

MUSICAL HYDROTHERAPY

Joel Cahen

with case study by Hannah Newman

Abstract

Liquid Vibrations was formed as a continuation of the underwater sound art concert series by Joel Cahen called Wet Sounds, which began touring UK pools in 2008. Adèle Drake, founder and former CEO of Drake Music in the UK, had made the connection between the properties of underwater sound perception and the potential benefits this could have on children with special and complex needs and together with Joel Cahen they began setting up the organisation in 2009.

Having set up as a charity in 2013, Liquid Vibrations has been providing training in Musical Hydrotherapy to staff at special needs schools. The combination of the benefits of hydrotherapy combined with music therapy and underwater listening has been researched in collaboration with Roehampton University and Kent University. The lack of verbalisation that most of the participants exhibit creates difficulties in fully assessing the effect the sessions on their well-being, hence the team has conducted careful observations in each of the sessions provided since 2010 by filming the activity with two or more cameras; interviewing the carers, the headmaster and the children themselves where possible; and sending out feedback forms to the parents.

The questions that guided the research were: Do the listening sessions affect a positive change in the participants' movement and awareness? Is there a discernable progression throughout the sessions? Do the sessions contribute to the development of meaningful communication and interaction with their surroundings?

This chapter will look at an analysis of the listening experience, a necessary consideration of all practice based in music and sound and is the conceptual background of Musical Hydrotherapy practice. It will then describe the aims and motivations behind Musical Hydrotherapy and how Liquid Vibrations achieves them. The chapter ends with a case study by Hannah Newman of Kent University. UK.

Introduction

Liquid Vibrations is a charity organisation that engages the children and young people with special and complex needs in listening through the medium of water facilitated by aquatic body therapy in hydrotherapy pools. Underwater speakers are placed inside the pool and sound is heard through them when any part of the head is placed in the water. Additionally vibrations can be felt in the body when it is in certain proximity to the speaker.

The properties of sound in water greatly affect the work.

Sound travels 4.5 time faster in water than in air (Etter, 2013), this changes the perception of directionality. The difference of the arrival time of the sound between the two ears is too short for the brain to identify the direction of the sound or any reverberation and therefore sense of space.

Underwater, sound is perceived by bone conduction by the skeletal system as well as the ear-drum (Parvin & Nedwell, 1995). Mostly affected are the spine and skull. The

vibrations travel from the water to the bone and stimulate the inner ear directly, and so the listener actually perceives the sounds as if they are heard from inside their head.

The result is a perception of sound that's incredibly detailed and immediate. The sound is perceived as detached from its spatial origin due to the lack of spatial signature usually recognisable by reverberation of the space. This gives the impression of a very personal and intimate experience. Despite being in a public space, the listener can feel as inhabiting a very private space, a womb-like environment.

The Listening Experience

Listening and attentiveness is important in creating meaningful communication (Purdy, 1996). Additionally, listening is an important part of meaningful musical interaction. Therefore the practice of deep listening could open up new vistas of communication in that it increases attentiveness to one's surroundings and can increase tolerance to unfamiliar circumstances and improve musicality in the individual.

Liquid Vibrations has devised sessions at hydrotherapy pools with emphasis on listening and enabling an optimal position for listening.

The beneficiaries of our service are children aged under 16 with special and complex needs and profound and multiple learning disabilities (PMLD) who have severe communication difficulties. Some cannot vocalise or have restrictions in movement and gestures, some are sight or hearing impaired.

The idea with which we approached the project, is the assumption that although everyone responds to sound differently, the factors that affect the listening experience, are shared by everyone.

As most musical experiences whether being created or perceived involve listening, various factors would apply to the experience of musical interaction and creation. These are briefly explained as follows.

THE LISTENER

Physical capabilities.

Can the listener hear? Most hearing occurs through activation of the eardrum, however some hearing occurs through bone conduction, especially underwater. In cases where the cochlea and neural pathways from the inner ear to the receptors in the brain are damaged, hearing is lost entirely. In the water one can feel sound waves if they are played using underwater speakers.

Do the listeners have any conditions that prevent them from listening?

These could be neural disorders that affect their tolerance of sounds or their attention span or they may be under medication.

Are they restricted from inhabiting the listening space? Such as an auditorium without wheelchair access or in case of listening in water then this medium is restricted for some listeners who may not be able to be in water due to skin sensitivities or physical condition.

Comfort and listening position. Physical comfort affects the degree of attention, thereby discomfort can affect listening negatively.

Mood. The listener's mood is affected by experiences directly preceding the listening experience. The mood can affect the listener's interpretation and receptivity to the present experience. This is a general statement but in the case of children with special and complex needs, the mood is volatile and can affect their ability to participate in the session and their consequent degree of attention.

Cultural background.

Do the listeners have a preconception of what constitutes a sound that demands listening? To listen is already to focus one's attention, to exert a particular effort (Barthes, 1985), some listeners may not regard some sounds as worthy of a focus of their attention, thereby ignoring them or regarding them as noise ¹.

Do the listeners have a sense of aesthetic appreciation? Exposure to art forms through practice and guidance can develop a sense of aesthetic appreciation that enriches an experience. The listening sessions offer a platform for the aesthetic appreciation of sound.

¹ This breadth of the scope of what is called noise and what is called Music has been determining the transformation of musical structures in the last 100 years. This liminal point is largely affected by the degree of exposure to a variety of different music of different structures and, with reference to art music, an aesthetic appreciation of sound perception.

THE ENVIRONMENT in which the sound is perceived

Physical affects. Perception of sound is influenced by the spatial dimensions of the space the sound is played in as these determine which frequencies are accentuated and reverberations. and the materials in the space (reflective, resonant, porous, etc).

Cultural affects. The cultural context, or the institutional context that define the listening environment informs the listener's expectation and contextualises the sound heard, thereby affecting its perceived meaning.

Company. The presence of other people can be a distraction, which affects the listening process and interaction. As music is a time-based media, continuity helps give meaning to the sounds perceived, if that continuity is affected by other people in the space, then their presence would affect the listening experience and the meaning given to the sounds.

THE SOUND

The compositional elements of the sound. Semiotic, aesthetic, cultural, its progression and rhythm.

The psychoacoustic and bioacoustic properties. Frequency, dynamic, rhythmic, binaural properties.

The method of production. The type of speakers, high or low fidelity, and the sound's relations to an action or gesture and the performance aspect all affect how the sound reacts in the space and the meaning of its production.

INTERACTION

The element that binds these three factors together is **interaction**. The interaction of the listener with these elements and between the elements themselves, actively feeds back onto the experience itself and makes the listening experience an active process.

As discussed by Eric F Clarke (2005), J J Gibson's (1966) ecological approach sees organisms immersed in a continual process of perceptual learning. This is progressive differentiation as perceivers become increasingly sensitive to distinction in the stimulus information. Perception is essentially an exploratory engagement, a 'tuning in' and adapting to the environment, optimising its resonance with the environment and developing awareness to the information that characterises it.

The aims of a therapeutic practice take into consideration the expectations of the treatment. In the case of music and listening practice, by considering and utilising the factors detailed above, the expectations are more closely aligned with the experience of the participant.

The aims of the practice

As Liquid Vibrations began looking into adapting underwater sound to use in an educational and artistic context with children with complex needs in the hydrotherapy pools, we developed the following aims:

Confidence and awareness. Developing a sense of individuality and sense of self in the listener despite being in a public space. To create a basis for linking proprioceptive and internal awareness with auditory perceptions, promoting external awareness.

This could facilitate communication as well as musical expression in movement or sound. The creation of a mental connection between relaxation and contemplative listening in combination with a sense of individuality, can suggest a sense of mental control over one's environment and communication with it. The sense of intimacy occurs as a result of special properties of listening to underwater sound and the sense of privacy it evokes.

To promote well-being. This is achieved by provision of a relaxing experience that gives a lasting positive feeling, encourages vocalisation and increases movement for those with limited mobility.

As the sound is only audible inside the water the listener has to intend to listen, the sound does not impose itself on the listener as it does in most life situations. This motivation develops intention and displays the curiosity of the participant.

To promote awareness of the art of music in particular. To increase the aesthetic appreciation of sound content in order to create immersion through observational separation. This could be beneficial in two ways:

First. An exercise in concentrated listening that does not demand any response as expected in many musical activities in the children's lives (singalong, play-along, dance-along for example). Deep listening allows for introspection whether as a result of a daydream or as a result of assessment of the sounds heard and activation of the imagination. Sound is separated from the communal context it is often presented as in schools.

Second. This could expand and empower the participant's musicality and tolerance of various environments as they have other tools by which to assess sounds, rather than just as signifiers of action to which they submit.

How do we achieve these aims?

Sound

To this effect Liquid Vibrations present a variety of music, classified as Tonal, Abstract and Narrative. The movement between these three types of sound follows the sequence in which they are written here.

Tonal/Familiar. This refers to music that has a harmonious and melodic tonal progression and/or steady rhythm². It serves to attract the participants into the new sensation and increase their interaction with their carers and each other.

Abstract music. Music that is characterised by its use of unconventional sounds, flexible structure, wide frequency spectrum and its focus on sonic texture. The low frequencies are physically felt as vibrations on the body and extend the sonic sensation beyond the aural; this is particularly effective with participants with impaired hearing. The varied uses of the frequency spectrum

² Generally speaking, the intention behind the term *familiar music* points to familiar and harmonic chord sequences and rhythmic structures of Western music.

is intended to invoke an interest in sound resulting from attention to textural sonic aesthetics rather than particular melodies, song or rhythm based sound structures, which compose a large majority of the recorded sound content to which the participants are often exposed.

“The wide-open sonic world of electroacoustic music encourages imaginative and imagined extrinsic connections because of the variety and ambiguity of its materials” (Smalley, 1992, pp. 514-554). In the same way that visual puzzles and optical illusions make conscious the borders between stimulus and image recognition and thus confuse the brain to find an explanation, so does abstract and unfamiliar music encourage the listener to pay attention to the textures and sonorous qualities of the sound in order to create meaning using imagination.

Narrative sounds. Narrative sounds are regarded as sonic signifiers, sound objects that, much like a photograph, represent the original but are only reproductions. Part of assimilation into a society that is saturated in reproductions would include exposure to reproductions, in sound, image and object. Narrative sounds shift the listening reference from the internal world, which the sonic textures are intended to immerse the listener in, to the external world, evoking the imagination to the familiar external environment that is nameable and identifiable.

Examples of narrative sounds are the sound of whales, bird song, a dog barking, voice, traffic or rain. Underwater, they can be heard in isolation. Because narrative sounds are usually heard in an experiential context, their isolation and disassociation from the actual event, as reproductions, bring to attention sonic qualities, which might otherwise be masked by the event. This could also expand the sound palate of the listener and their aesthetic idea of sound and find expression in their musicality.

Relaxation

Liquid Vibrations conduct basic aquatic body therapy training sessions for the staff and carers in each of the participating schools. Watsu is an aquatic body therapy through movement in water where the practitioner guides the participant using minimal contact and the weightless buoyancy in water to achieve a state of total muscle relaxation (Dull, 2004). This also facilitates the ideal position for underwater listening with the back of the head immersed in water, rearranging the posture for deep relaxation.

The benefits include: increased mobility and flexibility, muscle relaxation, fuller deeper breathing, reduction in anxiety and stress levels, decreased pain, improved sleep and digestion and a general sense of wellbeing (ibid).

Listening sessions

The listening sessions usually last 20 minutes to 30 minutes. Some of the participants in the sessions have had their carers support them one on one to facilitate underwater

listening by supporting their body in the water according to the training they received. Other participants, mainly those within the Autistic Spectrum Disorder, have attended the pool unaided and explore the space above and below the water independently.

Developing intention and action. Unaided, the participants initiate listening themselves as part of their playful use of the pool. Moreover, the underwater listening is by choice and is a musical, and abstract artistic experience.

The pool as a playful social space. Hydrotherapy pool sessions generally have an atmosphere of play and fun in them and are a positive environment. The session sometimes becomes playful and encourages curiosity and social interaction between the participants. The pool is a social space, which transforms into a private and intimate space as soon as the participant places their head in the water.

Case Study – Spring term 2015

The following is an adaption of the report written by Hannah Newman³.

Nine sessions occurred in a special needs school in Canterbury, UK. The participants were three females under the age of 16, all diagnosed with Profound and Multiple

³ Researcher and current PhD student. (An executive summary of the research can be found on the Liquid Vibrations website. The full report is available on request).

Learning Difficulties (PMLD). They experienced the sessions in the school's own hydrotherapy pool in which music created for the piece was played through underwater speakers. The piece of music was ten minutes long and consisted of different sounds and moments of silence. The participants also experienced Watsu and Aquatic Bodywork in the pool, which was carried out by either the specialist involved in the project, Steve Karle, or by the participant's teaching assistant (TA). All sessions were filmed.

In addition to this, 'dry' sessions occurred. This was where the same music was played in a quiet classroom, with the participant being accompanied by a member of staff. These sessions occurred at three points across the research period and were filmed.

The methods of analysis chosen and developed were based on the previous research that had been carried out with Liquid Vibrations. One method, was the established *Sounds of Intent* (SoI) which is a method for evaluation of musical development. This is a framework developed which analyses the musical development of individuals with special needs, from children who have PMLD to those on the autistic spectrum (with or without savant skills) (Sounds of Intent). The framework was developed from extensive observational data of children, psychological research into 'typical' music development and underpinned by the zygonic theory "which seeks to explain how music makes sense to us all" (ibid). The framework consists of three domains: reactive, proactive and interactive, which each have six levels of development. This is a tool for assessing musical development (Vogiatzoglou, A. et al, 2011; Welch, G. and Ockelford, A. 2010; Welch et al 2009).

In addition to this an observation document was developed for the purpose of this research which noted specific behaviours that looked for any changes or responses to the research.

Questionnaires were also developed for the TAs who worked with the participants, to document the behaviour of the participant, and any changes.

Questionnaires were also given to parents and carers to document behaviour changes.

At the same time as the 'dry' sessions, interviews were also carried out with the TAs and teacher in which similar questions to the observation form that was supplied on a weekly basis were asked, as well as typical behavioural cues for each individual and an overall perspective on the experience. This was carried out in the second and third dry session. An interview was also conducted towards the end of the project with the Head Teacher of the school.

Unfortunately, there were difficulties in attendance with the participants, as due to the complex natures of the conditions of each participant, medical issues often meant that they were unable to go into the pool or were not in school.

Results

Child One.

In the first few sessions no physical reaction was noted. In later sessions she had clear reactions suddenly changing her physical behaviour when the music started, or holding her weight and swaying her body from side to side. Later sessions the physical reaction reduced to smiling. There were no vocalisations that could be specifically linked to the music, as she vocalised throughout sessions.

With SoI, her grading started at R1 and developed to R2 after her third interaction with the session. In the 'dry' sessions she displayed happy sounds throughout, even able to complete one of them after her TA thought she would not be able to because she was in a bad mood. From the TA forms it can be concluded that there were no negative alterations to her mood or behaviour. The sessions increased her relaxation and half of them caused her to make her happy sounds. The interviews supported this with her class teacher commenting that she seemingly danced, which he had never witnessed her doing before. Only one parent/carer form was returned and this did not provide much information, as it coincided with a week when she was unable to go into the pool.

Child Two.

Physical reactions were noted in the first few weeks via smiling. She developed this to dance in later weeks. Towards the end her physical reactions were less frequent. There were no vocalisations that could be specifically linked to the music, as she vocalised throughout sessions. Her SoI grading was ranked at R2 in all sessions, bar the last one in which it reduced to R1. She was only able to attend the final 'dry' session so not a lot can be concluded from it, although she did put her fingers in her ears, which she had not done during the pool sessions. The TA form indicated that there were no negative effects on her mood or behaviour, with most sessions having at least a slight positive effect. The majority of sessions caused a change in her physical presentation or vocalisations. The TA felt that her interaction with the participant was increased during the sessions. The interview complemented the forms, although she did state that she had not noticed a change

in mood or behaviour, other than increase in happiness which had been generally happening. She noted that the participant enjoyed the sessions very much.

No parent/carer form was received.

Child Three.

No verbalisations were made at any point during the research. There were some physical changes when she heard the music for the first time in some of the weeks. In the final week she worked with us there was a very strong reaction to the music where she lifted her head towards the speaker, started moving her hands rapidly and the eyes became active. Her SoI grading was ranked consistently at R2. She attended the first and second 'dry' session. In the first she showed no response and in the second she seemed to enjoy the music: smiling as it went on.

No TA forms or parent/carer forms were returned.

Interview with her TA indicated that it was a positive experience for her, and that there had been change in, for example, her relaxation. We were able to interview this participant using eye pointing. She responded positively to all questions asked, except to one question about the Watsu, to which she responded that it surprised her.

Conclusion of Study

All participants showed at least once clear example of a reaction to the music. Another thing that can be concluded from the observation documents and supported by the forms and interviews, is that all of the children enjoyed the sessions. There were many instances of happiness and enjoyment which occurred in both the pool

sessions and 'dry' sessions. The fact that these occurred in the 'dry' sessions, indicates that the children are responding positively to the music that was created, aside from the hydrotherapy pool and Watsu. There was also an indication across the board of the experience being very relaxing, and calming, which is another positive outcome of the project.

The SoI ratings were inconclusive: one participant improved, one decreased and the final stayed the same. This is however expected due to the complex nature of the conditions that can cause fluctuations in behaviour.

In addition, there was an indication of change and development with all the participants, albeit relatively small. With individuals with PMLD the targets that are set for them can be very small and require a longer period of time to achieve. It is unlikely that a nine-week experience (approximately ten minutes per week) would have a profound affect. However, the fact that there was some change indicates this could be a positive tool to use.

This research has had a positive impact on the school. They have purchased their own floats, similar to the ones that were used with Watsu, and the staff are very positive and enthusiastic about continuing and developing the training of Watsu that they experienced. There are also discussions about purchasing underwater speakers.

This research project provides sufficient evidence to warrant further investigation into the role of underwater sound and Watsu on children with PMLD. This was an overview analysis of the work. The results that we can see from this warrant further investigation into this material to more closely analyse the effects (if any) that the music may be having over the period of time.

One strand to this research, which was not fully explored, was the effect that this experience had on the group students with autism (ASD). Some of them showed clear changes in experience outside of the pool and then inside the pool, e.g. one child would wear headphones and did not like noise, however once in the pool he would spend most of the time underwater near a speaker, actively seeking the noise and vibrations. Close analysis could occur of the footage that was taken to see if there were any significant differences but from the surface analysis that occurred, these children could benefit from such an experience.

Conclusion

As of 2016 Liquid Vibrations has conducted training sessions in several schools for children with special and complex needs in England and in Athens while continuing research. These were kindly funded by the Milton Keynes Foundation, Awards for All, Sound Connections, University of Kent, S.E.M.P.R.E, the Henry Smith Foundation, Arts Council of England and the Onassis Foundation. The researchers from the University of Roehampton, the University of Kent and The Institute of Education have produced reports for each of these sessions which are available on the Liquid Vibrations website.

Additionally, Liquid Vibrations has begun conducting music workshops for people with disabilities to compose for underwater listening, encouraging creative dialogues and exchange. The artistic experience and the listening activity under leisurely conditions are seen to promote curiosity, relaxation and, at times, a positive change in movement or vocal expression. The lasting effects beyond the session can only be assessed after a more prolonged period of observation involving their families and continuing hard and soft data analysis.

One of the greatest functions of art is, arguably, the space it clears up in the beholder's mind for reflection, imagination and repose. Similarly, sound, and its use in art and music, has functions that lie beyond the social interaction that surrounds its presentation. These functions are supported by phenomenological considerations as to its mode of presentation, whether for listening or for playing, these considerations shape the experiential effects that the work has on its creators and listeners. By customising and crafting the experience to cater for physical limitations and spatial parameters, whilst endeavouring to expose listeners to the wide mutations of sonic frameworks, Liquid Vibrations brings an aesthetic artistic experience to a public to which it may not be otherwise exposed.

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Joel Cahen

Audio and visual practitioner based in London, UK. His art work interrogates the affects of sound in various spaces (the physical, the cultural and the body). Since 2008, he has been performing worldwide with Wet Sounds, an underwater concert project that sonifies both wet and dry areas of the swimming pools. He has had a long-standing weekly radio show on London's Resonance 104.4fm exploring culture jams and cacophony. Since 2012, he has created Interzone Theatre, a work exploring the possibilities of locative sound-based augmented reality as a performative platform. He is also co-founder of Scrap Club, a public Destructivist activity where the audience smash household items with sledgehammers, and co-founder and artistic director of Liquid Vibrations, a charity which provides training sessions for musical hydrotherapy for children with special needs.

Joel Cahen's work has been presented and performed in galleries and festivals in the UK and abroad such as Tate Modern, Whitechapel Art Gallery, AV Festival, International Symposium on Electronic Arts, International Symposium for Music Education, Red Bull Music Academy, All Tomorrow Parties, , Nu Musik and many more.