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Composing the Actual: Brainwave Sonification as Materialized Intensity of Virtual Relations

Abstract: My recently performed experimental music performance *I Sit and Worry About Her* comprises a transdisciplinary research project that explores the function of large-scale cortical networks and application of EEG, monitoring the brainwaves in music making and perceiving. The project aims at understanding the activity of the brain and its electric impulses as an affect or intensity of virtual relations. There are several assemblages that relate rhizomatically in different dimensions inside an event; from minor gestures in the brain's electric impulse continuum, its self-enjoyment and experience of sound frequencies, to the affective modality that creates authentic collective identity during the performance, thus questioning the unity of movement between *subject* and *object*. The project involves playing pre-recorded music content back to the performance space in real time, triggered by a threshold of a certain brainwave frequency; thus, it functions as a sonification of the brain's electricity – a kind of materialization of a virtual property. Pre-recorded music is perceived in the performing space before the subject becomes a *knower* of the actualized potential, before she perceives her thought. Does that make me a composer of the perceiver's actual dimension? If we apply this performance technique, is it possible to actualize the virtual open-social identity, even while involved in a social collaborative interaction?

Keywords: sonified brain waves; virtual-actual dimension; open-social; affective interaction; music experiment.

Introduction

The transdisciplinary artistic research project *I Sit and Worry About Her* is my latest performed music experiment. It is engaged in research and application of electroencephalogram (EEG) brainwaves monitoring in music making and perceiving; understanding brain activity and its electric impulses as an affect, an intensity of virtual relations during the interaction between participants. The goal of this research was to explore the spontaneous complex interaction of the participants during the

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music performance, and a *relation*, as a concept for *interaction-in-the-making*.[1] In this text I am focusing on the phase of the event's realization and the experience of it, where the event and the experience of it have not yet fully become a subject or object or had a concrete meaning. The structure of this article follows the investigation of the practice-based research in genre of free improvised music, analyzing the various forms of interactions during the collaborative music event. In order to present the interrelation between *minor gesture* and *macropolitics*, I have applied a music-specific approach, recent findings in the study of performance and music cognition, and the philosophical work of Brian Massumi and Erin Manning. Further, I will also consider results of speculative experiments and physical measurements, and I will apply methods from biomedical science in order to analyze collected data. Artistic research in general does not have a standardized, discipline-specific set of methods; instead, the research is carried out through artistic practice itself. Qualitative methods of autoethnography here are used in order to bring into focus the experiences of the artist-researcher, who conducts research from a first-person perspective.

This project is concerned with the detailed examination of the lived experience on its own terms. Thus, the project attempts to draw conclusions by qualitative exploration of the minor gesture in the brain's electric impulse continuum, the affective interaction between participants, and the emergent open-social event. Brainwaves served in the sounding representation of *virtual-actual* (non-present potential and materialized form) relations, exploring the possibilities in creation of the actual dimension as a method in music composing and performing.

Minoritarian tendency in micropolitics

"A minor key is always interlaced with major keys—the minor works the major from within. The major is a structural tendency that organizes itself according to predetermined definitions of value. The minor is a force that courses through it."[2]

Free music improvisation is a collective music-making practice. The affective interplay between improvising musicians is the result of "alertness to the multisided interactions among people".[3] The affect is here understood as an intensity of relations. A continuous interaction between multiple individual bodies of participants during the instantaneous music-making of improvisation is in itself an act of social interaction.[4] This music practice, viewed as a singular network of multiplicative elements, is structured as an asymmetric system of relationships that allows the excessive mixing

[1] Brian Massumi, *Parables for the Virtual: Movement, Affect, Sensation* (Durham and London: Duke University Press Book, 2002), 9.

[2] Erin Manning, *Minor Gesture* (Durham and London: Duke University Press, 2016), 1.

[3] Chris Stover, "Affect and Improvising Bodies," *Perspectives of New Music* 55, 2 (2017): 5.

[4] David A. Steinweg, *Improvisational Music Performance: On-Stage Communication of Power Relationships* (University of South Florida, 2012), 2.

of the bodies as *assemblage*. As conceived of by Deleuze and Guattari, assemblages are complex constellations of objects-bodies-expressions-qualities-territories that come together for certain periods of time creating a new model of functioning.[5] The result of such a productive assemblage as free improvisation is a new means of music expression[6] developed through the process of interaction. There are several assemblages that relate rhizomatically in different dimensions of the music performance; from the minor gesture in the performer's body, its self-enjoyment and interrelation between body and sound, to the affective modality of the interaction between participants. Rhizom is here understood as a non-hierarchical and non-self-identifying system where any point is joint to any other, working as a model of association, rather that hierarchical. The Rhizomatic order is a non-centered system that is viewed from the middle, without the beginning and the end, the main and leader, constantly in the state of becoming and changing, as the main principle of the creative idea.[7] This modality creates an authentic collective identity during the group performance, questioning *subject* and *object* unity of movement. During this process there are overlapping "phases of occurrence", as participants interact with one another "following an arc of felt becoming".[8] Improvised music is in this sense a rhizomatic collaborative network; overlapping sound events mark time with moments, around which we can conceive a 'before' and an 'after'. These are moments of emergence, and of change. The ways performers' bodies come into affective relations, within themselves and with one another, provide the "conditions for the context of a particular performance to emerge".[9] In this ongoing interplay, affect could be understood as "the moment before the registration of the audible, visual, and tactile transformations produced in reaction to a certain situation, event, or thing".[10] Music events occur through immediate interaction between bodies. A body is characterized by a double movement: an ability to affect or be affected defined by the active movement in which "intensities come into contact and with one another".[11] The participant's body structure is the composition of its own relations, where the sensory observations and minor gestures cause changes in focus and mental processes. In this indeterminate phase of the music event it is the minor gesture that is active. "The minor gesture is the gestural force that opens experience to its potential variation. It does this from within experience itself,

[5] Graham Livesey, "Assemblage," in *The Deleuze Dictionary Revised Edition,* ed. Adrian Parr (Edinburgh: Edinburgh University Press, 2010), 18.

[6] Ibid., 19.

[7] Cf. Gilles Deleuze i Felix Guattari, *Kapitalizam i* šizofrenija *2, Tisuću platoa* (Zagreb, Sandorf & Mizantrop, 2013).

[8] Massumi, *Parables for the Virtual*, 3.

[9] Stover, "Affect and Improvising Bodies," 5–6.

[10] Felicity J. Colman, "Affect," in *The Deleuze Dictionary Revised Edition,* ed. Adrian Parr (Edinburgh: Edinburgh University Press, 2010), 11.

[11] Stover, "Affect and Improvising Bodies," 9.

activating a shift in tone, a difference in quality".[12] My goal is to capture that minor gesture, that movement in the process between virtual and actual, bare activity, with the witness' remove of a performer (one who objectively observes oneself). According to Manning, it is the minoritarian tendency that initiates the subtle shifts that create the conditions of change, although the grander gesture of "macropolitics easily sums up the changes that occurred to alter the field",[13] to actualize and to be perceived. It is easier to identify major shifts, such as in the sound, mode of improvising, music content, or provoked emotion. But the real transformative status lies in the minor gesture, the subtle movement of a continual variation on one's own experience. When looking at a large-scale picture, we see a recognizable structure, but not the variability and unsolidity of the transformative power of the minor elements.[14] As an improvising musician, I find that the threshold of an event's becoming is recognizable by focusing on one's awareness on the immediate moment. Mindfulness in music-making can be achieved with a constant alertness and maintained awareness of feelings, thoughts, and bodily sensations.[15]

Meditation on minor gesture

Much like nature itself, human constant brain activity is a complex flow of events as an immanent realm. The continuum of brain activity corresponds to the continuum of creativity or to that of consciousness. Brain functions constantly move during the course of an event. Following Deleuze, brain activity can be understood as the overlapping of micro events that are rhizomatic and form part of an ever-changing, ongoing process that occurs within individuals.[16] In terms of Deleuzian events, continuous brain work is a process in which an event comes after an event. It is becoming, changing, and marked by its properties. These events overlap rhizomatically and in overlapping they produce an affect. In other words, the stream of brain activity is an affect, an intensity of virtual relations, and it is not codified as a certain emotion (that comes afterwards), but functions without a socially recognizable code. In *Semblance and Event,* Massumi relies on the philosophy of Whitehead and James, but also of Deleuze and Guattari. Concerning the processes that make up events, Massumi explains that the event has two dimensions: the first one is the relational dimension of events in which the event is "under the aspect of its immediate participation in a world of activity larger than its own";[17] while the other dimension is the qualita-

[12] Manning, *Minor Gesture*, 1.

[13] Ibid.

[14] Ibid., 1–3.

[15] Cf. Simon Gray, *Mindfulness for Beginners* (Great Reads Publishing, 2015).

[16] Christian Beck and François-Xavier Gleyzon, "Deleuze and the event(s)," *Journal for Cultural Research* 20, 4 (2016): 329.

[17] Brian Massumi, *Semblance and Event: Activist Philosophy and the Occurrent Arts (*Cambridge and London: The MIT Press, 2011), 3

tive dimension, its *thusness*, where "experience is coming out of bare activity into itself".[18] Because of events' fundamental duplicity, according to Massumi, the relational / participatory process of the first dimension is political, and the qualitative / creative, self-enjoying process is the aesthetic dimension. Awareness of the mind processes' duplicity in music improvisation is considered a creative meditational technique; a unique opportunity to transfer that experience with sound to the audience.

When I am still …

I sit quietly practicing mindfulness,[19] training my mind to be attentive and aware of the thinking process. Mindfulness should be my basic ability for being fully present, aware of what I am doing, and what is this "thing when it isn't doing".[20] With practice, I sharpen my perception so it makes me witness the stream of thoughts in the form of electricity flow, in a stage of virtual potential. Brain waves represent rhythmic variations in voltage, effectuated by the flow of electrical current.[21] At first, it feels like stillness; I can feel a subtle shift in the experiencing the doing of thinking, which is not easy to identify. Manning refers to a minor gesture that initiates a tendency of movement,[22] as a slight variation of experience is witnessed. I explore that movement that is hardly felt, as well as the feeling of the body moving (as an electric stream). But movement is still not actualized. Rather, it takes place between the potential and the event that has not yet happened; I am not experiencing my thought as the actualized value (codified meaning) yet. The movement happens too quickly to have happened, actually, it is still virtual, so my body (as electric current) as a thought, is as much virtual as it is actual. I refer here to Massumi's argument that the virtual cannot be experienced and cannot be felt, but contained.[23] What I actually experience is the contained awareness of experiencing, where "the experience is at the same time self standing and self-contained".[24]

A minor gesture, as it takes place between virtual and actual, is not easy to perceive or to grasp, which makes it speculative. Not known in advance, it is a minor gesture singularly "connected to the event at hand, immanent to the in-act",[25] and that makes it pragmatic. Both Manning and Massumi agree that it is contained and not

[18] Massumi, *Semblance and Event*, 3

[19] Mindfulness is the psychological process of purposely bringing one's attention to experiences occurring in the present moment without judgment, which one can develop through the practice of meditation. It is widely used for stress control as a mind training technique.

[20] Massumi, *Parables for the Virtual*, 6.

[21] "What are Brainwaves?" Brainworks, https://www.brainworksneurotherapy.com/what-are-brainwaves, acc. January 10, 2020.

[22] Manning, *Minor Gesture*, 2.

[23] Massumi, *Parables for the Virtual*, 30.

[24] Massumi, *Semblance and Event*, 36.

[25] Manning, *Minor Gesture,* 2.

experienced; the former refers to "in-act" and the latter suggests that "there's happening doing".[26] The experience's *just-beginning-to-stir* is in relation with the event's occurring in the participatory activity, in a world larger that its own. I perceive the doing as a performance of autonomous bodily reactions, occurring in the brain but outside consciousness: the electric stream, the virtual potential, an intensity that is transitioning in-act to the expression. Perceiving is almost like experiencing the bare activity, the thusness of an event, creatively self-enjoying the potential that is innate into activity and that is expressed through the event of becoming. What is contained is thusness. Witnessing the movement is thusness; it is one's awareness of an event becoming. I can feel its quality in participation itself. Massumi explains that as "the feeling of unfolding itself- self relation", and the process of becoming is a self-creation.[27] The movement between virtual and actual is *relational.* The body itself relates to this transition - its variations with oneself. The body is moving with its non-present (virtual) potential, so it makes this relationship "real but abstract".[28] I experience, in presence, the momentary creation of the bodily movement; perceiving the participatory dimension of the event. This dynamic relational dimension is experienced as the *event's occurring.*

Although this bare activity is contained at every threshold of emerging experience of becoming, I am interested in how this bare activity can be taken out of context, presented and captured through sound. Careful, still and silent, I catch the frequency movements and turn my not-yet thoughts into sound on the saxophone. I make music out of brain activity because it is easier for me to hear the thoughts, and control the movement of brain frequencies in this way, teaching myself how to read through the content before they actualize as thoughts. I vulnerably make the present moment conscious through free improvisation. I sonify my presence, the thusness, and use sound as a tool for translation, implementation, and transformation. Potential is materialized through the sound, and the quality of thusness, of my presence, has a great impact on the music content that is emerging.

Sounding the virtual-actual relation

The field of emergence of this event's occurring is not pre-social. It is open-endedly social[29], in the sense of what comes before separating an individual from an identifiable group. As a musician, just by producing one sound, in Massumi's sense, I am relational to the world. Once the sound is actualized, it becomes social in interactive relations to other bodies. When collaborating with other musicians, the music content and relations are social. However, I would argue differently. With the practice of

[26] Massumi, *Semblance and Event,* 1.

[27] Ibid., 2.

[28] Massumi, *Parables for the Virtual,* 31.

[29] Colman, "Affect," 8.

mindfulness, a musician learns how to transpose an in-act movement from virtual to actual, into sound, and explore the possibility to actualize the virtual open-social identity, even while involved in a social collaborative interaction. If a musician is producing a sound on an instrument as a projection of her/his inner relations, in the state of tentative awareness, then this sound is open-social, not yet in relation to the world. In this state then, one relates to outer stimuli, other musicians, duplicating the relations. A musician gets socially engaged in a grander event's occurring, that works in affective modality, while being open-endedly social in the same time. Relational duality is possible to understand as a *trans-individual* unity that mirrors the inner and outer relation of the individual, one's psychological and social reality. This is a *relation of relation* within the pre-individual and the individual (social, collective). Exploring Massumi's subject-object terms and relations, Filipovic explains that the *trans-individual* exits between and over the pre-individual-virtual, and that the individual exists in communication with the others-actual. Trans-individual functions in and above the relationship of two orders of magnitude, open-social and social.[30] Taking action in interaction with others makes one's performing music collective and social. The awareness and sound projection of the trans-individual while involved in collaboration is the subject of this artistic research.

Research and performance[31]

In my latest collaborative experimental music performance "*I Sit and Worry About Her*"[32] brain activity[33] and its electric impulses became the material itself, the integral elements of the work of sound-art. In five months' artistic and scientific research before the final performance, I explored a function of the large-scale cortical networks and applications of electroencephalogram (EEG)[34] technology, using it as a

[30] Andrija Filipović, *Brajan Masumi* (Beograd: Orion Art, 2016), 29.

[31] As a National winning proposal, this project was produced by the Serbian Center for Promotion of Science within the European ARTificial Intelligence Lab project, performed at the SASA Gallery of Science and Technology in Belgrade on November 14, 2019.

[32] Jasna Jovicevic. *I Sit and Worry About Her* (2019), http://www.jasnajovicevic.com/music-mind, acc. January 15, 2020.

[33] "Brain cells communicate by sending tiny electric signals to each other. The more signals that are sent, the more electricity the brain will produce. An EEG can measure the pattern of this electrical activity". Science Museum, *How can we measure brain activity?*
<whoami.sciencemuseum.org.uk/whoami/findoutmore/yourbrain/howdoesyourbrainwork/howcanwemeasurebrainactivity>, acc. January 23, 2020.

[34] "An electroencephalogram (EEG) is a test used to evaluate the electrical activity in the brain. EEG tracks and records brain wave patterns. Electrodes are attached to the scalp with wires, and the electrical impulses are analyzed in the brain, signals are sent to a computer that records the results," "EEG (Electroencephalogram): What is an EEG?" Healthline, https://www.healthline.com/health/eeg#risk,. acc. January 21, 2020.
EEG is a visual plotting of the signal that generates electric fields of neural activities. These electric fields are extremely faint, with amplitudes on the order of only a few microvolts, so that they must be greatly amplified in order to be displayed or processed, E. R. Miranda and A. Brouse, "Interfacing the Brain Directly with Musical Systems: On Developing Systems for Making Music with Brain Signals," *Journal Leonardo* 38, 4 (2005): 331–6.

tool for artistic purposes. The aim was to deepen a personal music practice in creation and interpretation, but also to experiment with unconventional modes of interactive communication between the participants. To this practice-based research, my knowledge and experience as a yoga and mindfulness instructor and practitioner was indispensable; I was able to develop a mind control method with sound. I referred to my previous artistic research "*Flow Vertical*"[35] inspired by the vibrational fields which act as energetic whirlpools responsible for a person's holistic body and mind condition.[36] This work was concerned with the overall experience of body (sound vibration, brain waves) and mind (emotions, thoughts). Although the results of both these research projects could not be considered as scientific, they are relevant for producing new knowledge for music creation and performance.

Four mothers of daughters were asked to participate in the research and the final performance. In five months of lab work, the research team of experts[37] analyzed their brain activity emerging under the influence of acoustical stimuli: improvised music that I played live and the custom-made psychological audio triggers consisting in previously recorded voices of the mothers' daughters that evoke certain emotional reactions.[38] The analytical data that were used in the creation of the sonic projection were based on the measurements of the observed brain waveforms that mothers produced as a reaction to these stimuli. Sonic projection of the brainwaves was presented as the generated musical symbols for the emotional reactions during performance (music content such as noise, drone, voice, melodies with acoustic instruments).[39] In the final stage a musical performance was presented in the context of the experiment itself.

[35] Jasna Jovicevic Sextet, *Flow Vertical*, (Essex: FMR Records, 2018) [FMRCD475].

[36] Jasna Jovicevic, "Flow Vertical: Composing and Improvising Original Music Inspired by Bodily Sound Vibrations," *Leonardo Music Journal* 29 (December 2019): 78–82.

[37] Expert team in EEG technology and biomedicine: Assistant Professors Milica Janković and Jelena Ćertić (University of Belgrade – School of Electrical Engineering), Nebojša Malešević – Postdoctoral Fellow, Lund University, Faculty of Engineering, Department of Biomedical Engineering, and the students of the BioMedical Instrumentation and Technology (BMIT) Lab from the School of Electrical Engineering in Belgrade.

[38] In order to explore the mind process and possibilities in emotional manipulation during the performance, I added recorded sentences from the mothers' daughters. These sentences were recorded during the research process, without the mothers' presence, so as to ensure a surprise factor in the performance. Daughters aged 3, 7, 14, 22, and 43, were asked to say words that provoked happiness, calmness, worry, or agitation on the part of their mothers (laughing, crying, sentences such as: "Get out of my room!", "Leave me alone!", "My tummy hurts", "I am tired. That's enough, "Mother, I love you"…).

[39] Bojan Živojinović, "Process of research and production of music experiment 'I Sit and Worry About Her' –Jasna Jovicevic,", www.youtu.be/iI6iGA5tj6Y, acc. January 15, 2020.

Figure1: *Performance*

Figure 2: *EEG Monitoring*

During the music performance, four mothers who have daughters (all of different ages) sit still on the scene as "non-performers" (listeners as performers) in front of me (musician) (Figure 1.). While they are listening to the improvisation that I play, and audio-samples that trigger certain emotions and thoughts (their daughters' voices stimulating worry, happiness, anxiety), their brain activities are being estimated[40] in real time. During the performance, with the different sound frequencies, instruments, and improvised content, three kinds of brain waves from the non-performers were generated: alpha, beta, and theta.[41] Beta activity is associated with active thinking and concentration, so where faster frequency is dominant, a sense of alertness occurs in awaked state. Beta activity rises when one's attention is directed towards the outside world, and is most evident in the frontal lobes.[42] Alpha activity is linked to the relaxation state. While slower brain waves are dominant, fatigue, sleepiness, and sluggishness are felt. Usually, alpha activity will increase when a subject closes his or her eyes, and beta activity will then increase when a subject opens his or her eyes. The strongest alpha waves can be observed in the occipital lobe.[43] Theta waves are related to, for example, daydreaming, or can be observed in children in a sleeping state. Theta activity indicates deep relaxation and meditation, associated with very slow waves.[44] The EEG system registers the dominant brain wave which reflects the condition of mothers at a certain threshold; and as a response, it triggers the pre-composed sound samples for further instrumental improvisation. Everyone's different brain frequency gets its sonified projection that is being heard in the performative space, so that mothers, myself, and the audience can all hear it. This instigates an interactive communication between mothers, generated sound, daughters' voices, and instrumental music. The unpredictable sonic content from the brain waves is manipulated once again (the brainwave sound projection is heard in the space) as is the musical improvised content. Perpetual modification becomes a self-making improvised musical piece, where mutual communication through the sound effects activates new possibilities in the sonic game among the participants.[45] A web-like interplay of individual psychological needs, expectations, states and intentions, has been created. Most importantly, this interplay

[40] In the immersive research followed by the performance, we used EEG technology as presented: two (2) electrodes were placed on the scalp, with a signal perceived and augmented by OpenBCI Ganglion hardware, which sent the information to a computer, with an activated and visualized EEG signal being proceeded in OpenVibe software. Notch filtration and frequency band extracted alpha, beta, and theta waves, and was performed in real time. The signal segments were taken every one (1) second and the power of the range was compared to that of the threshold. It was suggested that it is the best if frequency is maintained for one (1) second. Transference of the signal went with negligible delays, so we could say, non-technically, that it is instant.

[41] Measurement threshold: alpha (8-13 Hz), beta (14-30 Hz) and theta waves (4-7 Hz)

[42] D. Millet, "Hans Berger: From Psychic Energy to the EEG," *Perspectives in Biology and Medicine* 44, 4 (2001): 522–42.

[43] Anton Nijholt, "Introduction: Brain-Computer Interfaces for Artistic Expression" in *Brain Art, Brain-Computer Interfaces for Artistic Expression*, ed. Anton Nijholt (Switzerland: Springer, 2019), 4.

[44] S. K. Hadjidimitriou, and L.J. Hadjileontiadis, "Toward an EEG-based recognition of music liking using time-frequency analysis," *IEEE Transactions on Biomedical Engineering* 59, 12 (2012): 3498–510.

[45] Živojinović, "Performance *I Sit and Worry About Her* – Jasna Jovicevic."

engages conscious and unconscious reactions to overall sound stimuli. In this case, instead of just subjective spontaneity, I discovered an assemblage that is circularly repeating and changing, that includes body-brain waves-sensors-Open BCI-software reading-audio samples-musician-acoustic improvisation-audience-body assemblage that is circularly repeating and changing.

The concept of the piece relates to the social interaction in the expression-network of a *collaborative event*, emphasizing the constant, never-ending motherly worry about their daughters. The poetics of this complex, multilayered artwork provided me with my own constitutive interpretation of the brainwaves.[46] This method enabled the audience to understand and apply an autoethnographic exploration of the mother-daughter relationship, whereas the personal and collective experience and distribution of thoughts and emotions was used to examine and/or critique the cultural experience.[47] My intention was to configure the possibilities of the improvisational methodology that can directly influence the brain waves and manipulate the brain activity of the listener.

Who is a composer of their brainwaves?

The continuous movement of electromagnetic waves in the body is immeasurable, unless the position is set as a potential endpoint by the EEG and the trajectory of the motion is estimated retrospectively. After research with EEG measuring, new operations were added retrospectively, because of the expectation and possibility that something will be repeated. A motion can only be captured if it is repeated. Through the process of standardization of measuring, the quality of movement changes through a process of feedback. Movement stops when we are thinking the space and linear time as a net of positions, as Massumi explains about the notion of feedback. With the determination of brainwave thresholds on alpha, beta, delta and theta points, we stop the wave in certain positions, giving it a cultural and psychological function, so every next EEG measurement becomes 'natural', 'foreseen', an interrelated unity of variations as the emergent quality of a movement. We produce meaning about the movement retrospectively; we give a value to the virtual, not yet actual thought. The measured virtual potential of brain activity informs us how we feel and how we react, before we know and before we react. According to Deleuze, the affect is a "transitory thought or thing that occurs prior to an idea or perception"[48]. Through this experiment, I tried to capture the virtual realm of intensity as affect, actualizing it through sound before it emerges in actual realm, before we become a knower of an idea.

[46] Miodrag Šuvaković, *Epistemologija Umetnosti* (Beograd: Orion art, 2008), 19.

[47] Stacy Holman Jones, Tony Adams, and Carolyn Ellis, "Introduction: Coming to Know Autoethnography as More than a Method," in *Handbook of Autoethnography*, ed. Stacy Holman Jones, Tony Adams, and Carolyn Ellis (London and New York: Routledge, 2016), 22.

[48] Colman, "Affect," 11.

During the process of this examination, the question arose on the subjects and objects of this experiment. What is the role of brainwave content, non-performing performers, EEG tools, pre-recorded daughters' triggers, improvised music, frequency modulation and manipulation, sonified brain activity, and the collective music expression? An element of the assemblage becomes a subject and transforms into object with open-ended ability to cross over into each other. This is an event: a rolling of subjective and objective elements into a mutual participation. A mother (non-performer) produces an electric stream in the brain; even before she perceives it, it gets measured, its threshold actualizes as a sound that has a cultural function (prerecorded music sample) provoking further musical interactions between participants and myself. As a musician, I recognize which sound sample relates to a certain brainwave and its characteristics, as I was the one who previously composed and recorded them; so I react to it with momentary improvisation. At the same time, instrumental improvisation momentarily influences and changes the brain frequencies of the participants who now exposed to both improvisation and brainwave sound projection. The engaging in the perpetual interaction as action in creation, that conditions the participants' relation, positions the subject and object in a coordinated network by making them social. Massumi claims that only in retrospect, when subject and object are already in transit into different roles, it is definitely clear what the object or the role of the subject will have been. Massumi does not separate a subject from the event. We can thus conclude that what is produced, actualized, the relations it represents, are only virtually subject or object. They are irreducibly temporal modes of experienced relations. "There is only the event as subject to its occurring to itself. The event itself is a subjective self-creation."[49]

If all is actualized relations of relations, if there is no subject or object but only affective interactions of multiple bodies in assemblage, then am I, in composing and projecting sound, the composer of the not yet actualized brain potential? In preparation for the performance, I constructed a compositional diagram that represents the dynamics of the brain intensities for a 30-minute-long music composition (Figure 3). Prior to performing, I projected a musical scenario that leads non-performers from beta-alpha-theta brainwaves, using instrumental improvisational techniques, brainwave sound projection, and prerecorded triggers-voices. The score alludes to the existence of mothers' transferring of emotions between all of us by experiencing everyone else's reaction through the interaction. The map shows the prediction of timelines for the collective unison reactions with forecasted functions of the sounds. Although the instrumental parts were improvised in relation to the group sound production, certain elements were composed beforehand, such as: when to enter with alto/soprano saxophones or bass clarinet, where to use a pentatonic scale or asymmetric rhythms, when to perform sudden indications of noise or more aggressive dynamics, when to evoke meditative musical atmosphere, and when to play recorded voices. In this sense, the score was a proposition; its successful realization proves that it is possible

[49] Massumi, *Semblance and Event,* 8.

to manipulate brain activity and distribute personal experience into a collective one. The diagram is the code or arrangement according to which an assemblage operates; it is a map of the function of an assemblage,[50] a map predicting the reactions and the modification of experiences that are a vital part of the Deleuzian concept of affective change. Mirroring a Deleuzian framework, in this case, "affect operates as a dynamic of desire within any assemblage" manipulating the meaning and relations.[51]

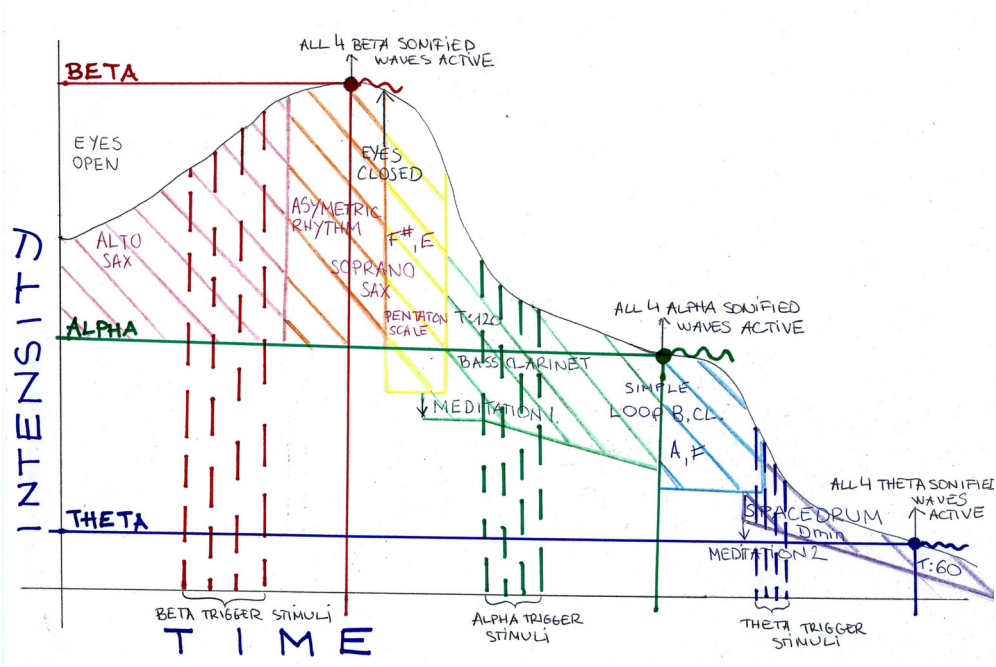

Figure 3: *Score Diagram*

Conclusion

The conception of event-oriented subjectivity and objectivity raised some questions in the research. Is the mother` sonified brainwaves perceived by herself in the performing space open-social, as it is actualized even before her idea (the expectation of how mother perceives her daughter's voice) has terminated in the percept that she cognitively knows *for certain*? The mother perceives her brainwave sound projection as a *virtual knower* before she is its *actual knower*. If the sonified brain activity appears as actualized potential that I composed previously, does that make me the composer

[50] Livesey, "Assemblage," 18

[51] Colman, "Affect," 13.

who is a *knower* of the mothers' potential before they *know*? This speculating on the concepts of the *knower* and the *known*, of *subject* and *object*, derives from Massumi's *occasion of experience*.[52] Subject and object are not the representation of the knower and known, but they constitute each other in the context of event.[53] The tight interconnection between different dimensions and assemblage elements inside the collaborative music event, from a minor gesture in the performer's body to the interaction in affective modality between participants, lead us to think that identity (individual or collective) is always in the process of emerging, constituting and becoming. Assemblage theory provides a framework for analyzing this social complexity by emphasizing fluidity, exchangeability, and multiple functionalities. Within a body, the relationships of component parts are not stable and fixed; rather, they can be displaced and replaced within and among other bodies.[54] Free improvised music as assemblage in the example of "*I Sit and Worry About Her*" can help account for the mutations, transformations, and reconfigurations involved. This project resonates with Massumi's event-oriented concepts that describe the living present of interactive improvisational music-making as a "collective event". Collectively improvised music-making helps build a kind of intersubjective political structure,[55] underlining individual-social relations.

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[52] Massumi, *Semblance and Event*, 8.

[53] Ibid.

[54] Paulo De Assis, *Logic of Experimentation: Rethinking Music Performance through Artistic Research* (Leuven: Leuven University Press, 2018), 71.

[55] Stover, "Affect and Improvising Bodies," 49.

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