

Andrzej W. MITAS\*

## ABOUT THE POSSIBILITIES OF THE INFORMATICS TECHNOLOGIES APPLICATION IN MUSIC THERAPY

In the paper the music therapy development outline was briefly shown, paying special attention to the state of art and to the remarks of the contemporary researchers. The purpose of the study is to discuss the preparation of the experiments basics in the range of constructing an individually dependent tone set with a therapy use, especially in biofeedback depending on the relaxation state of the patient. The presented issues from the domain of music therapy have a survey and auxiliary character for the biocybernetic research.

### 1. INTRODUCTION

The contemporary medicine goes through its unusual evaluation, implied in one of the most important dimensions by the electronics and informatics technology progress. Informatics and its various applications in medicine, supported by the appropriate, mostly very complicated software, raises hope for next "mile" steps to the improvement of humans' life comfort. Simultaneously, in the face of many cases of conventional medicine being unsuccessful, ways of influence of the human environment to the health state are searched. The common name "alternative medicine" is used here with reference to many therapy technologies, which scientific, mathematical model is too complex, to precise and to describe it definitely. That fact is used very often by those, who make an advantage of the lack of the physical model and calling it "magic", offer their receivers completely absurd theories and grounding on the substantiated "cure" effectiveness they base probably rather on the natural self-defense of the human body or at least on the "placebo effect".

### 2. SHORT MUSIC THERAPY DEVELOPMENT OUTLINE

The therapeutic influence of music was documented in the history of human kind already thousands of years ago. The first legendary music therapist was king David, who cured king's Saul hysterical depressions with tones. At Esculap's sanatoriums special therapeutic music was brought in, which was used by so called "azetologs"<sup>1</sup>. Aristotle and Pythagoras stressed the favourable influence of music on pregnant women, they suggested to apply music also to increase the knowledge revision by the students. Music as a therapy means was used to cure chorea, a disease occurring in the XVI-th and the XVII-th century. The soothing impact of music inspired the therapists of the time to apply the music treatment by hiring musicians and whole, specially appointed orchestras.

Robert Burton, publishing in 1632a tractate titled *The anatomy of melancholy* ([4]) described the influence of music basing on the observations on himself reacting to music. In 1749 an English doctor Brocklesby presented a paper *Reflections about ancient and modern music applied medicinal in various disease cases*, which is treated as the first textbook of this type. He based on examples from his own practice. At the same time a French medicine doctor, Louis Roger, presented "*Tractate about how music affects the human body*". The researcher, who made one more step, crossing the line of the perceptive area, was Pargeter, considering pieces and musical instruments from the medical point of view, which resulted in a definite assignment of the specific music type to given disease entities.

The above mentioned researches concentrated on a subject matter called nowadays with a common name "music therapy". Yet the transition from researches to a strict scientific phase happened not before psychology was defined as a science. This was, that has enlivened the previous neuropsychiatry, which was proposing among other things a completely different new idea of adaptation the music therapy in mental hospitals and in rehabilitation of handicapped persons<sup>2</sup>.

In the quoted bibliographic list, being some kind of a review of music application under the aspect of humans' health domains, exceptionally aged works were singled out by writing them in bold, which reveal the origin of this discipline, that because of its multidimensionality still awaits for a analytical description under the aspect of the impact on a human being.

### 3. DIFFERENT KINDS OF MUSIC'S THERAPEUTIC IMPACT

Music, used as a causative agent in the process of healing in all probability does not subject to that negative rate, which was mentioned in the introduction, at least because of its physical dimension. In the artistic character it is a arrangement of tones in horizontal and vertical dimensions; it is also defined by such elements as rhythm, measure, dynamics, harmony and others. The point of view of a technocrat with reference to music is defined by its character of a mechanical wave, which can

\* Silesian University of Technology; Andrzej.Mitas@polsl.pl

<sup>1</sup> Zob. Korabiewicz W., *Cuda bez cudu. Rzecz o dziwnych lekach*, Ludowa Spółdzielnia Wydawnicza, Warszawa 1988r., s. 106

<sup>2</sup> ibidem, s. 106-111

be described by some features such as frequency spectrum, amplitude characteristics or conditions of the propagation in a given environment. In the music therapy context the transmission medium is usually the air, which material character is mostly omitted, even though its density is, as well known, about  $1.3 \text{ kg/m}^3$ ; amazing are yet obviously literature reports about the ability of ruining a building using infra-sounds with relatively low power. Considering the energy of oscillation of a huge mass of air particles, which are resonating by a source (with corresponding big power range) of a mechanical waves, one can easily understand this phenomenon mentioned above.

It is assumed that infra-sounds are „rather unfriendly”, also in the context of the 7 Hz frequency wave impact (a dangerous frequency for the human brain), unlike to ultrasounds, that are mainly used in medicine, as well as in diagnostic as in various therapies. In the context of medical sounds’ (from the typical audible spectrum) applications, two fundamental ways of interaction should be considered, according to the following graph – fig. 1.

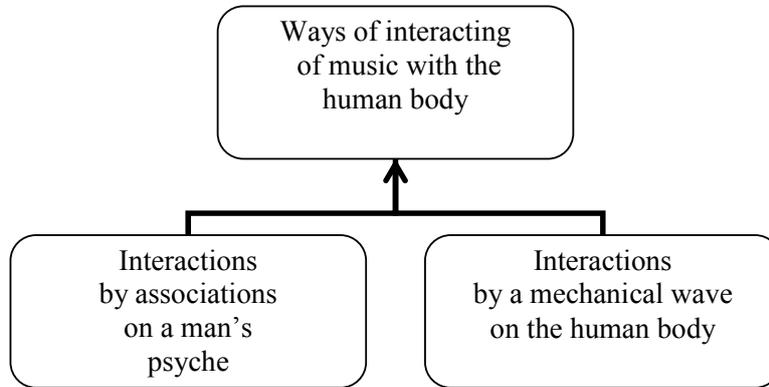


Fig. 1. The influence of music on the human being

The influence on the psyche and the naturally accompanying “placebo effect” are the subject of many psychiatric-psychological publications ([6], [7], [8], [17] et al. – *bibliographic list*). This domain is now still the primary field of music therapy functioning. Historically, the music therapy in its uncontrolled dimension is probably as old as music itself, which is a self-contained proof of its therapeutic character. Considerations of music psychology are on the one hand multidirectional (teaching music and the conditions of preparing a professional instrumentalist, projection and associative music perception...) and on the other hand characterize with observed, absolutely evident clinical therapy effects, which reasons cannot be explain.

Within the confines of the scientific-research activity of the Chair for Informatics Education of Silesian University in Cieszyn many problems were investigated, especially in the common area of the art and pedagogy, taking advantage of the neighbourhood of the Faculty of Ethnology and Education Science and of the Faculty of Art with its significant Institute of Music. One of the master thesis’s, supervised by the author ([18]), range, the statistical analysis of the tone mode “minor-major” preference in context of personality type among other things was made. The random sample of about 100 people was admittedly not a huge one, but the way, people were chosen among the mental patients, makes premises to appropriately serious treatment of the received results – fig. 2.

The diagram shows unambiguous the preferences of tone modes, recognized typical as sad or soft, as its name indicates, among people, who usually need psychiatric or psychological help; happy modes (or according to etymology hard) are chosen by those, who does not need that kind of help yet.

It should be noticed, that the associated “dur” (major) and “moll” (minor) accord differ “only” in the placement of one interval, especially of the third music gamut. The difference is very small, and physically the relative coefficient has a value of any percentage. In this context, even without normalisation and any statistical independence test, the obtained results show evident dependence between the preferred mode and personality type. The modern music theoreticians take the position, that acceptance of some specific harmonic arrangements is a matter of tradition, music education and fashion; even though this kind of these mostly do not pass the test of time (tonal arrangements survived millenniums, although names and order were brought in about three hundreds years ago) and atonal music did not make it outside a small group of fans, while popular music, as one can guess from its name – for people, is still being composed in the traditional, functional harmony.

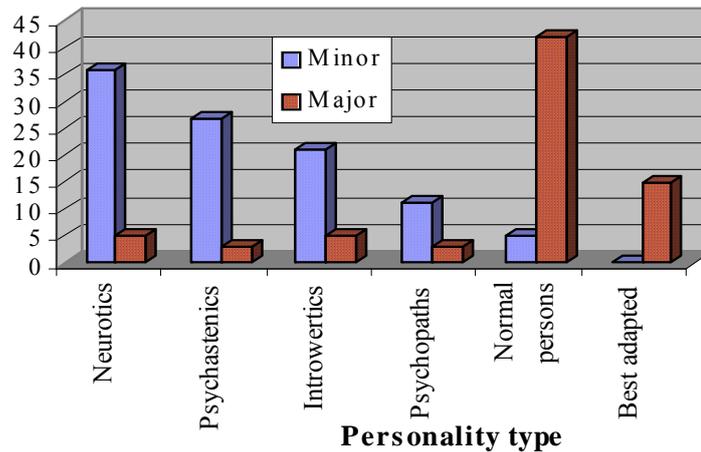


Fig. 2. The preferences of the tone mode

Literary sources from the field of music therapy often include sets of concrete music compositions, that should be used in specific disease cases. This kind of assignment, basing rather on the analysis of the music elements of a given composition together with longtime practice and experience, is rather intuitive and not unique.

The block scheme of a music therapy, presented on fig. 3., shows an approach, when the therapist plays a role of a receiver of the patient's reactions, what implies a high level of the therapist's knowledge and experience.

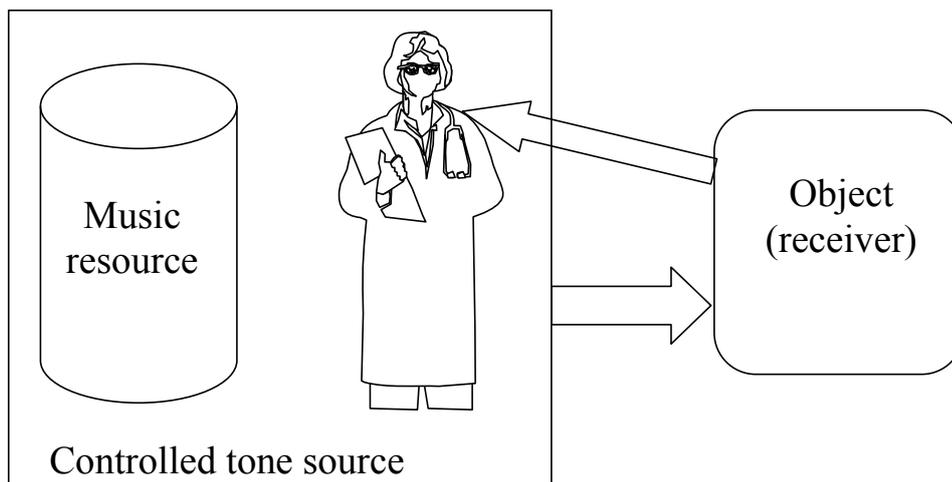


Fig. 3. Information circulation in traditional music therapy

Another approach, entering the biocybernetic field, is the physical impact, illustrated on fig. 3. It is well known, that it is possible to affect the brain work by the resonant influence of infra-sounds, which is even more dangerous because of the fact that such an acoustic wave is completely invisible for the object. By analogy, it might be guessed, that a mechanic impact on other human organs is possible. The thematic literature ([27]) includes theses going far further, specifying concrete tone frequencies appropriate for correction of functioning given human organs, i.e. for lungs it is 220 Hz and for the stomach 110 Hz. The in [27] presented idea of cure possibilities of the whole parts of body is based on the experiments with tuning-forks, which are tuned to pre-defined frequencies. From the point of view of a biocybernetics this theory cannot handle the criticism, because the human individually variability makes us presume, that even in case of sensitivity to a sound wave with a given frequency this function will also be individually differential. After all it is rather the influence of the basic tone on the patient that is considered here, without all the other important music elements (harmonics, wave propagation, delete time etc.).

A mile stone in the area of music therapy was the activity of Prof. Taduesz Natanson from Wroclaw in Poland, whose scientific reports (e.g. [24], [25]) present some weighted views with reference to a correct selection of a music work in therapy, especially under the aspect of composition analysis. In his scientific team researches were taken, also presented in the bibliography, which can be nowadays, by a completely different standard of hard- and software, used as a start point for new projects. These new researches would be concentrated on the quantity analysis of the relaxation state in dependence on the music stimulation. The proposed at the time measure techniques, like EEG, are of course authoritative, however, the problem is rather on the stimulus generator's side, which should receive any feedback signals from the object and then correct the values of the controllable features of music. The proposed experiment was shown in a draft version on the fig. 4. The first step is of course making the choice of these features, whose current values could represent the actual psycho-physical state of the

patient. One could suggest e.g. skin-galvanic reaction, which relative values correspond to the changes of the body state. Another solution could be the measurement of the body temperature with correlation to the current hearth state. The biggest set of exact information about our body is naturally given by the EEG; however, here we have a difficulty with the usability of the measure system. The correct choice of the feedback signal in this classic control unit with feedback is just one of the problems. The other, more complex, is the problem of the algorithm for stimuli generator in function of the character and current value of the feedback signal.

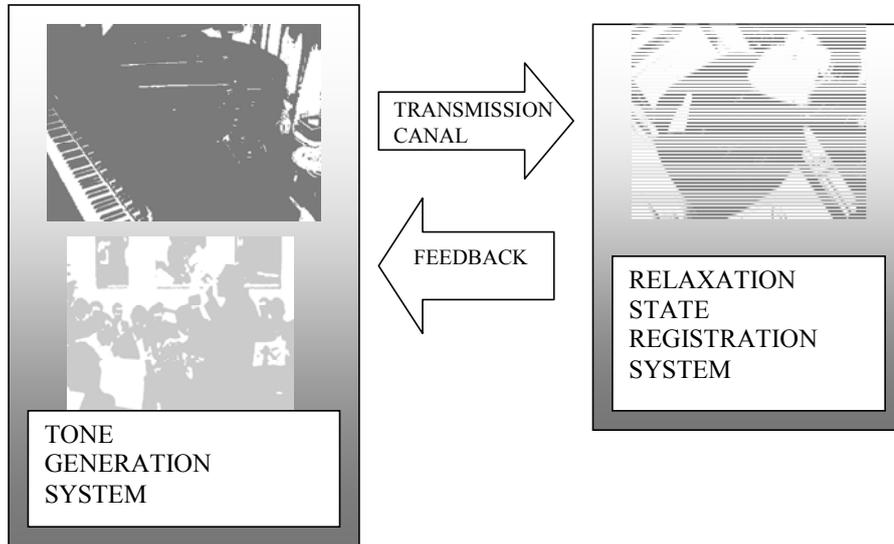


Fig. 4. A schema of a biocybernetic experiment

#### 4. SUMMARY

Music is omnipresent in the everyday life of men. It occurs often without a listener's conscious perpetration, it is an element of his surroundings. If it is too loud, it can lead to obvious hearing injuries, aggressive and disturbing – it is a music background for many media news (used probably to increase the concentration), sometimes it is a way of creating a romantic atmosphere... Therefore, it is naturally essential. There is “only” a question – why? Its entertainment's character is not a satisfactory motivation of its permanent presence. The influence on the psyche is indisputable, indisputable is also the difficulty in establishing any relations. The planned experiment, which assumes the use of a generator of audible sounds with programmable basic frequency, with a controlled composition of harmonic frequencies, with adjustable dynamics, rhythm and music measure, allows to find an all the music parameters' changing methodology to set such a sound source, that would lead in the next step to the improvement of the patient's comfort.

#### BIBLIOGRAPHY

- [1] Aranowska E., Pałosz P., Relacje między preferencjami muzycznymi a percepcją muzyki, materiały z LI Otwartego Seminarium z Akustyki, Gdańsk- Sobieszewo, 06 - 10.09.2004r.
- [2] Aranowska E., Witkowski P., Zieliński P., Wpływ koloru otoczenia i stanu emocjonalnego słuchaczy na percepcję muzyki, (w:) pod red A. Rakowski, Kształtowanie i percepcja sekwencji muzycznych, Wydawnictwo Akademii Muzycznej, Warszawa 2002r.
- [3] Brown R., *Medicina Musica*, Nottingham 1929r.
- [4] Burton R., *The Anatomy of Melancholy*, Oxford 1632r.
- [5] Chomet H., *The Influence of Music on Health*, London 1930r.
- [6] Colonna-Kasajan D., Muzykoterapia i trening relaksacyjny jako metody oddziaływania psychoprofilaktycznego w toku edukacji dzieci w młodszym wieku szkolnym – na podstawie badań i doświadczeń własnych, (w:) red. Nauk. L. Kataryńczuk – Mania, Innowacje pedagogiczne w edukacji muzycznej dzieci i młodzieży, Wydawnictwo Wyższej Szkoły Pedagogicznej, Zielona Góra 2000.,s.61-67
- [7] Dywicki Z., Elementy muzykoterapii w pracy z dzieckiem upośledzonym umysłowo, *Wychowawca*, nr 1, 1998r., s. 20-21, 36-37
- [8] Galińska E., Muzykoterapia schizofrenii, *Zeszyt Naukowy Akademii Muzycznej we Wrocławiu* , nr 57, 1990r.
- [9] Galińska E., Historia poglądów na lecznicze działanie muzyki, (w:) *Muzykoterapia, wolność, wyzwolenie, „ALBO albo – Inspiracje Jungowskie”*, 1/1992.

- [10] Galińska E., Kierunki rozwojowe w polskiej muzykoterapii, Zeszyty Naukowe Akademii Muzycznej we Wrocławiu, nr 45, 1998r.
- [11] Gajdzica Z.: Struktura programu komputerowego adresowanego do ucznia z lekkim upośledzeniem umysłowym (w:) A.W. Mitas (red.) Pedagogika i Informatyka, UŚ, Cieszyn 2001, ISBN 83-910722-5-8
- [12] Giza M. „Stymulacyjny wpływ muzyki na aktywność ruchową człowieka”, Kultura Fizyczna, nr 3/4, 1995.
- [13] Iwanicki H., Muzykoterapia jako forma oddziaływania terapeutycznego, Opieka, Wychowanie, Terapia, nr 4, 1999r., s. 38
- [14] Janiszewski M., Muzykoterapia aktywna, Wydawnictwo Naukowe PWN, Warszawa Łódź 1993r.
- [15] Janiszewski M., Muzyka w profilaktyce, leczeniu i rehabilitacji, Akademia Muzyczna w Łodzi, Łódź 1998r.
- [16] Knoch Hans-Georg, Knauth K., Leczenie ultradźwiękami, Państwowy Zakład Wydawnictw Lekarskich, Warszawa 1984r.
- [17] Kołda U., Terapeutyczne oddziaływanie muzyki na całkowite lub częściowe wyeliminowanie agresji u dzieci upośledzonych umysłowo w stopniu lekkim, Szkoła Sepsjalna, nr 5, 1998r., s. 360-361
- [18] Kopczyński T., Tonalność w stanach relaksacji, Dyplomowa praca magisterska, Uniwersytet Śląski, Cieszyn 2006. Promotor Andrzej W. Mitas
- [19] Korabiewicz W., Cuda bez cudu. Rzecz o dziwnych lekach, Ludowa Spółdzielnia Wydawnicza, Warszawa, 1988r
- [20] Kronenberger M., Muzykoterapia. Podstawy teoretyczne do zastosowania muzykoterapii w profilaktyce stresu, Wydawnictwo Mediatour, 2005r.
- [21] Metera A., Muzykoterapia. Muzyka w medycynie i edukacji, Wydawnictwo CTN Metronom, Leszno 2002r.
- [22] Mitas A.W., Pietruszka A.B., Wybrane problemy muzykoterapii. Monografia: „Tradycje kształcenia nauczycieli w Cieszynie (Od Polskiego Seminarium Nauczycielskiego do Filii Uniwersytetu Śląskiego)”, UŚ, Cieszyn, 2008r.
- [23] Mitas A.W., Stokłosa M., Golak S., Komputerowa metoda oddziaływania na stan relaksu, Czasopismo „Informatyka”, listopad/grudzień 2000, ISSN 0542-9951
- [24] Natanson T., Programowanie muzyki terapeutycznej: zarys podstaw teoretycznych, Akademia Muzyczna im. Karola Lipińskiego, Wrocław 1992r.
- [25] Natanson T., Wstęp do nauki o muzykoterapii, Zakład Narodowy Imienia Ossolińskich, Wrocław – Warszawa – Kraków – Gdańsk 1979r.
- [26] Raszevska M., Rola muzykoterapii w pracy z dziećmi upośledzonymi, Kultura Fizyczna, nr 3/4, 1998r., s. 21-23
- [27] Romanowska B, Kamertony i muzykoterapia w leczeniu dźwiękiem, Wyd. KOS, 2004r.
- [28] Savil A., Music, Health and Charity, London 1923r.
- [29] Schiftan Y., Stadnicki A., Terapia akustyczno-wibracyjna Musica Medica w oddziaływaniach zdrowotnych i pedagogicznych, Akademia Pedagogiki Specjalnej im. Marii Grzegorzewskiej, Warszawa, 2003r.
- [30] Schwabe Ch., Leczenie muzyką chorych z nerwicami i zaburzeniami czynnościowymi, PZWL, Warszawa 1972r.
- [31] Sidney L., Music in Medicine, Boston 1946r.
- [32] Szulc W., Woźniak J., Opala T., Rzymiski P., Muzyka w medycynie, a muzykoterapia, Przewodnik Lekarza nr 8, 2002r., s. 99-103
- [33] Szulc W., Muzykoterapia jako przedmiot badań i edukacji, Wydawnictwo UMCS, Lublin 2005r.
- [34] Weir L.E., Music Therapy, Kansas 1952r.
- [35] Wood M., Music for Mentally Handicapped People, London 1983r.
- [36] Żychowska T., Wychowanie muzyczne w resocjalizacji młodzieży w zakładzie poprawczym, Szkoła specjalna, nr 4, 1976r.

