" (Braun and Bock, 2008:34).

This theory correlates to Alexi's experience and preferences of different instrumental sounds since they help to fine-tune aural detection of nuances and sound textures, and in turn may support later acquisition in learning two languages. As with Sami, Elle and Veronike, the different responses in children from bi-lingual families can provide information to therapists, families and educators to support additional vocal challenges. However, what of the musical engagement since he appears throughout, to be passive and reluctant to engage? There is no doubt that Alexi is observing and according to his mother, 'he loves music, and enjoys making it at home'.

Space and time

Alexi, like so many children need space and time to develop musical opportunities and subsequent ability. In this respect I note that the primary focus of musical engagement by the participants in all groups appears to be no different from hearing children. By offering them time and space to explore, with key materials and a brief interjection of adult-led guidance, the children take on owner-ship of music and make it their own. The example video clip captures this in abundance as well the exuberance of parental and sibling engagement (Hutchinson, 2011:C2b). Gruhn talks of time as a key to engagement - '...sensory and motor systems are gradually optimised through life experience and learning' (Gruhn and Rauscher, 2008:28).

They are clearly not talking about a 'rushed job'. The normal channels of aural training such as therapy, one to one learning, adult led activities (Jonny, Alexi) are established to support communication and vocalisation over time. Sound exploration offers another area of life enrichment. Offering these children space, time and musical tools to do this, can provide more holistic avenues of information involving personality, confidence, opinion (making choices) and relationship building.

Parental engagement

The exploration of space and time moves me onto significant adults who allow for the possibility of musical play. Musical engagement is as much about parent encouragement and participation, as spontaneous play. Tuning into sounds, language and music is influenced by personality and experiences (musical), and in turn are supported by their key adults. Positive, life-enriching response is about immersing parents happily into their deaf child's activity. Young children naturally wish to emulate their parents (observe Sami and her mother in Hutchinson, 2011:C2d) since information comes from their immediate surroundings out of which they imitate what makes them happy, confident, secure, and safe. Musically too, 'when a parent and child are engaged in rhythmic music making the musical elements of pitch, rhythm and dynamic energy are in play' (Flohr and Trevarthen, 2008:73). Deaf children's parents in particular should be encouraged since communicative skills can be developed.

Dornan discusses the importance of family involvement, demonstrating 'positive language outcomes in children with hearing loss' (Dornan, 2010:64). We note parental influence too, with Alexi and his mother (Hutchinson, 2011:C2e). In the same example we note all the parents are musically participating - this was evidenced throughout this research. 'Music can also provide profound motivation for positive behaviour and can become a means for developing positive self-image' (Altenmueller, 2008:243). In the Cathnor group, music is an approved and positive activity as translated by the child directly from their parent.

Moving to instruments and sounds - whose turn is it?

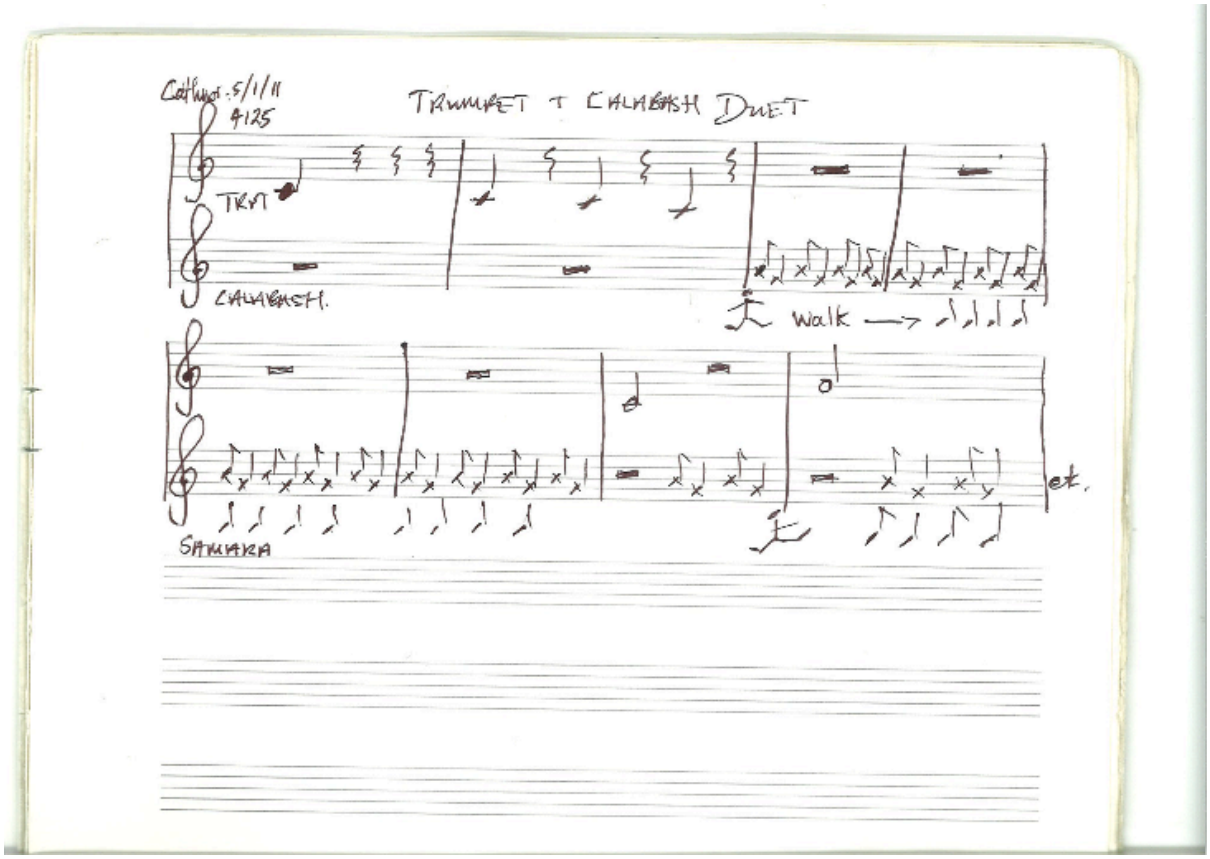
By using a wide variety of instruments these children were able to move freely within a semi-structured framework. As the leader I had a go, then a child took over. No instruction was given. The transition from facilitator to child was allowed to happen without vocal interruption (Hutchinson, 2011:C5a).

By enabling, there was no dispute over "your turn, my turn" or "now we change, now we do this, now we do that…" The musical flow was fluid, and spontaneous sounds emerged – not just from a child's voice, but from the actions and sounds from the instruments they had. The sensory system is highly sensitive to the environment - 'Dalcroze identified the body as the first instrument to be trained in music'. (Flohr, 2005:98). Their environment included things in it; and in this case, instruments.

Sami interrupted the session's framework to explore the large drum. She banged it, moved it, lifted it up and listens to it (with an ear close). Then she puts it down (Hutchinson, 2011:C1d). We allowed her to do this, and went with her. Without Sami's input the sounds do not happen. Sami has worked this out and realises that the drum can make different sounds - if she is in charge. I modified the framework to allow space and time for each child's spontaneous musicality to emerge. The environment has been shifted from the perceived 'music space' to another involving interesting props (Hutchinson, 2011:PSJ)

Shared leadership

When instruments are moved, or are still, a composition can emerge. At Cathnor Katy is blowing and making a sound on the trumpet. Her body is still; her sound is strong and clear. Meanwhile, Sami has the calabash and as she shakes it, making a pleasing seed "shh
shaa, shh shaa" sound. Sami also skips in time. (Hutchinson, 2011:C1e). The merging of the senses (physical, feeling, visuals – seeing what the seeds do) creates a musical activity between two players- albeit in this case unconsciously. The composition here is what transpired – note how there are three parts – calabash, trumpet and body movement:



Music or sound making is undoubtedly made through physical and visual spontaneity. By facilitating a space, some good instruments and a positive ethos, the groups have blossomed musically, vocally and shown social skills such as leadership, turn taking and bravery (trying something new).

What the research and data found

Many times during this research project I noticed that music was 'seen'. The responses from individuals often had no sound, just a profound sense of musicality. ‘Are there ever moments of real silence?” (Young, 2009:60). In this research project I saw many moments, but these moments had to be enabled as demonstrated. They had to be nurtured by allowing space and time for those moments to occur. By analysing the responses of deaf children to live instrumental sounds through this research I saw evidence as the tip of a melting iceberg, underneath which many new avenues are waiting to be explored and discovered:-

In this respect research and development of musical programmes for deaf children should account for emotive, physical and visual responses made by young children in their experiences with particular sounds, and should involve much more then just vocalising. We have looked at how deaf children respond physically, visually and musically. CI's and hearing aids have shown remarkable 'switch on' responses in deaf people. However, a simultaneous contribution of joyful musical experiences induces a dopamine kick that can help stressful or unknown situations to transfer into positive challenges (Braun and Bock, 2008). It can also combine the efforts of technological advancement with aesthetic musical understanding.

Conclusion

Yennari suggests that ‘new studies are emerging to see evidence of musical learning as a positive way of supporting and developing perception of musical communication, together with the new hybrid cochlear implant involving transmitting sound signals using electronic and acoustic stimulation’ (Yennari, 2010). I can conclude that the children (most of whom had CI's) participating in this study demonstrated preferences for particular sounds. They made choices in preferred instruments, and used them to create musical moments in:

Vocalising
Physically moving
Instrumental exploration

Simultaneously these musical moments were supported by

The environment
The people around
The materials used (props including un-tuned instruments, donkey puppets, scarves etc.)

This research has exposed a depth of musical perception in young deaf children that goes beyond hearing. Deaf children cannot hear sounds in the same way that hearing children can (Dornan, 2011). However physical responses observed from this research - from what they saw, felt and heard – were musical. As an observer I ‘heard’ musical sounds as a result of these deaf children's movement - 'she sings what her hand is doing' (Bjøkvold,1992:64). In a deaf child's silence, whether it is vocal silence or instrumental silence, there is undoubtedly sound. Further research of sound in movement, and music in silence would for me, be a natural progression to this research since it could help to define more of what constitutes a musical world in young children. I noted parallels between movement and sound that for the most part - in deaf and hearing children - could not be separated. From this research I can state that a component of influences defines' deaf children's responses to different instrumental sounds.

A key element of this research that emerged was how significant adults and other children influenced responses to different sounds heard, and the influence of their immediate environment. Being deaf did not necessarily restrict musical responses and with the support of quality instruments to explore sounds, musical self-discovery was made by the deaf child, and their parents together.

This confirms to me that the aural system is only one tool of many in a child's experience of musical sounds. Frequent references in this research have been made to physical responses. Are we hearing through our bodies as well as our ears? Perhaps - and more radically - should we be looking to what we

wear to discover whether our body's ability to absorb and decipher sounds is restricted? 'A child's 'whole body functions as an expressive instrument' (BjØkvold 1992:85).

Alexi is making his own music through his body. His head slant's, his foot moves sideways, and then he bends his knees. He sees, he feels, he hears, he responds (Hutchinson, 2011:C5b). Perhaps we need to look towards the 'every-sense' since - this much I saw - hearing is just a small part of a deaf child's response to instrumental sounds.

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Appendices

All data collated
Hearing reports for all participants on DVD, 2011
Hutchinson, E; (2011). Interview with Farnhill, J. Head, Exeter Academy for the Deaf. UK:EAD

Hutchinson, E; (2011). Recording with Graham, J. (Honorary Consultant Otolaryngologist), Meerton, L. (Clinical Scientist, Audiology), Vickers, D, Dr. The Royal National Throat, Nose and Ear Hospital), London UK: RNTNE

Hutchinson, E; (2011). Cathnor group. Notes from own jottings:CJ

Hutchinson, E; (2011). Pre-School group. Notes from own jottings:PSJ

Hutchinson, E; (2011). Vanessa child. Notes from own jottings:VJ

Hutchinson, E; (2011), Cathnor session 1. DVD, AppleMac:C1a-f

Hutchinson, E; (2011). Cathnor session 2. DVD, AppleMac:C2a-e

Hutchinson, E; (2011). Cathnor session 5. DVD, AppleMac:C5a-b

Hutchinson, E; (2011). Home session. DVD, AppleMac:H

Hutchinson, E; (2011). Pre-School session 4. DVD, AppleMac:PS4a-f

Hutchinson, E; (2011). Pre-School session 6. DVD, AppleMac:PS6a-d