

Musical Styles and Reactivity Recorded by Polygraph

Valentina-Elisabeta Constantin

National University of Science and Technology Politehnica Bucharest, Department of Training for Teaching Staff and Social and Human Sciences, Splaiul Independentei St., nr.313, Bucharest, Romania

Corresponding author

Valentina-Elisabeta Constantin, National University of Science and Technology Politehnica Bucharest, Department of Training for Teaching Staff and Social and Human Sciences, Splaiul Independentei St., nr.313, Bucharest, Romania.

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ABSTRACT

"Music brings man out of himself and out of the world, it lifts him above himself and the world, being the most beautiful revelation of God." Music is one of the most mysterious forms of art, which exerts a fascinated attraction. It provokes and excites us, it enchains us with its power, it enslaves us, but it never ceases to delight us. In this research, the testing of musical tendency and the relationship between behavioral reactions and musical liking/disliking was carried out by means of a questionnaire and emotional reactions, which were observed through certain behavioral reactions of the research respondents by means of the Polygraph machine at the Faculty of Psychology of Hyperion University. The correlation between the scores recorded with the help of the Polygraph and the scores recorded after the application of the questionnaire targeting musical liking/disliking was followed. We assume that there is a statistically significant difference between the preferences (pleasure/displeasure) for different musical styles (Latin, rock, pop-'dance, and neutral sounds of nature- the sound of the sea waves and the sound of chirping of birds, the sound of rain). The respondents of the research are 31 person, aged 18-35 years, 17 female and 15 males. The group [of participants was chosen in nonprobability round- robomized sampling style, from several activity backgrounds: student, employees, entrepreneurs. Following the realization of the research the hypothesis was confirmed, we admit that the result is highly statistically significant between all the means of the analyzed parameters, the subjects' reactions showed statistically significant difference between the first and the second measurement performed. The limitations of this research being the time, the number of participants, the limited number of musical stimuli, the mood of the participants at the time of the research. For future research we propose a larger number of participants and musical stimuli, in different time periods and in different groups.

Keywords: Musical Stimuli, Emotional Reactions, Behavioral Reactions, Preferences (Liking/ Disliking), Polygraph, Neutral Sounds

"Music makes man come out of himself and the world, it raises him above himself and the world, being the most beautiful revelation of God." Music is one of the most mysterious forms of art, which exerts. Fascinated attraction. It challenges and excites us, chains us with its power, enslaves us, but never ceases to delight us. In this research, the musical tendency and the relationship between behavioral reactions and musical pleasure/ displeasure were tested through a questionnaire and emotional reactions, which were observed through certain behavioral reactions of the research respondents using the Polygraph device at the Faculty of Psychology of Hyperion University. The correlation between the scores recorded using the Polygraph and the scores recorded after applying the questionnaire targeting

musical pleasure/displeasure was followed. We assume that there is a statistically significant difference between the preferences (pleasure/displeasure) for the different musical styles (latino, rock, pop-dance, and neutral sounds from nature the sound of sea waves and the sound of birds chirping, the sound of rain). The respondents of the research are 31 people, aged between 18-35 years, 17 female and 15 males. The group of participants was a non-probabilistic random sampling, from several areas of activity: students, employees, entrepreneurs. After conducting the research, the hypothesis was confirmed, we admit that the result is highly statistically significant between all the averages of the analyzed parameters, the reactions of the subjects presented a statistically significant difference between the first and second measurements performed. The limits of this research are time, the number of participants, the limited number of musical stimuli, the mood of the participants at the time of the research. For future research, we propose a larger number of participants and

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musical stimuli, in different time periods and in different groups. In recent decades, the study of music processing has gained momentum in Cognitive Psychology and interdisciplinary fields dealing with brain-behavior reality. Topics such as: "Emotions induced by music", "The innate character of syntactic processing or the emotionality of music" have become frequent in scientific journals of Psychology and Cognitive Neuroscience.

There are multiple attempts to define music Jules Combarieu stated that "it is the art of thinking with sounds", Yehudi Menuhin specified that "music is man, more than words, because words are nothing but abstract symbols that convey real meanings based on facts", J. J. Rousseau defined music as "the art of combining sounds in a manner pleasant to the ear", Firth said that it represents "organized sounds that can be distinguished from noise". Borris Luban-Plozza defines music as "a sound architecture, governed by specific laws regarding the succession (melody, rhythm), timbre qualities and superposition (harmony) of sounds and having a double impact (psychic and organic) on the listener's body based on the listener's decoding of a message that it conveys, intuitively or through evaluation based on rational evaluation of the combination of sounds received via the acoustic analyzer."

According to Frideriche Nietzsche: 'music, in the total absence of its limits, needs neither imagination nor concept, it tolerates both alongside itself', and Anthony Storr states that music is 'a nonverbal art directly related to physiological arousal, which can be measured with scientific instruments.'

The main elements of the musical structure are: sounds, characterized by pitch (frequency), intensity and timbre (color) that are linked by "filling" the empty sound space.

The musical stimuli in the research are: - the experimental paradigms used pleasant/unpleasant musical fragments, which induced joy, boredom, anger, Calm etc., these emerging from different genres of music: dance, classical, folk, rock, jazz, Latin- American, electronica, new-age dance, oriental, haute club, and others.

The general psycho-neuro-physiological processes involved in listening to music are: sensory processes, with the participation of the acoustic analyzer; acoustic processes proper-the reception of sounds as such in both symmetrical areas of the temporal lobes; musical processes proper-the integration of isolated qualities of sounds, but also of musical motifs and phrases, as well as rhythms; intellectual-affective processes-which reflect the awareness of musical perception, the analysis of the musical 'Technical' Content, but also the 'ideational-emotional' experience of the message conveyed by the music listened to.

Scientific research methodology: Hypotheses

Alternative hypothesis (H1): We assume that there is a statistically significant difference between the preferences / state (pleasure / dislike) for different musical styles within the group of 31 people tested using the Polygraph.

Null hypothesis (H0): We assume that there is no statistically significant difference between the preferences / state (pleasure /

dislike) for different musical styles within the group of 31 people tested using the Polygraph.

Sample /Participants:

The research was carried out on a sample of 31 people aged between 18-35 years, 17 women and 15 men. The group of participants were in the style of non- probabilistic random sampling, from several activity environments: students, employees, entrepreneurs. Following the research.

Instruments:

The following instruments were used in the study:

1. Polygraph device, Lafayette brand, model LX 4000, computerized system, together with the LX 4000 VARIANT 9. 9. 5 programs with measurement sensors: P2- Thoracic Respiration; EDA- Electrodermal; Cardio (Cardiovascular), with the following measured parameters:
 - LLRT - Thoracic Respiration Line Length;
 - RR - Respiratory Rhythm;
 - Rc- Cardiac Rhythm;
 - ARED- Electrodermal Reaction Amplitude;
 - RED- Mean Electrodermal Reaction Value (ohms);
 - ATAB- Amplitude of Brachial Pulse Arterial Tension.2).
2. Questionnaire consisting of 16 items, of which: The first 6 items, measured on a Likert scale from 1 to 5 9 where 1-1- means Very Little, 2-Little, 3- Appropriate, 4-A lot, 5. Very Much), the questions continued: "- How much did you like each stimulus? ". Items 7, 8 and 9 measured with the same Likert scale contained the questions:" - How much did you like dance, Latino, pop-rock music, in general?"

Items 10 and 11 on the Likert scale continued the questions: "- Which of the 6 musical secrets did you like the most?" Items from 12 to 17 targeted emotional stimuli - It was requested to choose a significant emotion from 11 significant emotions, for each emotional stimulus in particular. The statement of emotions from the questions and related definitions (Larousse, Paul Popescu NeVEANU, Dex.):

1. **Euphoria** - general emotional-affective state of satisfaction and good mood.
2. **Joy** - feeling of lively contentment and spiritual satisfaction.
3. **Sadness** - oppressive state of mind, grief, bitterness, regret.
4. **Enthusiasm** - state of strong enthusiasm, drive, ardor, passion, exaltation.
5. **Irritation** - state of annoyance, nervous excitement: hypersensitivity to external stimulation, which usually accompanies an embarrassing emotional state.
6. **Amusement** - fun, entertainment, cheering up, recreation.
7. **Detachment** - detachment, detachment, separation from a unitary whole.
8. **Surprise** - unexpected, unforeseen, feeling, state of astonishment, amazement, surprise, observation, discovery, awareness of a momentary aspect.
9. **Boredom** - a depressing mood, mild depression caused by loneliness, lack of unattractive occupation, monotony, emptiness.
10. **Disgust** - aversion to something, disgust, disgust.
11. **Balance** - a state of peace, harmony, stability, and joy.

Procedure

The research respondents received instructions on how to use the Polygraph device in the experiment and how to complete the Questionnaire. They also expressed their Consent to participate in the study, so that we could use the results obtained for scientific purposes.

The Polygraph Device was tested in the Experimental Psychology Laboratory at Hyperion University, on a sample of 31 people as follows:

- The three measurement sensors were applied to each participant in the experiment: the sensor for thoracic breathing, the sensor for electrodermal reaction and the cardio sensor.
- Each participant in the experiment listened to the 6 musical sequences (3- musical and 3- with neutral sounds, from nature).
- The recording of the measurements from the Polygraph device was carried out at the same time as the subjects listened to the audio sequences, so that the psychophysiological reactions were recorded accurately.
- The recording of the subjects' reactions to the listened audio sequences was done twice, the first time in the initially

established order, stimulus - rain, Abba; stimulus - bird chirping, Bailando (Enrique Iglesias); stimulus - Sea Waves -, ACDC, and in the second measurement in a changed order compared to the first measurement.

- After listening to the audio sequences, the Questionnaire with the 17 items was applied to each participant.
- N O1 O2 O3 X1

N- Non-Equivalent groups 9 equal in number, but are not identity, the difference being observed after the intervention of the observer, that is, after changing the order of the musical sequences and the neutral secrets in the second measurement, experimental design and variables: O1- questionnaire
O2-Measurement 1 of Polygraph Reactions
O3- Measurement 2 of Polygraph Reactions

X1- Examiner intervention by reversing rhythmic and neutral music sequences. The experimental design used in this research is a correlational design with non-equivalent groups, and the method used is a non-experimental one. This design is "used to establish relationships between pre-existing behaviors and to predict a set of behaviors from other behaviors. [1]. The data collected from the polygraph and questionnaire

Table 1 : Statistical analysis includes the averages of the variables obtained for each type of music, in the two polygraph measures (time 1 and time 2) and the Questionnaire Averages

	RAIN	CHIRP	WAVES	ABBA	ACDC	LATINO
LLRT1	1,054.77	1,128.00	1,161.52	941.03	1,074.45	1,083.81
LLRT2	1,157.16	1,193.90	1,177.45	1,048.77	1,099.65	1,098.84
RR1	17.77	18.03	17.81	19.48	19.26	19.19
RR2	18.32	17.87	17.19	19.35	19.18	19.47
MEDIA RR	18.07	17.95	18.00	19.42	19.18	19.47
ARED1	9.64	7.42	6.97	10.80	7.88	8.28
ARE2	6.90	7.14	6.50	7.28	6.48	6.73
Media ARED	8.27	7.28	6.74	9.04	7.18	7.50
RED1	281.23	279.03	283.39	278.61	287.87	280.87
RED2	300.74	292.26	309.97	316.03	306.35	296.61
Media RED	290.98	285.65	296.68	297.32	297.11	288.74
RC1	71.45	73.10	72.55	73.45	74.35	72.03

Measurement was coded and entered into xl and the said statistical program.

dependent variable - polygraph parameters - the reaction of the subject's body exposed to musical stimuli. 9 reaction speed to certain stimuli, recognition of certain sounds or syllables, appreciation of distances. etc.and cognitive dependent variants. \Independent variable - musical stimuli and pleasure/displeasure [2].

Results

LLRT 1- Thoracic breathing length (LLRT1 di LLRT2) highest variant - 1, 161.52 - Sea waves

LLRT 1- The value lowest-941.03-ABBA

LLRT2- HIGHEST VALUE - 1,193-Chirp LLRT2- LOWEST VALUE-1,048.77-ABBA

RR-RESPIRATORY RATE -RR1 AND RRRR1- Highest

value -19.48-ABBA RR1 -Lowest value- 17.77-Rain
RR2-highest value - 19.74- Latin RR2- lowest value-17.8-Chirp

ARED- Electrodermal Response Amplitude (ARED1 and ARED2) ARED1- Highest value - 10.80- ABBA ARED2- Lowest value -6.97-Sea waves ARED2- Highest value -7.28- ABBA
ARED2-Lowest value low-6.48-ACDC

RED- Average value of electrodermal reagents in ohms (RED1 and RED2) RED1- Highest value - 287.87- ACDC

RED1- Lowest value- 278.61-ABBA RED2- Highest value- 316.03-ABBA RED2- Lowest value- 292.26 – CHIP

RC - HEART RHYTHM (RC1 AND RC2)

RC1- Highest value -74.35 - ACDC RC1- Lowest value - 71.45- RAIN RC2- Highest value- 76.26- ACDC RC2- Lowest value- 71.94- LATINO-ENRIQUE

ATAB- Pulse pressure amplitude (ATAB 1 and ATAB2) ATAB1- Highest value- 3.11-RAIN

ATAB1- Lowest value- 2.17- ACDC ATAB2- Highest value- 2.96-CHIRPIT

ATAB2- Lowest value- 2.41- ACDC

Statistical analysis includes the averages of the variables obtained for each type of music, in the two polygraph measurements (time 1 and time 2) and the averages of the questionnaire [3].

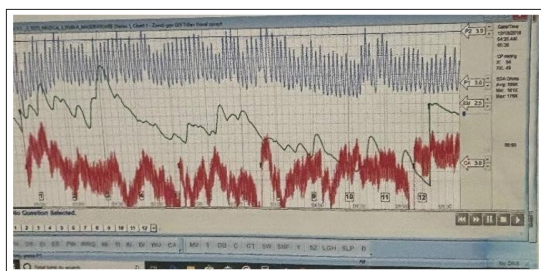


Figure 1: Psychological interpretation

Image no 1 Polygraph photo with the reactions of a research respondent

1. The following main emotions emerged from the scores obtained in the Questionnaire: out of the 11 mentioned: Enthusiasm, Euphoria, Balance, Detachment and Joy. This results in the subjects being in a generally good state during the musical testing.
2. During the testing with the Polygraph device, as well as at the end of the testing, the following behaviors were observed from the participants: smiles, calm and relaxed state, visible indifference, drowsiness/sleepiness, gaze focused downwards, gaze focused on certain points, wide open eyes, amazement, closed eyes, laughter, sighs, startles, good-dissociation, conformity, dance rhythm, strongly closed eyebrows, facial muscle tension, etc.
3. Regarding the tendency towards a musical preference from the 3 musical styles/3 neutral tendencies, we admit that there are certain significant differences and correlations between the psychophysiological measurements performed and the Questionnaire applied, as follows:
 - i. At the level of the LLRT parameter, the highest average is represented, in the case of significant stimuli, by the Latin style (1091.33), followed by the rock style (1087) and dance pop (995), and in the case of neutral stimuli, the highest average was recorded by the sound of the birdsong (1193). Correlated with the questionnaire applied, in the case of this parameter, the tendency of preference will be in the area of neutral stimuli (birdsong), with the highest score in the Polygraph registration, along with the highest score in the Questionnaire. Regarding the representative

stimulus, we observe a discrepancy between the result of the questionnaire and the result obtained at the Polygraph, thus the pop-dance style ABBA, ranks first in the preferences in the Questionnaire, while the Latin style of E. Iglesias - Bailando, ranks best as a score of the Polygraph recording.

Note: LLRT (Length of the Thoracic Breathing Line) is inversely correlated with the activity of the Nervous System, consequently, the lower this indicator has a value, the higher the probability of prediction of insincere behavior.

- ii. At the level of the RR parameter, the mean with the greatest significance, according to the specialized literature, is directed in the case of our research towards the neutral stimulus (birds chirping) with the lowest value (17.95) there
- iii. being a statistically significant correlation between the Questionnaire and the Polygraph measurement, and at the opposite pole being the Latin style with a value of (19.47).
- iv. At the ARED Parameter level, the most important average is located in the case of a neutral stimulus (6.74) represented by Sea Waves, and regarding the stimulus represented by ACDC, there is no significant correlation between the results of the Questionnaire and the Polygraph Measurements.
- v. At the RED parameter level, the lowest average is in the case of the neutral stimulus (Birds' Chirping) with a value of (285), and the highest in the case of the Latin style (2.92), with a RC of 72bpm, and the lowest average is represented by ACDC, but with the highest RC 9 75.31) [4,5].

Conclusions

We admit that the unitary hypothesis H1 has been confirmed. We admit that the result is highly statistically significant.

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