

Q&QMT 2017

2nd International Workshop on Quantitative and Qualitative Music Therapy Research

<http://quantitativemusictherapy.weebly.com>

Universitat Pompeu Fabra
Barcelona
May 26, 2017

Proceedings

Rafael Ramirez
Universitat Pompeu Fabra

Nuria Escudé
IL3 - Universitat de Barcelona (Master in Music Therapy)

Zacharias Vamvakousis
Universitat Pompeu Fabra

Maria Rosa Guitierrez
Institut Català de la Salut

Programme Committee

Nuria Escudé (IL3 - Universitat de Barcelona & Catalan Institute of
Music Therapy, Barcelona)

Jörg Fachner (Anglia Ruskin University, Cambridge)

Sergio Giraldo (Universitat Pompeu Fabra, Barcelona)

Maria Rosa Gutierrez, (Institut Català de la Salut, Barcelona)

Joanne V. Loewy (The Louis Armstrong Center for Music & Medicine,
New York)

Júlia Mirabell (Universitat de Barcelona & Carrilet C.E.E., Barcelona)

Dorothee von Moreau (SRH Hochschule Heidelberg)

Julian O'Kelly (Royal Hospital for Neuro-disability, London)

Josep Planas (Hospital del Mar, Barcelona)

Rafael Ramirez (Universitat Pompeu Fabra, Barcelona)

Andrew Rossetti (The Louis Armstrong Center for Music & Medicine,
New York)

Elisabet Sanchez (Carrilet C.E.E., Barcelona)

Zacharias Vamvakousis (Universitat Pompeu Fabra, Barcelona)

Q&QMT 2015

International Workshop on Quantitative and Qualitative Music Therapy Research

Motivation

Music is known to have the power to induce strong emotions and physiological changes. Musical activities have a positive impact in the perception of quality of life and may even improve cognitive, social and emotional abilities. It is not surprising that a variety of clinical conditions are often treated with music therapy. Large scale studies have shown that music therapy produces significant improvements in social behaviors, overt behaviors, reductions in agitated behaviors, and improvements to cognitive problems. However, the positive effects of music therapy are not homogeneous among all studies, and there is often a lack of formal research involving quantitative and qualitative methods to assess the benefits and limitations of music therapy in concrete treatments. A special topic in this year's workshop is Accessible Music Interfaces as a means to allow people with disabilities to perform and compose music. A concert involving several accessible music interfaces is planned as part of the workshop.

Workshop aims

The aim of the workshop is to promote fruitful collaboration among researchers, music therapists, musicians, psychologists and physicians who are interested in music therapy and its effects, evaluated by applying quantitative and qualitative methods. The workshop will provide the opportunity to learn about, present and discuss ongoing work in the area. We believe that this is a timely workshop because there is an increasing interest in quantitative and qualitative methods in music therapy.

Programme

09:30-09:40 Welcome and opening remarks

09:40-11:10 Oral session 1

Chair: Rafael Ramirez

09:40-10:10 Focus groups in a qualitative research study on Music therapy in Spain

María Del Moral, Melissa Mercadal-Brotons, Andrés Sánchez-Prada, Patricia Sabbatella

10:10-10:40 Strumming with Stringpots: A Novel Guitar Controller Designed for a Person with Limited Sensorimotor

Joan Sandoval, Zacharias Vamvakousis

10:40-11:10 Audio-tactile multimodal perception of tissue-conducted sound fields

Peter Lennox, Ian McKenzie

11:10-11:40 Coffee break

11:40-13:40 Oral session 2

Chair: Maria Rosa Gutierrez

11:40-12:10 Music Performance as Therapy for Terminally Ill Patients: an EEG Study

Rafael Ramirez, Josep Planas, Nuria Escudé, Jordi Mercade, Cristina Farriols

12:10-12:40 Music Therapy Improves the Mood of Patients Undergoing Hematopoietic Stem Cells Transplantation

Carlos Dóro, José Zanis, Rosemyriam Cunha, Maribel Pelaez

12:40-13:10 Neural Correlates of Emotion and Audiovisual Stimuli in
Autistic and non-Autistic Children
Natalia Delgado, Rafael Ramirez

13:10-14:30 Lunch

14:30-15:30 Oral session 3
Chair: Rafael Ramirez

14:30-15:00 Makam Panflute: A head-breath midi controller for makam
music
Zacharias Vamvakousis

15:00-15:30 Designing Accessible Instruments for Meaningful Musical
Participation
Jacob Harrison, Andrew McPherson

15:30-16:00 A Gaze Controlled Digital Music Instrument as Music Therapy
Tool
Tanit Piñeira

19:30 Concert: Accessible Music

Abstracts

Focus groups in a qualitative research study on Music therapy in Spain

María T. Del Moral¹, Melissa Mercadal-Brotons², Andrés Sánchez-Prada¹ & Patricia L. Sabbatella³

¹Universidad Pontificia de Salamanca (UPSA), ²Escola Superior de Música de Catalunya (ESMUC), ³Universidad de Cádiz (UCA)

Background

Music therapy is an established profession in several countries over the world. However, music therapy is not recognized as a profession by the Spanish society. Previous studies (e.g. Del Moral, Mercadal-Brotons & Sánchez-Prada, 2014; Mercadal-Brotons, Sabbatella & Del Moral, 2015; Poch, 2011; Sabbatella 2004; Sabbatella & Mercadal, 2014) have developed a review of the situation of music therapy in Spain.

Aims

This work focuses on the study of the current state of Music Therapy in Spain, particularly in the research field. The main aim of this study is to know the opinion of the Spanish music therapists about the situation of music therapy in Spain, specifically the research field.

Methods

An exploratory-descriptive study, within a qualitative approach, has been carried out, based on action research methodology through focus groups. 103 music therapy experts, professionals and students participated in this study and 16 focus groups have been developed. A categorization of subjects and contents following the procedure of Grounded Theory (Glaser & Strauss, 1967) has been accomplished, using the NVIVO 11 computer program. Likewise, a SWOT analysis has been performed and the possible strategies in order to consolidate music therapy as a profession and scientific discipline in Spain have been identified.

Results

The main issues mentioned were: professionalization (52%), followed by education (20%), research (19%) and clinical practice (9%) in music therapy in Spain.

Conclusions

The analysis of the focus groups reveals the difficulty, especially for students and professionals, to address in depth the issues regarding

the current status of music therapy research in Spain.

Keywords: Music therapy; focus groups, qualitative research, SWOT analysis, content analysis.

References

- Del Moral, M. T., Mercadal-Brotons, M. & Sánchez-Prada, A. (2014). Music Therapy Research in Spain: A Descriptive Study. In J. Fachner, P. Kern, & G. Tucek (Eds.). Proceedings of the 14 World Congress of Music Therapy. Special Issue of the Music Therapy Today, 10(1), 342-343.
- Glaser, B. G. & Strauss, A. (1967). The discovery of Grounded Theory: Strategies for qualitative research. New York: Aldine Publishing Company.
- Poch, S. (2011). Music Therapy Education, Practice and Research in Spain. Ponencia del VIII Congreso Europeo de Musicoterapia. En Sabbatella, P. (Ed). Identidad y Desarrollo Profesional del Musicoterapeuta en España. Actas del III Congreso Nacional de Musicoterapia. Cádiz 8-10 Octubre 2010. Málaga: Grupo Editorial Universitario.
- Mercadal-Brotons, M., Sabbatella, P. L., & Del Moral Marcos, M. T. (2015). Spain. Country report on professional recognition of music therapy. Approaches: Music Therapy & Special Music Education, Special Issue, 7(1), 181-182. Retrieved from <http://emtc-eu.com/wp-content/uploads/2011/09/Approaches-71-2015.pdf>
- Sabbatella, P. L. (2004). Music Therapy in Spain. Voices Resources. Retrieved January 08, 2015, from http://testvoices.uib.no/community/?q=country/monthespanol_march2004.
- Sabbatella, P. & Mercadal-Brotons, M. (2014). Perfil profesional y laboral de los musicoterapeutas españoles: Un estudio descriptivo. Revista Brasileira de Musicoterapia, 17, 6-16.

Strumming with Stringpots: A Novel Guitar Controller Designed for a Person with Limited Sensorimotor Skills

Joan Sandoval, Zacharias Vamvakousis

Universitat Pompeu Fabra, Roc Boronat 138, 08018 Barcelona, Spain

joansando@gmail.com, zacharias.vamvakousis@upf.edu

BACKGROUND

People with motor disabilities often have difficulties in playing common musical instruments. Digital Musical Instruments (DMI) often incorporate multiple sensors for capturing input gestures, making possible the design of musical instruments highly adapted to the specific needs of individuals with limited sensorimotor skills.

AIMS

The primary objective of this study was to implement a guitar midi controller for a 37 years old woman that suffers from tetraparesis with Brown-Séquard syndrome.

METHODS

For building the instrument, it was decided to use the guitar controller of the game Guitar Hero. The already built-in buttons were mapped to multiple chords following a specific chord system. The strumming part was built using two string potentiometers and four little pulleys that allowed to apply strumming techniques used in normal guitars. Then, the target-user was asked to play a medium-level song over different musical sessions and, temporal accuracy and chord success were measured among others to evaluate its effectiveness.

RESULTS

The user achieved a temporal accuracy of 90 % with twice the velocity compared to the first session, in which the user had nearly 60 % of accuracy. Chord accuracy was also improved, the user achieved nearly a 100% on the last session. In addition, the instrument did not present any technical problems during the evaluation. The chord system worked well and its low weight permitted a comfortable performance.

CONCLUSIONS

The results showed a high temporal and chord accuracy rates on the last sessions, which suggests that the instrument was suitably built for the target-user given the specific needs. However, an improvement of the sound quality and the resistance of the string potentiometers would provide a better performance and a better sound-end quality

Audio-tactile multimodal perception of tissue-conducted sound fields

Peter Lennox, Ian McKenzie

College of Arts, Humanities and Education, University of Derby, UK

Background

Approximately 5% of the World's population, that is, 360 million people, suffer from "disabling hearing loss" and the proportion of over-65s rises to about 33%. 13.4% of geriatric patients have significant conductive components to their hearing loss. For this segment of the population, "music deprivation" may have significant long-term health and wellbeing consequences amounting to diminished quality of life (QoL). Assistive technologies implementing sensory augmentation could ameliorate the effects of lack of ready access to music, the experiential attributes of music listening can be reinstated and tangible benefits might accrue.

Aims

To extend human perception through application of multimodal audio-plus-tactile stimuli. Objectives: Investigate how perception can integrate multimodal stimuli; Investigate how novel multimodal stimuli can engage perceptual learning; Investigate whether this approach offers enhanced communication, and enhanced quality-of-life (QoL) in cases of conductive hearing loss

Methods

A spatial array of vibro-mechanical transducers for bone-and-tissue conduction has been used to convey spatial ambisonic soundscape and spatial musical material. One hundred volunteers have undergone a five-minute listening experiences, subsequently describing the experience in their own words, on paper, in an unstructured elicitation exercise. The responses have been aggregated to identify descriptive themes, which were then mapped against each other to identify to what extent the experience was valuable, enjoyable and informative, and what qualia are may be available through this technique.

Results

Emergent key themes were: "positive" (77%), "spacious", "interesting", "weird", "clarity", "vibrations" and "feeling-descriptions" (such as "dreamlike"). The attribute class that mapped most strongly to 'positive'

was 'interesting' (35%) followed by 'spatial' (32%), feeling-descriptions (26%), 'clarity' (19%), 'vibrations' (15%) and 'weird' (11%).

Conclusions.

The spatial qualia elicited are notable, since psychoacoustic theory does not predict that spatial impressions extend beyond a simple lateralisation paradigm. Without pinnae effects (or some signal-processing equivalent), elevation and externalisation should not be discernible. It may be that listeners are utilising tactile cues in cognitive spatial mapping, which we shall investigate.

It appears that this experience differs qualitatively from other (air-conducted) forms of listening and that a majority found the experience positive, interesting and strange; many expressed interest in repeating the experience. It may be that the novelty of the experience was conflated with positive judgements.

We also observe that the vibro-tactile stimuli inherent in this technique seem to contribute to, rather than detract from, the experience, indicating that the multimodal stimuli are sometimes neuronally additive. Future work will focus on quantifying the features of this multimodal interaction.

Music Performance as Therapy for Terminally Ill Patients: an EEG Study

Rafael Ramirez¹, Josep Planas², Nuria Escude³

¹Music and Machine Learning Lab, Universitat Pompeu Fabra, Barcelona

²Palliative Care Unit, Oncology Service, Parc de Salut Mar, Barcelona

³Catalan Institute of Music Therapy & Universitat de Barcelona, Barcelona

Background. Music performances are known to have the power to induce strong emotions. Given the right conditions they may even improve cognitive, social and emotional abilities. Thus, a variety of clinical conditions are often treated with music therapy. However, there is often little research involving quantitative methods to assess the effectiveness of music therapy interventions for terminally ill patients. Recent reviews point out the need to provide an evidence-based rationale for music therapy clinical treatments in this field. The present study assesses, based on EEG data, the emotional response of terminally ill cancer patients to a music therapy intervention in a randomized controlled trial.

Aims. The objective of this work is to quantify the emotional effect of music therapy sessions in advanced cancer patients. With this aim, the patients' emotional state is decoded from their brain activity, detected as EEG data. EEG activity is measured before, during and after the sessions in order to quantify the effect of both the general effect of the music therapy sessions, as well as the individual effect of different music therapy techniques.

Method. A sample of 40 participants from a palliative care unit in the Hospital del Mar in Barcelona is randomized and assigned to two groups of 20 patients. The first group participates in a session of music therapy, and the second group is provided with company. The participants' EEG activity is recorded before, during and after the sessions using a 14 channel low-cost EEG device and analyzed using the Matlab programming language. Based on our previous work on emotion detection (Ramirez, 2012), emotional indicators in the form of a coordinate in the arousal-valence plane (Russell, 1989) are extracted from the participants' EEG data. The emotional indicators are analyzed in order to quantify (1) the overall emotional effect of music

therapy on the patients compared to controls, and (2) the relative effect of the different music therapy techniques applied during each session.

Results. During each music therapy session, five conditions have been considered: I (initial patient's state before MT starts), C1 (passive listening), C2 (active listening), V (visualization), and F (final patient's state). The analysis of preliminary data has shown a statistically significant positive arousal difference between I and C2 ($p=0.016$) and a significant positive valence difference between I and F ($p=0.0009$). No significant differences were found on the control group.

Conclusions. Preliminary results show that music therapy has a positive emotional effect on advanced cancer patients. The analysis of the EEG data shows a significant positive difference of the patients' valence states at the end of the music therapy sessions with respect to their states at the beginning of the sessions. This result can be interpreted as a positive emotional effect of music therapy in advanced cancer patients. To the best of our knowledge, this study is the first clinical randomized controlled trial worldwide to systematically examine the emotional effects of music therapy in palliative care using brain activity information.

Keywords: Music therapy, emotions, brain activity, EEG, Cancer

References

- Ramirez, R., and Vamvakousis, Z. (2012). Detecting emotion from EEG signals using the emotive EPOC device, *Lecture Notes in Computer Science* 7670, Springer, 175–184.
- Russell, J. A., Weiss, A., & Mendelsohn, G. A. (1989). Affect Grid: A single-item scale of pleasure and arousal. *Journal of Personality and Social Psychology*, 57, 493–502.

MUSIC THERAPY IMPROVES THE MOOD OF PATIENTS UNDERGOING HEMATOPOIETIC STEM CELLS TRANSPLANTATION

Carlos Antonio Dóro, Faculty of Arts of Paraná
José Zanis Neto, Federal University of Paraná, Federal University of Paraná
Rosemyriam Cunha, Faculty of Arts of Paraná, Federal University of Paraná
Maribel Pelaez Dóro, Tuiuti University of Paraná

Objective

The allogeneic hematopoietic stem cell transplantation (Alo HSCT) is a therapeutic medical treatment for various neoplastic hematologic, congenital, genetic or acquired disorders. In this procedure which combines high-dose chemotherapy and/or radiotherapy and has a high degree of cytotoxicity, the patient experiences solitary confinement, which causes psychological distress, pain, anxiety, mood disorders and can lead him/her to depression. Music therapy was applied with the purpose of decreasing this social confinement. This is a randomized clinical trial.

Method

n=100 patients were selected randomly. Patients n=50 were selected for the Experimental Music Therapy Group (EMG) who received music therapy interventions and patients n=50 for the Control Group (CG) who not received music therapy. The intervention of live music was applied using music therapy methods: receptive, improvisation and recreation by music therapist professional. Assessment and quantification were made using the visual analog scale (VAS). The dependent variables were pain, anxiety and the mood of patients.

Results

The Mann Whitney test ($p < 0.05$) applied was considered statistically significant when comparing the groups, improving mood significantly (EMG).

Conclusion

Music therapy proved to be a strong ally in the treatment of patients undergoing (Alo HSCT) providing bio-psycho-social welfare.

Neural correlations of music and emotion in autistic and non-autistic children

Natalia Delgado, Rafael Ramirez
Music Technology Group
Universitat Pompeu Fabra

Background

The Autistic Spectrum Disorder (ASD) is characterized by a delay in expressing and interpreting others' emotions, as well as by a lack of social engagement and interaction initiation, refusal of new settings and repetitive behavioral patterns [1]. However, studies have proven ASD people have strong abilities for music regarding pitch labeling, pitch direction and identification of pitch contours [2], and suggest that although they cannot interpret the emotion in a picture, ASD children are perfectly capable of identifying the emotion expressed by a music piece [3]. The reasons behind this difference in abilities between ASD and typical people is not strictly proven, however studies claim music helps autists express and canalize emotions [4]. As a matter of fact, this knowledge is being exploited more and more by psychologists and music therapists not only with autists, but also involving music as a non-invasive treatment for people who have difficulties in interpreting and displaying emotional states [5].

Aims

The fact that ASD children can interpret the emotion expressed by music implies that although in the case of visual stimuli it becomes a huge challenge, they can comprehend external emotions. Hence, it would be highly useful to comprehend at which point of processing visual stimuli emotion differs from auditory stimuli emotions in ASD and when and how this processing differs from typical to ASD, to better treat patients with such disorder. The aim of this project is to confirm, as previous studies suggest, that the difference between typical and ASD children in interpreting emotion depends on the stimuli they are exposed to, both by looking at their answers and their EEG; and to contribute to the search of understanding the reason behind this difference.

Methods

This work consists of an experimental phase and an analysis phase. The first is carried out by exposing ASD and typical children between 8 and 13 years old to a set of audio and visual stimuli which reflect one of four emotional states: happy, sad, calmed, or aggressive. These

stimuli are presented first in the form of audio stimuli only, then visual stimuli only, followed by a set of them combined in a coherent way in terms of emotion, and finally a set of stimuli combined in a non-coherent way. During this exposure to the stimuli, their EEG signal is recorded by an EEG device, and the children are asked what emotion each stimuli transmits to them. Their answer is also recorded. Once the data is collected, results are analysed. The first objective is to search for correlations between the EEG signal and the expected response, the EEG signal and the response given by the child, and to compare expected response with given response. The data of all ASD and typical children is averaged separately, to then observe differences between both groups. This part is carried out to observe whether this data coincides with other studies in the sense that ASD children tend to interpret emotions similarly to typical children when it is presented in the form of audio stimuli, but have more difficulties when visual stimuli are being presented. The second objective of the analysis phase is to search for relations between the interpretation of emotion and audio features. Audio features are extracted from the audio excerpts and arranged into four groups: melody, harmony, rhythm, and timbre. Correlations are searched for between EEG features, such as valence, arousal, alpha or beta, and audio features, to search for specific parts of the music that might have more relevance in the children's understanding of emotion. This objective is proposed towards better understanding difference in emotion processing between typical and ASD children, as presented above.

References

- [1] M.-C. Lai, M. V. Lombardo, B. Chakrabarti, and S. Baron-Cohen, "Subgrouping the autism "spectrum": Reflections on dsm-5," *PLoS Biol*, vol. 11, no. 4, p. e1001544, 2013.
- [2] E. Applebaum, A. L. Egel, R. L. Koegel, and B. Imhoff, "Measuring musical abilities of autistic children," *Journal of autism and developmental disorders*, vol. 9, no. 3, pp. 279–285, 1979.
- [3] R. Ramirez and Z. Vamvakousis, "Detecting emotion from eeg signals using the emotive epoc device," in *International Conference on Brain Informatics*. Springer, 2012, pp. 175–184.
- [4] K. Simpson and D. Keen, "Music interventions for children with autism: narrative review of the literature," *Journal of autism and developmental disorders*, vol. 41, no. 11, pp. 1507–1514, 2011.
- [5] C. L. Edgerton, "The effect of improvisational music therapy on the communicative behaviors of autistic children," *Journal of music therapy*, vol. 31, no. 1, pp. 31–62, 1994.

Designing Accessible Instruments for Meaningful Musical Participation

Jacob Harrison, Andrew McPherson
Centre for Digital Music
Queen Mary University of London

Background

We present a discussion of design considerations for accessible musical instruments. The term 'accessible instrument' has come to mean any musical instrument designed for a musician with a physical or cognitive impairment. We suggest that this is an ambiguous term, to the large variety of requirements and use cases of instruments for people with disabilities to delineate between simplified musical devices, often designed for therapeutic purposes, and more sophisticated instruments designed with a higher level of musicality in mind.

Aims

We make the distinction between the sub-categories of accessible instruments: 'therapeutic devices' and 'performance-focused instruments', in order to propose design considerations for future accessible instruments.

Methods

This project is in the early stages, and currently consists of a systematic review of the literature. Future studies within this project will involve the design and evaluation of new accessible musical instruments.

Results

Figure 1 shows a comparison of the properties of traditional instruments versus the two sub-categories of accessible instruments introduced previously. Physical Accessibility: A common feature of therapeutic devices is the broad scope of physical ability for which they are designed. Commercial products such as the Skoog¹ and SoundBeam² are examples of instruments with a large input gesture space. Examples of performance-focused accessible instruments are often bespoke designs, intended for a specific user's physical requirements. As a result, such instruments often exist as bespoke one-off designs, developed in DIY settings such as makerspaces. The KellyCaster³ is an excellent example of this. Learning process/acquisition of mastery: The complexity of learning

the instrument, inspired by Wessel and Wright's concept of a 'low entry fee with no ceiling on virtuosity' (Wessel and Wright, 2002). In many music therapy tasks, a period of learning may prove frustrating and demotivating, and so a low barrier to entry is often essential, often with an effect on the 'ceiling of virtuosity'. Larsen's actuated guitar highlights how a reduction in the complexity of the interface enables instant musical results, with a constraint on the complexity of the music afforded by it Larsen et al. (2014). Utilising the highly flexible approaches to mapping afforded by DMIs would allow complexity management to be explored for performance-focused instruments. Musical Diversity: Based on Jorda's work on Digital Lutherie (Jord_a, 2004), this refers to the varying levels of diversity and flexibility afforded by an instrument. Performance-focused instruments should attempt to match closely the musical diversity of traditional instruments, in order to encourage uptake and motivation to learn the instrument. Larsen et al. (2016) discuss this issue and conclude that using existing instrument paradigms opens up social music making more easily than entirely new ones, and can make use of existing repertoire and pedagogy. The Jamboxx MIDI breath controller⁴ and the EyeHarp (Vamvakousis and Ramirez,

1 <http://skoogmusic.com/>

2 <http://www.soundbeam.co.uk/>

3 <http://www.drakemusic.org/our-work/research-development/artist-led-projects/john-kelly-the-kellycaster/>

4 <http://www.jamboxx.com/>

Figure 1: A table comparing the properties of Traditional Instruments, Therapeutic Devices, and Performance-Focused Accessible Instruments (2011) are examples of performance-focused instruments which have demonstrated the ability to enable physically disabled musicians the ability to perform from an existing repertoire. Use Cases: When discussing accessible instruments, the goal is often to enhance or enable music therapy, with musical performance and participation a secondary or non-existent aim. This is perhaps the most crucial property for disambiguating between therapeutic devices and performance-focused instruments. A performance-focused instrument should share identical use-cases and musical diversity to a traditional instrument, with a mode of interaction that is accessible to those with physical impairments.

Conclusion

The aim of this project is to reflect on the design of accessible musical

instruments and ask relevant questions of the specific properties of existing instruments. While there is a great amount of valuable work focused on providing music therapy to users with physical and cognitive impairments, there is a much smaller number of instruments designed purely with meaningful musical participation in mind.

References

Jorda, S. P. (2004). Instruments and Players: Some Thoughts on Digital Lutherie. *Journal of New Music Research*, 33(3):321-341.

Larsen, J. V., Overholt, D., and Moeslund, T. B. (2014). The actuated guitar: Implementation and user test on children with hemiplegia. In *NIME '14 Proceedings of the 2014 Conference on New Interfaces for Musical Expression*, pages 60-65.

Larsen, J. V., Overholt, D., and Moeslund, T. B. (2016). The Prospects of Musical Instruments For People with Physical Disabilities. *NIME '16 Proceedings of the 2016 Conference on New Interfaces for Musical Expression*, pages 327-331.

Vamvakousis, Z. and Ramirez, R. (2011). The eyeharp: An eye-tracking-based musical instrument. *8th Sound and Music Computing Conference*, (December).

Wessel, D. and Wright, M. (2002). Problems and Prospects for Intimate Musical Control of Computers. *Computer Music journal*, 26(3):11-14.

Makam Panflute: A head-breath midi controller for makam music

Zacharias Vamvakousis (zacharias.vamvakousis@upf.edu)
Universitat Pompeu-Fabra, Barcelona

Background

Although there is a number of assistive music interfaces designed for the western 12-semitone tuning system, to the best of our knowledge, there is no such interface for different tuning systems. In this paper we present a head-breath controlled music interface designed for playing makam music. Makam is a system of melody types used in Persian and Turkish classical music. The octave is divided into 53 equal intervals known as commas.

Aims

The aim of this study is to implement a prototype that will allow controlling vst instruments for playing makam music. Using the prototype, a musician with disability and experience in makam music should be able to play makam music with expressiveness.

Methods: A software, serving as a midi-controller, was implemented in openframeworks open source C++ toolkit. This software serves as a midi controller. A virtual midi port, such as loopMIDI is then used to control a vst instrument in a vst host application. When the application starts, the user selects from a list of available common makams. More makams can be added by editing the makams.txt file found inside the application's folder. In order to achieve the correct makam intervals, the corresponding pitch bend value is sent before the send note-on midi message. The graphical interface consists of a number of vertical bars, equal to the set number of total notes. The user moves the mouse pointer on the screen and controls the pitch of a vst instrument. In order to control the interface by head-movements, the user should own a head tracker. The current prototype was evaluated by a user owning a SmartNav 4 commercial infrared-camera head-tracker. The dynamics are controlled through a breath sensor implemented with Arduino microcontroller and an MPX5010DP air-pressure sensor. The notes number value can be set in a text configuration file. A vertical line is drawn at the middle of the screen. When moving the cursor over this line, the triggered notes are tuned to the predetermined makam intervals. By moving the cursor up or down the pitch-bend midi value is controlled. The prototype was evaluated by a musician with tetraplegia and basic knowledge of makam music theory. After a period of two weeks he was interviewed about his experience with the interface.

Results

The user reported that the interface served well for playing makam music. Nevertheless he proposed possible improvements. For example he proposed that the height of the pitch bend region should be adjustable, as it is difficult to maintain the cursor in the same column when moving the cursor vertically to control the pitch bend. The user agreed that the implemented prototype will be useful for playing and studying makam music.

Conclusions

Using low-cost open source software we constructed a prototype that serves for playing makam music. The prototype should be further evaluated and improved according to the feedback received by the users.

A Gaze Controlled Digital Music Instrument as Music Therapy Tool

Tanit Piñeira, Universitat de Barcelona

Rafael Ramirez, Universitat Pompeu Fabra

Background

Music performance and learning to play a musical instrument have been showed to provide several benefits for acquiring non-musical skills, e.g. improved ability to hear speech in noisy backgrounds; reduced age-related auditory degradation, increased verbal and auditory memory, and enhanced auditory attention. Furthermore, music playing can provide positive emotional changes which promotes neurostructural changes.

Up to now there is a lack of access to music instruments adapted for people with sever motor disabilities and consequently lack of access to its benefits. Vamvakousis and Ramirez (2016) developed the EyeHarp, a gaze-controlled Digital Musical Instrument (DMI) which allows people with severe motor disabilities to play, compose and perform music and thus, to have access to the associated benefits. The EyeHarp consists of two layers: the Step Sequencer layer and the Melody layer, allowing the user to control pitch, timing and dynamics of a melody, as well as chords and arpeggios in a performance.

Scope

The aim of this study is to use the EyeHarp as a traditional instrument for learning music and promoting the emotional expression. As a first step, the study has been carried out with a 10 years old boy who suffers quadriplegia and can only control eye movements, i.e. he is not able to control other movements voluntarily. He does not have any music knowledge but wishes to play music.

Methods

Music and Music Therapy sessions have been conducted by a professional music therapist for one hour weekly during 4 months. During this period the student both received music tuition and music therapy, and we evaluated rhythm and pitch accuracy in both technical exercises and musical pieces. In addition, we analysed the student's brain activity by recording his electroencephalogram (EEG) signal during one of the sessions. From the EEG data we estimated the instantaneous emotional state of the student.

Results

The study is still in progress so processing of the data is still being done. However, preliminary results are encouraging with visible musical progress of the students both in terms of melodic and rhythm accuracy.

The emotional changes experienced by the student during sessions have been evaluated qualitatively based on his reactions during music performance improvements. These emotional changes have been ratified also by his own perspective and by the EEG data.

Conclusion

Preliminary results seem to show that the EyeHarp can be used as a traditional instrument for people with severe motor disabilities and can provide the benefits associated with music playing. This study has triggered the implementation of a music teaching program based on the EyeHarp in a music school in Barcelona, including regular classes which can combine music lessons and music therapy for people with motor disabilities.