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STIMULATION METHODS IN MUSIC THERAPY – SHORT DISCUSSION TOWARDS THE BIO-CYBERNETIC ASPECT

In the paper music therapy was briefly discussed, paying special attention to the state of art under the aspect of stimulation methods which are typically taken into consideration in this process. The purpose of the study is to discuss the possibility of proper defining of the crucial parameters for music therapy, depending on the unique determinants of the individual patient's character. It is pointed out, that in a therapy especially a metre and rhythm should be considered as the main elements of the generator for music stimulation.

1. INTRODUCTION

There are many definitions of music therapy. Most of them are collected and described in [1]. Almost every researcher from the field of music therapy [7, 8, 11] has an imperative to formulate his own world of definitions, avoiding drawing conclusions of axiomatic-deductive character. It can be guessed that the area of so called "music therapy" is so not surveyed that we are not able to defined the absolutely basic notions.

All scientists axiomatically assume the positive music's influence on the human body but typically in the literature the problem of the negative or even damaging effects is rarely mentioned if ever [5]. It is even more surprising that the authors or consultants in this field are mainly doctors who should be long life guided by the rule "primum non nocere".

In this context, regarding to lack of any quantitative guidelines concerning stimulation of the human body by sounds, the music therapists' activities are similar to dosing medicine without quantitative rules of use and the only pointer would have to be the patient's state after application. In selected papers the factor of acoustic pressure is pointed out but only in regard to the standard hearing organ and the mechanical attribute (vibrations – [10]) are emphasized in this case. It can be here colloquially assumed that "what does not kill you, makes you stronger", but taking into consideration the harmful influence of the low-tone speakers during the public concerts on our body, at first it would be worth researching the limits of experiments on "living organism". Probably it is assumed, that the human body, while unwilling the acoustic stimuli of music dimension, if only it has such a possibility, will effectively defend itself against the easy to shield sound wave. On the engineering point of view only these physical principles have the value of the common usability, which results are measurable. This can become fact only when the stimuli are prior measurable.

We have to pay attention to this aspect mainly because music is very hard to define in the holistic approach. The specified music's elements have to be parameters, whose appropriate selection makes the controllability of the object (listener) by sound's stimuli more possible.

2. STATE OF ART – THE WORLD OF DEFINITIONS

On the basis of the ideas presented in [10] we can become convinced that music therapy has relatively immeasurable properties and is described mostly rather on the foundation of medicine or psychology. On the page 16th of this above mentioned publication a definition of World Federation of Music Therapy is given. It expresses the object of our considerations as follows: "Music therapy is the usage of music ... in the process that is designed for the convenience of communication, learning ... for the development of inner potential and also for the development or rebuilding of the individual's functionality, so that this individual would be able to reach ... the better life's quality".

In the very similar form, in the mentioned literature, the other opinions which relate to the stimuli's application are presented. Quite often there are to find such descriptions of stimulation's methods like "... a little bit of jazz..." or "... practically everybody (75%) of the polled patients had stated, that the music had a calmativ influence on them ...". Respectfully for the research efforts of the persons who dabble in this area, a bio-cybernetic measurement's insufficiency can be noticed. On the other hand; the observed and in the topical literature described reports of the carried out experiments give us the absolutely sufficient imperative for systematic, engineering approach in the frame of quantitative stimulation methods.

The proper foundation for getting off the researches on this bio-cybernetic area can be established by [11] in a given definition, which was formulated by Juliette Alvin. It describes music therapy as "...a controlled using of music for treatment, rehabilitation, education and training of adults and children, suffering from disorders..."

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3. STIMULI FOR MUSIC THERAPY

Numerous criteria for music classification, especially in the aspect of music therapy, are rather related with the expected therapeutic effect on the psychiatric-psychological area. An undoubtedly important psychiatrist opinion (from the utilitarian point of view) was presented in [4]: the doctor expects from musicians the recordings that are "... reflecting a certain psychological states, including basic human feelings." This sentence refers to some attempts to categorize the music, classified (for example, by [4]) into music designed for rhythmic movement's stimulation, for listening (entertainment), for attentive listening (requiring the full concentration) and the working (irritating) on the senses music (including rock music, etc.). The difficulty of the discussion of musical preference is obvious, so perhaps it would be better to avoid any quality classification, because of the primary preferences, for example, with regard to the music scales ("our" - major/minor, but also in Europe the scale of the Gypsy, Highlander, not to mention about the "Eastern" scales).

The fragmentation of musical material into sounds is also conventional – every day we use twelve primary sounds of the chromatic range, but there are known cases of classification of the octave into 70 "tones" (to eliminate, of course ineffective, of "Pythagorean comma"). The author's classification of music in terms of the intentions of its creators include the following classes (they can have common areas, of course):

- a) music as a factor that stimulates the intended movement (dominated by utility factor, although a kind of goal function, which relies on the putting into a rhythmic trance state, is also obvious),
- b) music exposing the emotionality of the musician, who is just making music (composer, performer, improviser)
- c) music which inspires recipient's emotionality (derivative of carefully studied composer emotionality, in a controlled manner modified by the emotionality of the performers).

Dominant trend in the selection of therapeutic stimuli determines the huge set of typically well known and accepted music works, generally named "classic music". A set of Mozart, Bach and Vivaldi works, given in the literature (e.g. [10], p. 8) as a valuable items for the therapy, actually does not provide any information about stimulation, because the versatility of these composers assure the real presence of all the basic music elements (melody, harmony, rhythm or measure). In opposition to these recommendations remains the "relaxation" music which is actually fuzzy in terms of music elements. This kind of "therapy works" combination, often also defined more precisely by the therapists to the concrete pieces or parts of them (e.g., the list contained in [4], p.64), is probably the result of their valuable own activities, quite often fructified by therapeutic successes, however in the axiomatic-deductive sense not necessarily provides a basis for determining the optimal set of stimulation. After all, any trial of any specific common music features selecting in the case of the above mentioned famous composers, has not real chance for success; and supplementing by so called relaxing (modern) music we obtain a whole continuum audible sounds.

An often considered therapeutic aspect is the tonality of music pieces. The musical scale (in choral harmony and it dominates in music) is based on the frequency which is fixed by the tonic.

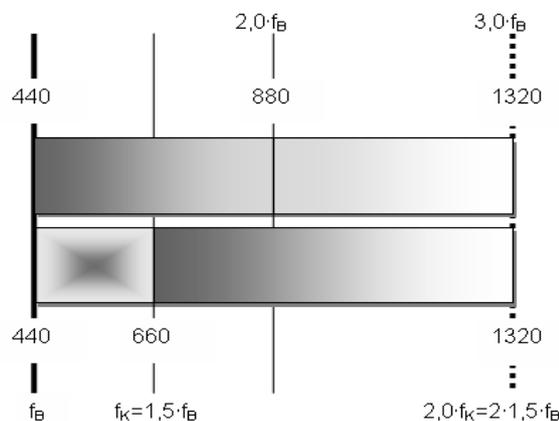


Fig. 1. Basic idea of harmonic's equivalence

In the author's monograph "Music and Bio-cybernetic" (which is just being prepared) this subject of musical tuning plays one of the main roles, especially with regard to the Fourier-analysis. An illustration for the problem of the consonance's concords is given in Fig. 1. The symbols f_B and f_K mean here frequencies of tonic and fifth respectively. Two sounds are total compatible consonantly, if they are tuned according to Pythagorean key, because in this case the second harmonic of the fifth and the third harmonic of the tonic are equal, and it means, in the acoustic practice, the lack of rumbling. After many centuries of trials "to improve" the Pythagorean tune, Johann Sebastian Bach had proposed and popularized the so called "uniform, equable tune"; in the practice it means, that all the sounds of the gamut (without octaves) are consistently put out of tune. However, this putting out is slight, so that the typical intervals seem to be perfect, while listening to (for most of us). In Fig. 2. there are shown the differences between the frequencies of a selected octave (G-g) and in Fig. 3 there are presented the relative errors of these frequencies. We have to take into consideration the really insignificant deviation from the "ideal" level; these are laboratory values, ca. 1%. The differences are real inaudible, and not only for the worse musically educated ear.

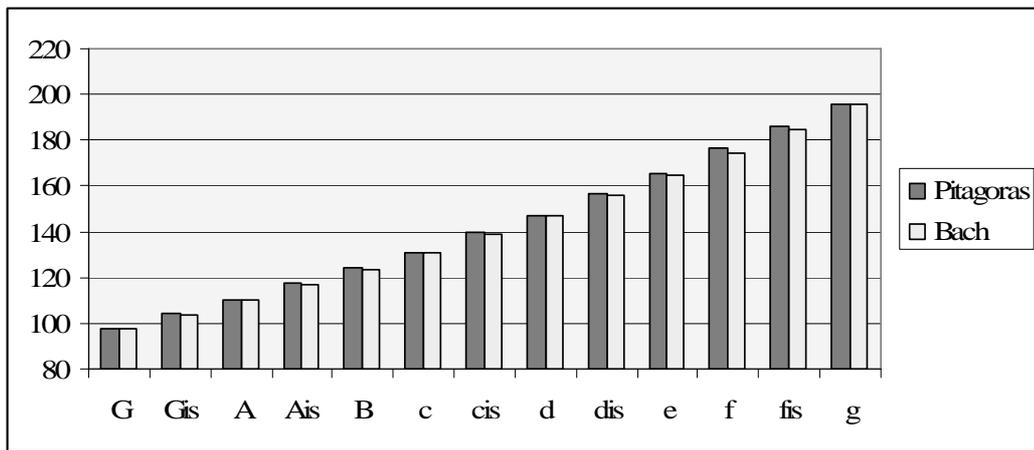


Fig. 2. Differences (in Herz) between sound's frequencies for an whole octave in the case of Pitagoras' and Bach's tuning

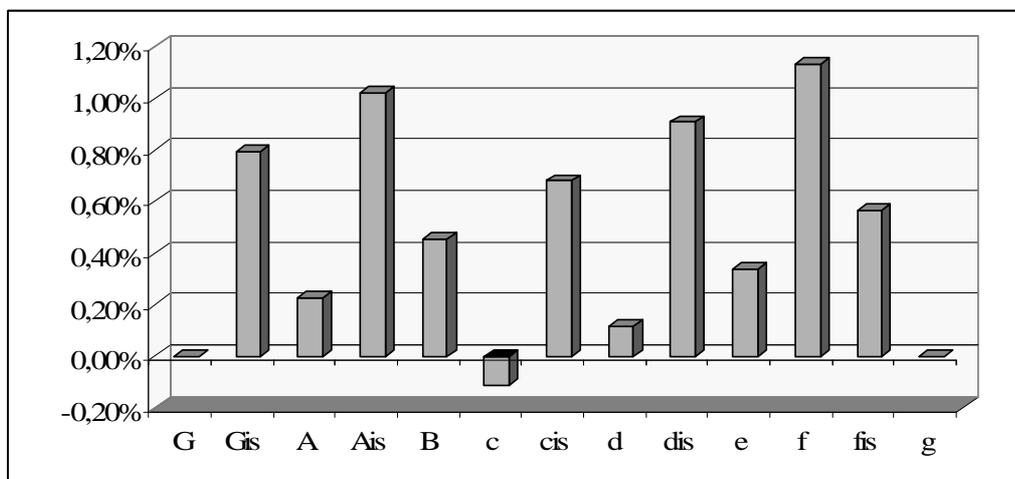


Fig. 3. Relative error for the octave's tones (Bach v. Pitagoras)

Another problem, that is connected with the influence on a human body of defined musical key (it is suggested in many publications that consider the music therapy), is the reference frequency for the tuning of a musical instrument. At present, it is caught on the value of 440 Hz as a standard; however at that time, when the so called "classical" music pieces had been composed it wasn't obvious. Just in opposite. The tuning had lower reference frequency mostly. A contemporary brass band is toned higher, e.g. to 443 Hz. The musical instrument at home changes typically its tune about 1-2Hz few days after tuning. In this context a supposition of an "exceptionality" of any given musical key is not justified. It could be consider and potentially accepted, that some keys are less or more advantageous (for example for a pianist the gamut C-major and for a violinist Fis-major is "uncomfortable", while the H-major and G-major are all right respectively). Therefore also the music pieces, that have been written in these scales can have any special expression, however, following rather from the anatomy of composer and not from any exceptional character of a scale. It is easy to prove, that the change (also of any percents) of the reference frequency for the tuning won't be mostly noted by a listener, excepting the extraordinary people with an absolute hearing.

4. SUMMARY

Music is a so evident part of our everyday live that calling in question of its influence of a human being principally doesn't last out the trial of time - [6]. Justifying atonal, arrhythmic or going beyond the functional harmony of music pieces is not persuasive regarding to the preferences of so called mass recipient. It can be assumed, that a not well musically educated listener will prefer the music forms of lower complexity. However, it would be difficult to defend a thesis that he would be exposed (by himself) instinctively to such kind of music, that his body would have to "struggle" with it. Just in opposite, we usually like rhythmical music and also syncopated, with sufficiently laud articulated metro-rhythmical factor, especially in the lower frequencies range. Moreover, the results of the experiments, which used mechanical vibrations stimulations of acoustic frequencies onto ill, specified by the patient places of his body [10], seem to prove qualitatively the correctness of the statement of a medical researcher who means that: "... music is a reflection of rhythms which are specific for human body's functionality..." ([10], p. 19).

Multi-sensory reception of sound stimuli is probably therapeutically profitable, however it would be difficult (if possible at all) to carry out a quantitative deduction that could check the correctness of heuristic remarks.

It seems that the positive research results of reaction strengthening of the hearing perceptions channel by so called "vibration transmitters" – [10] is semantically coherent with the remarks owing from the observations of the patients' reactions exposed to tuning fork's technique – [9], which have many followers, especially among therapist (the tuning fork is an obvious "vibration transmitter").

The main conclusion, to use in the currently carried out quantitative experiments based on the literature which presents real therapy researches and taking into consideration own results and calculations, can be express as follow:

Fundamental, measurable factor of the stimulation in music therapy is given by a set of music elements: measure and rhythm.

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