

Assessment of emotions in music therapy

Ph. D. Martina Lucht, Fraunhofer IDMT, Department of Children's Media
Hirschlachufer 7, 99084 Erfurt, martina.lucht@idmt.fhg.de

Gabriel Gatzsche, Fraunhofer IDMT, Department of Acoustics
Ehrenbergstr. 31, 98693 Ilmenau, gabriel.gatzsche@idmt.fhg.de

Abstract. In this paper we issue three important challenges in music therapy: 1.) How can also non-musician patients be enabled to express its emotional state musically in a better way? 2.) How can a more valid and reliable interpretation of the patient's musical out-put be reached? 3.) How can unwanted influence of the patient by audio or video recordings be prevented? First we will discuss several problems and solutions within that relationship. After that requirements for a new music therapeutic musical instrument are derived. A study shall show, if (a) such an instrument can be generally used in music therapy and if (b) such an instrument significantly improves the treatment of non musician patients.

1 Introduction

Music is an often used medium in psychotherapy. Especially for young people music can help to make suppressed emotions conscious [4, p.181f]. The consciousness of emotions like fear, anger or aggression is important to successfully treat the clients. Music is one way to express the individual emotional experiences. It often leads the way to the source resp. the reasons for the emotional disorder. By using music it is possible to expose negative situations and experiences within a secure surrounding and to change the connected feelings (Smeijsters, [16], [15]). This is why music rapidly strides into psycho therapy. An own field of therapy therefore has developed, the music therapy. It is defined as "... the use of sounds and music within an evolving relationship between child or adult and therapist to support and encourage physical, mental, social and emotional well-being" [3, p.8]. Bruscia [2] differs between 'active' music therapy, meaning the playing of music and the 'receptive' music therapy that generally focuses on the listening to music during the therapy sessions ([2], cited from [4, p.186f]). In this paper we focus on the active music therapy, where the clients are asked to give music improvisations.

2 Restricting aspects in music therapy

The potential of music in the field of psychotherapy is handicapped by three major aspects: 1) the difficulty of the client to expose her or his feelings through music, 2) the correct interpretation of the patient's musical output by the therapist and 3) the possibility to record the course of the therapy and the emotional state of the patient. In this chapter we will discuss

these three aspects and their relevance for improving music therapy.

2.1 Expression of emotional state with music

Professional musicians are able to express their emotional state through music in a way that listeners can identify the expressed emotion correctly [6]. Mergl et al. [13] approved this also for non musicians. But a similar study showed restrictions in the identification of the expressed emotions played by the non musician [5]. They conclude that maybe the recipients identify the improvisations of non musicians based on the velocity of the keystroke. This often leads to a mix up of the emotions "anger" and "pleasure". The musical instrument is also a limitation for non musicians. In musical therapy either the percussion instrument or the own voice are used for musical expression. These instruments are easy to use and only less introduction or training is needed. However, using percussion for emotional expressions implicates a reduction of the expressive possibilities to pitch and velocity. For a better identification of expressed emotions by non musicians it would help to have an instrument that can be intuitively played and that offers multiple possibilities to shape multiple musical parameters.

2.2 Interpretation of musical performances

Volland/Hofmann [5] showed that detailed prototypical improvisations of a given emotion lead to the correct interpretation of a whole block of musical performances. During their studies they recognized that if a number of different interpretations of one test person were merged, the rate of correct identification of the feelings would be much higher (ibid.). The process of

decoding the correct feeling seems to be a matter of experience. Is the therapist a musician with a rich musical record, it seems more likely that a music performance is interpreted correctly. This also allows a musical communication between the client and the therapist: If the therapist is a musician, he can reply on the performances of the client, both find a new language to communicate. Another important aspect is relevant on the side of the therapist: The therapeutic experience. Louven [11] found out that people felt very confident on the allocation of emotions to musical performances, even when their interpretation was wrong. It might be a problem in musical therapy that the therapists start the treatment on a wrong interpretation. The correctness of the decoding of clients performances might be improved by two innovations. Firstly a database with prototypical improvisations and the relevant emotions could support the therapist to interpret the improvisation correctly. By giving a range of possible emotions, the database could support a reflexive process to the therapist. Secondly it would help to have a musical instrument that is quickly to handle, with an intuitive usability. This would allow also therapists who are non musicians to use the possibilities of musical therapy.

2.3 Falsification of musical interpretations by the use of tape recording

Louven [11] stated: "The documentation of a therapeutic session on video- or audio tape, allows to analyse and reflect the multiple processes on the level of music, emotion, cognition, movement and sociology to the therapist". However, these recordings could lead to false interpretations. Louven found that the usual practice of audio recording leads to misinterpretations in terms of observed feeling and intensity of feeling. If video and audio recording were used, the interpretation was more often correct, probably due to the additional information of gestures and facial expressions (ibid.). Recording a therapeutic session with a video camera might be a strong intervention in the treatment. Firstly the client feels observed and insecure while it should be the highest priority to make the client confident. Secondly the patient must stay in his seat to be correctly captured by the camera. Finally it should be mentioned that it is challenging to evaluate several hours of video material. A better and faster analysis would be possible if the musical performances of the client would be digitally available. Data about the psychoacoustical and music theoretical parameters of the generated music could help the therapist to evaluate and classify the performances. The digital form would also allow an additional analysis of the musical interpretation with the prototypical performances in the database and with earlier performances of the

relevant patient.

3 An musical instrument to express and assess perceived emotions

In the following paragraph a musical instrument is proposed which shall enable also non-musicians to express emotions musically. The interactive system is shown in Figure 1. The core assumption of the instrument is that emotional properties of musical audio signals are encoded within different physical, psychoacoustical or musical parameters¹. In Figure 1 this is represented by the block "Physical, psychoacoustical or musical parameter spaces". Along its live time a musician learns to vary these parameters on a musical instrument. But to reach a precise and conscious real-time control a long term learning process is required. To enable the player to express own emotions after a short training period, complex physical, psychoacoustical or musical parameters have to be translated into low dimensional "Emotional Parameter Spaces" (Figure 1). The player of the instrument does not control the sound along physical but along emotional dimensions e.g. valence and arousal. This can be done using a "Realtime Controller" (Figure 1) like Frederik Nagels EMuJoy [14] a graphical representation of emotions like the 9 point self assessment manikin (SAM) [1] or a semantic differential (e.g.) labeled with the base emotions found by Hevner [8]. Also an "Timeline Editor" known from audio sequencer software could be used to define paths in the emotional parameter spaces. Having defined an point in the emotional parameter space the patients input is mapped to a physical, psychoacoustical or musical parameters using the "Parameter Mapper" shown in Figure 1. According to Gabriellson's and Lindström's overview [10] the parameters defined by the patient can be mapped to the tempo of a rhythm, the amplitude envelope of an timbre etc. This information again is feed to the "Sound Synthesizer/Drum Machine/Loop generator" which generates the actual audio signal. The advantage of the system is that not only the musical output can be recorded and analysed by the therapist. Additionally the therapist has the possibility to analyse the path in the emotional parameter space directly or to analyse the objective physical, psychoacoustical or musical parameters and its emotional meaning independently. In Figure 1 this is represented by the arrows pointing to the block "Psychotherapist/Data Recorder". An additional feature of the system is given by the blocks "Semantic Analy-

¹An overview on this issue has been provided by Gabriellson and Lindström [10] who showed that emotions are linked to typical amplitude envelopes, to the articulation, the harmony, the loudness, the melodic range, the mode, the tempo or the timbre.

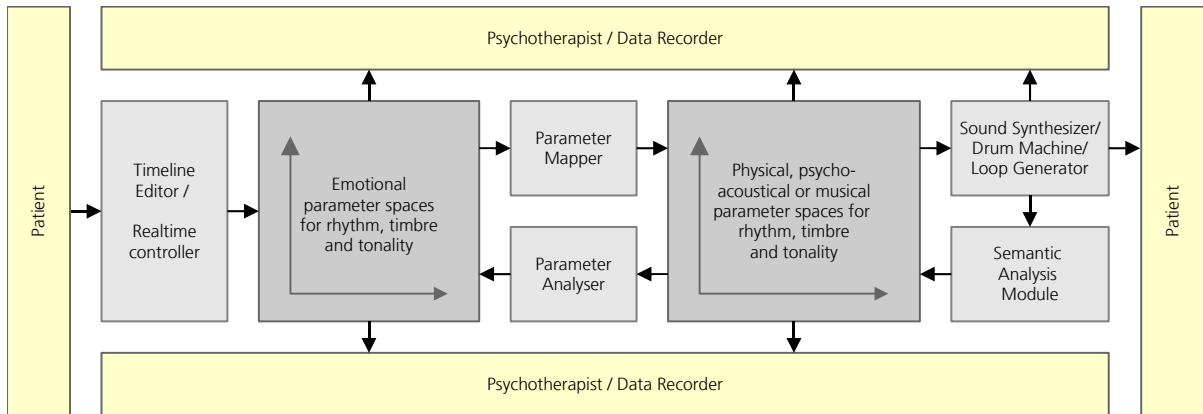


Figure 1: The interactive system

sis Module" and "Parameter Analyser" which allow to analyse an arbitrary musical signal and to map it back, first to several physical, psychoacoustical or rhythmic dimensions and from there or to the emotional parameter space.

To obtain a better reliability we propose to provide an interface which lets the patient express its emotions independently on three levels: 1.) A timbre level, 2.) a rhythmic level and 3.) a tonal level: In the first step the patient is required to select a timbre that best pleases him or that best represents his emotional state using the interface mentioned in the preceding section. In a similar manner the patient is required to find a rhythm, a chord type, a chord transition² or a melodic sequence. In the first period of the therapy the patient defines quasi-static soundscapes which can be analysed and discussed by the therapist. In more advanced levels the patient is also allowed to change the parameters over time.

4 Evaluation

The evaluation of the proposed instrument shall ensure that the system is accepted by the patient and the therapist. If this is fulfilled, the studies mentioned in the chapters 1-3 about the correctness of the interpretation of musical performances have to be reiterated. The method used in the evaluation should meet the advantages of quantitative and qualitative instruments by keeping the individual nature of music therapy on

the one hand and leading to standardized and comparable results on the other (for discussion on the right approach see [4, p.182]). For a successful integration of the proposed instrument into psychotherapy it is a precondition that it is self-explanatory and easy to handle. A tutorial could introduce the main functions and possibilities of this musical instrument to beginners. The tutorial should be evaluated and refined in terms of the learning process and its success. The patients as well as the therapists will be observed during the learning process and will be interviewed afterwards. If the acceptance is confirmed the instrument is integrated into the therapy process. The experiences of the therapists and the patients will be investigated using the repertory grid method which helps to enquire major constructs [9]. The found constructs will reveal information on the major aspects about the feelings and the classification of the proposed instrument. In a second step, these constructs that iterate in several grids could be used for a standardized (quantitative) questionnaire [12]. Once the proposed instrument is accepted by therapists and patients, the scientific evaluation of the musical performances and their interpretation will start. The major questions are whether the musical instrument gives practical advantages in terms of expressing emotional states and a correct identification of these states through the musical performances. Additionally it would be of interest to find out whether it is possible to change/treat the emotional states of a client by using the proposed instrument. The correct identification of emotional states by the therapists will be evaluated in an experimental setting. The test person will be asked to perform given emotions on the instrument. Afterwards the rate of correct identification of the emotions and the intensity of emotions by the therapists will be measured and tested in three

²For the definition of chord types or chord sequences we propose to use the HarmonyPad presented by Gatzsche et al. [7] at the AudioMostly 2008. The HarmonyPad represents pitches in a way that the geometric distances of pitches represent emotional qualities: Neighboured pitches result in consonant tone combinations, more distant pitches result in dissonant ones.

settings: During the performance (live), on a recorded version of the performance and on basis of the digital data of the proposed instrument. Both, the patients and the therapists will be distinguished in musicians and non musicians.

5 Conclusion

We think that much more is possible, if people are not restricted to listen to music only but are enabled to produce their own songs, according to their dominant emotional state. But to this day this "medicine" is only available for musicians. Therefore we propose an instrument, that allows the creation of sound and music not mainly by the control of physical, psychoacoustical or musical parameters but the definition of a path through one or more emotional dimensions. Through this step also non musician patients will be enabled to express its own emotional state musically. Additionally non musician psychotherapists will be enabled – supported by several emotion analysis modules – to interpret the patients musical output correctly. The permanent recording of the digital data generated on several semantic stages within the instrument will prevent irritations of the patients during the therapy by the use of video tapes for recording. Repeating the studies on the identification of emotional states will show if the proposed instrument can support the musical therapy. Together with the feedback from the patients and the therapists it is possible to conclude on the advantage, the proposed instrument has in musical therapy.

The present research and development has been partially supported by the Thuringian Ministry for Culture (TKM) within the project iCycle under contract PE-004-2-1.

References

- [1] M.M. Bradley and P.J. Lang. Measuring emotion: The selfassessment manikin and the semantic differential. *Journal of Behavior Therapy and Experimental Psychiatry*, 25:49–59, 1994.
- [2] Kenneth E. Bruscia. *Defining music therapy*. Barcelona Publ (Nh), 2nd edition edition, 1989.
- [3] L. Bunt. *Music therapy: An art beyond words*. Routledge, 1994.
- [4] L. Bunt and M. Pavlicevic. Music and emotion: Perspectives from music therapy. In Juslin P. and Sloboda J. A., editors, *Music and Emotion: Theory and Research*, pages 181–201. Oxford, UK: Oxford University Press., 2001.
- [5] Volland C. and G. Hofmann. Darstellung und erkennen des emotionalen ausdrucks in musikalischen improvisationen bei kindern und erwachsenen. Online unter: http://www.musiktherapie.de/fileadmin/user_upload/medien/pdf/mu_downloads/volland_hofmann.pdf, 2003.
- [6] Alf Gabrielsson and Patrik Juslin. Emotional expression in music performance: Between the performer's intention and the listener's experience. *Psychology of Music*, (24):68–91, 1996.
- [7] Gabriel Gatzsche, Markus Mehnert, David Gatzsche, and Karlheinz Brandenburg. The harmonypad – a new creative tool for analyzing, generating and teaching tonal music. In *Proceedings of the International Conference on Interaction with Sound – AudioMostly*, 2008.
- [8] K. Hevner. Experimental studies of the elements of expression in music. *American Journal of Psychology*, (48):246–286, 1936.
- [9] G. A. Kelly. *The psychology of personal constructs*. Norton, 1955.
- [10] Alf Gabrielsson E. Lindström. The influence of musical structure on emotional expression. In P. Juslin and J.A. Sloboda, editors, *Music and Emotion: Theory and Research*, pages 223–248, 2001.
- [11] C. Louven. Die beurteilung der gefühlsqualitäten von stimmimprovisationen. ein vergleich von ton- und videoaufnahmen. Online unter: http://www.musiktherapie.de/fileadmin/user_upload/medien/pdf/mu_downloads/louven_audio-video.pdf, 2003.
- [12] Martina Lucht, Nicola Döring, and Helmut Niegemann. Erfüllung der meinungsbildungsfunktion im fernsehen. ein vergleich von herkömmlicher und interaktiver dokumentation. *Television*, 21(2):21–27, 2008.
- [13] R. Mergl, C. Piesbergen, and W. Tunner. Musikalisch-improvisatorischer ausdruck und erkennen von gefühlsqualitäten. In Kleinen G.; Motte-Haber H. Behne, K.E., editor, *Musikpsychologie*, pages 68–81. Hogrefe, 1998.
- [14] Frederik Nagel. *Psychoacoustical and Psychophysiological Correlates of the Emotional Impact and the Perception of Music*. PhD thesis, Hannover University of Music and Drama, 2007.
- [15] H. Smeijsters. Analogie als kernkonzept der musiktherapie. eine psychologische und empirische betrachtung. *Zeitschrift für Musik-, Tanz- und Kunsttherapie*, 14(1):9–18, 2003.
- [16] H. Smeijsters. Forms of feeling and forms of perception. the fundamentals of analogy in music therapy. *Nordic Journal of Music Therapy: Theory Building in Music Therapy*, 12(1):71–85, 2003.