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Continuous Brain Activity in Artistic Research
I Sit and Worry About Her

Jasna Jovićević

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Jasna Jovićević*
Subotica, Serbia

CONTINUOUS BRAIN ACTIVITY IN ARTISTIC RESEARCH *I SIT AND WORRY ABOUT HER*

Abstract: This text discusses the intentions and outputs of the complex creative processes associated with a sound experiment entitled *I Sit and Worry about Her.* This project involves a sound representation of the continuous motherly worries within the wider context of artistic research, by analyzing and measuring the brain activity as a central concept of the work. The project explored the applications of electroencephalogram technology (EEG) in order to deepen the practice of musical perception and creation, but also to present an affective mother–daughter relationship I explored the spontaneous interactive relations of the participants during musical improvisation. The results of this research were presented in the form of a musical performance.

Keywords: biosignal-driven music, EEG and music, mothers and daughters, brainwave improvisation, jazz and well-being.

I Sit and Worry about Her is a musical experiment that aims to create an authentic artistic expression through a transdisciplinary approach, with the help of neuroscience, technology, and social engagement. This project was produced by the Center for the Promotion of Science, Belgrade, and was a national winner in the EU AI Lab Program led by Ars Electronica in 2019. It was performed at SASA – Science and technology Gallery – Premier, Arts & Science Lab EU Program – Belgrade (2019), Ars Electronica Festival, Kepler's Gardens (2020),

* Author's contact information: jasnajovicevic@yahoo.com.

Other World Group Exhibition, Balkan Cinema – Belgrade (2020), and Arts & Science Group Exhibition, Faculty of Philosophy – Belgrade 2020.

The goal of this experiment was to create an original approach to the sound representation of motherly worry in the wider context of artistic research; brain activity was a central concept in exploring the spontaneous interactive relations in music making. The article discusses the intentions and outputs of the complex creative process involved and provides readers with its interpretation and documentation. This artwork is unique since it is focused on the cultural and personal experiences of being a mother of a female child in today's society, and the collective distribution of emotions translated into the sound projection of brain activity. Taken-for-granted cultural experiences of motherhood have raised feminist questions that were answered in the brain–sound art environment. This artistic research highlights the intricate interplay between culture, psychology, and gender roles within the mother–daughter relationship, emphasizing that the mother–daughter relationship is deeply embedded in the broader sociocultural fabric. We explored the function of the large-scale cortical networks and applications of the electroencephalogram (EEG) (Borck 2018, 1) technology as a tool used for artistic purposes; the aim was not only to deepen a personal music practice in creation and interpretation but also to experiment with the unconventional modes of interactive communication between the participants.

Being a Mother in recent artistic works

Over time, societal expectations have traditionally defined the role of mothers. However, in today's society, these conventional frameworks are being challenged, expanded, and even dismissed. The understanding of the term 'mother' is no longer as universally evident as it once was in past centuries. Many female artists are exploring the realm of motherhood with feminist perspectives, creating new narratives.

In group exhibition *My Mother's Daughter*, curated by Julia Fidder (2021) and presented at Roskilde Festival (Fidder 2021), female artistis such as Larissa Esveld, Lennard Creutzburg, Margriet Luyten, Maria Pask, Pleun van Dijk, Tanja Ritterbex and Sydney Lowell experimented with their own experience and perception of 'mother', which is reflected in their work. 'Mother', as one of the most universal and yet one of the most personal concepts in the world, was investigated from different views; what a mother is or should be because we all have different experiences with 'mother', image of a woman, role of a mother, change through feminism and philosophy, mothers in the modern age (Western experience), the mother's influence on the child, mother–child relationship, and change through life phases through various perspectives. This exhibition opens

a discussion about the concept we all have of a mother, or of motherhood, and it shows that it has changed dramatically as a result of feminism and psychoanalysts.

Elizabeth Hibbard, an American artist, delves into the intricacies of the mother–daughter relationship in her work *The Dynamics of the Mother–daughter Relationship* (PhMuseum 2020). Focused on the female body, maternal bonds, and humanity's role in nature, the project explores desires and fears related to species reproduction. Hibbard examines the liminal space between self and mother, intimacy and isolation, and desire and revulsion. Her concern lies in the unreflective inscription of femininity, particularly within the family structure, and the role of the lenticular gaze in this process. By delving into the subconscious and bodily recesses, Hibbard seeks guidance, intertwining anxieties about reproduction, motherhood, and the environmental and political climate of today. This introspective exploration addresses the pressing collective question of navigating an uncertain world in the shadow of impending environmental crises.

Context of Mother–daughter in *I Sit and Worry about Her*

This experimental work explores the mother–daughter relationship, delving into its psychoanalytic and sociological dimensions. Cultural variations shape the psychodynamics of mothering, recognizing that patriarchal cultural contexts play a crucial role in defining maternal roles and expectations. Cultural norms and practices influence the emotional and psychological experiences of women as mothers and the subsequent impact on their daughters' development (Lorber, Coser, Rossi, and Chodorow 1999). Also, cultural expectations shape mothers' identities and behaviors, influencing their daughters' understanding of gender roles and relationships. Unconscious processes, learned behaviors, and interpersonal dynamics also contribute to the shaping of maternal roles and the mother–daughter relationship. Mothers often find themselves deeply invested in their daughters' lives, driven by a combination of love, concern, and a desire to shield them from societal pressures. In navigating the intricate web of societal expectations, mothers worry about their daughters' well-being in the broader social environment.

This worry is heightened by the realization that the social landscape is continually changing, presenting new challenges and opportunities. The intergenerational transmission of values, expectations, and concerns becomes a central aspect, influencing how mothers perceive and guide their daughters in the face of societal pressures. As mothers grapple with their own experiences and societal shifts, the complexity of the mother–daughter relationship unfolds, creating a narrative rich in emotional dynamics.

In a feminist context, the complexity of the mother–daughter relationship is further accentuated by the scrutiny of traditional gender roles and the pursuit of empowerment. Mothers, cognizant of historical gender disparities, navigate a delicate balance, fostering their daughters' autonomy while challenging societal norms. The relationship becomes a crucible where feminist ideals intersect with maternal guidance, shaping daughters who are not only resilient in the face of societal expectations but also equipped to challenge and reshape them.

In contemporary society, gender norms are in a state of flux, with women increasingly challenging historical constraints. Navigating this shifting landscape, mothers find themselves torn between wanting to shield their daughters from persistent gender inequalities and preparing them to confront and dismantle these challenges. The complex task of instilling resilience while acknowledging the societal barriers women face underscores the difficulty of raising daughters in a world where gender expectations remain deeply ingrained (Martin 1987).

As a mother of a daughter, and as a contemporary artist in a patriarchal social environment, I revealed my concerns, fears and worries, and, at the same time, I was looking for a shared experience and mutual support.

Mothers in the experiment

Four mothers of daughters (of different ages) were asked to participate in the research and the final performance. Besides mothers, other eight volunteering respondents (of different ages and sexes) participated in our lab work. The team 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 of previously recorded voices and words of the mothers' daughters). The analytical results were used in the creation of the sonic projection based on the measured/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 the performance. In the final stage, a musical performance was presented in the context of the experiment itself. During the performance, the same four participating mothers were "non-performers" (listeners as performers) musically interacting with their in real-time measured brainwaves (in the form of sound projection), with each other, my live music improvisation and previously recorded daughters' voices. The sonification of the brain waves served as an artistic concept resembling an incessant and endless worry of a mother for her daughter, presented through an ongoing improvised song. The poetics of the complex multilayered artwork provided me with my own constitutive interpretation of the brainwaves, as well as the intentionality through the concept (Šuvaković 2008,

19). This method enabled the audience to understand and experience the autoethnographic exploration of the mother–daughter relationship, whereas the personal and collective experiences were used to examine and/or critique the cultural one (Jones, Adams and Ellis 2016, 22).

Bio-signal as Music Content

Brain waves represent rhythmic variations in voltage between parts of the brain that result from the flow of an electric current. Brain waves change according to what we do and feel (brainworksneurotherapy.com 2020). Beta activity is associated with active thinking and concentration, so where the faster frequency is dominant, a sense of alertness occurs in awakened state. Beta activity rises when our attention is directed towards the outside world, and is most evident in the frontal lobes (Millet 2001, 522–542). 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 (Nijholt 2019, 4). 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 (Hadjidimitriou and Hadjileontiadis 2012, 3498–3510). Human brainwaves were first measured in 1924 by Hans Berger (Hans 1928, 527–570) by the EEG, 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 (Miranda and Brouse 2005, 331–336).

I used the monitoring of brain activity as an expanded compositional and interpretational technique. The idea was to take contemporary technology and recontextualize its functions by placing the frame of music performance around its data, providing a new dimension to artistic practice.

In the immersive research followed by the performance unipolar electroencephalographic (EEG) recording was performed using two EEG electrodes placed on the right lobe of subjects (auditory processing area) (Samson and Ehrle 2003, 2006; Zattore 2003, 231) one in the frontal lobe (F4) and the other in the parietal lobe (P4), according to the 10/20 International EEG electrode placement system (Klem, Lüders, Jasper and Elger 1999, 3–6) (as recommended by the International Federation of Societies for EEG and Clinical Neurophysiology). A reference electrode was placed on the right mastoid bone and a ground electrode was positioned on the forehead. The signal from electrodes

was perceived and augmented by OpenBCI Ganglion hardware, which sent the information to a computer, with an activated and visualized EEG signal being processed in OpenViBE software. The usage of two EEG electrodes, OpenBCI hardware (Open Source Brain-Computer Interfaces 2020) and OpenViBE software (Open Vibe, 2020) is an open and common low-cost solution for such kind of experiments and performances, widely available to the art and neuroscience community, and only affordable but sufficient toolkit for our research. Notch filtration and frequency band extracted alpha (8–13 Hz), beta (13–30 Hz), and theta waves (4–8 Hz), and was performed in real-time. The signal segments were taken every one second and the power of the range was compared to that of the threshold. Transference of the signal went with negligible delays, so we could say, in a non-technical manner, that it is instant. When a threshold reached its individually-adjusted frequency value, the pre-recorded audio sample was represented as a brain wave projection (see Figure 1).

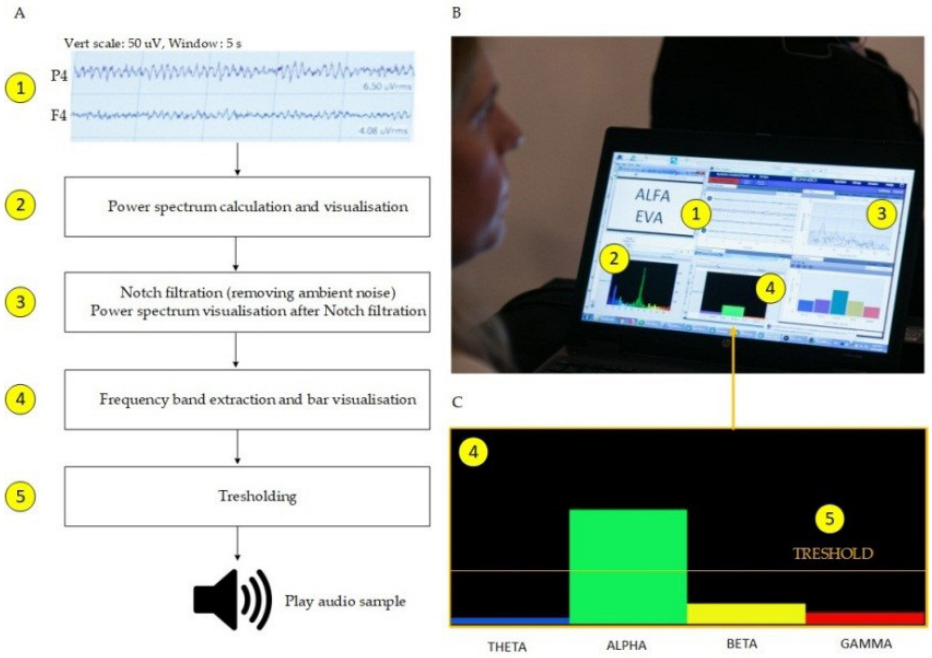

Figure 1. Procedure and interface. A) Block diagram of the real-time algorithm B) Example of interface presented to the operator during the performance C) Bar visualization of extracted frequency bands with the threshold for alpha activity (when alpha activity crosses the threshold, it will cause playing of the corresponding pre-recorded audio sample).

Research Process

During the five months long collaborative research, I was privileged to work in a team with several experts in EEG technology and biomedicine.[2] The research does not qualify as a scientific one, but it served the internal purposes of the performance. Four mothers as main respondents, as well as eight other volunteers, were examined; every examination lasted approximately from two to three hours and was repeated twice. The goal of the research was to investigate the examinee's responses (brain activity) to different audio stimuli in the form of live improvised music. Also, the intention was to configure the possibilities of the improvisational methodology that can directly influence brain waves and manipulate the listener's brain activity; to produce sounds that provoke calmness, enjoyment, peace, and equilibrium of mind. To this practice-based research, personal acquired experience from yoga and mindfulness techniques as an instructor and practitioner was a source of indispensable knowledge for the mind control method development with sound. The reference to my previous artistic research (Jovicevic 2018), inspired by the vibrational fields which act as energetic whirlpools responsible for a person's holistic body and mind condition, served as an inspiration and a starting point (Jovicevic 2019, 78–82).

While the respondent's mental activity was being monitored, I was freely improvising in front of them on the soprano saxophone, alto saxophone, bass clarinet, and the spacedrum. Cognitive studies examine several perceptual attributes that can be individually manipulated in order to analyze how our brain processes music (Shan 2012; Peretz and Zatorre 2003; Gerard, Drake and Botte 2005, 192). During the experiment, the brain activity changed in relation to sound color of the instrument, rhythm, speed, style of improvisation, timbre, meter, dynamics, length of music sentences, intonation, tonality, and extended instrumental techniques. The brain reaction to audio stimuli investigation was crucial for the brainwave sound representation, that is, the audio samples recorded with acoustic instruments during the research period. Guided by the research results, we recorded 12 sound samples, with every participant obtaining three samples for each brain wave, adjusted to their threshold. The research showed that samples produced for a certain frequency conjoined with and played back to the respondents induced the projected brain activity. These samples were interpreted

2 Assistant Professors Milica Janković and Jelena Ćertić from the 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.

in the performance space when the brain activity threshold reached the certain frequency.

Conducted Performance

Figure 2. Performance.

During the performance, four mothers who have daughters (all of different ages) sit still on the scene in front of me, a musician (Figure 2). While they are listening to the improvisation and audio samples of their daughters' voices that trigger certain emotions and thoughts, their brain activities are being measured in real time. With the different sound frequencies, instruments, and improvised content, I generate three kinds of brain waves from the four mothers: alpha, beta, and theta. The EEG system registers the dominant brain wave at a certain threshold and triggers the brainwave sound projection previously recorded. A sonified projection of everyone's brain activity 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 being manipulated once again by the musical improvised content. Perpetual modification and mutual communication through the sound effects that activates new possibilities in the sonic game among the participants becomes a self-making improvised musical piece, re-directing the individual experience of the participants towards a collective course of unpredictability and accidents. Non-performance technique and immobility of performers place a human body

in the role of mediator. In other words, the body does not aim to interpret a sound by instrument or voice, but by mind: sensory observations and minimal physical gestures causing changes in focus and mental processes.

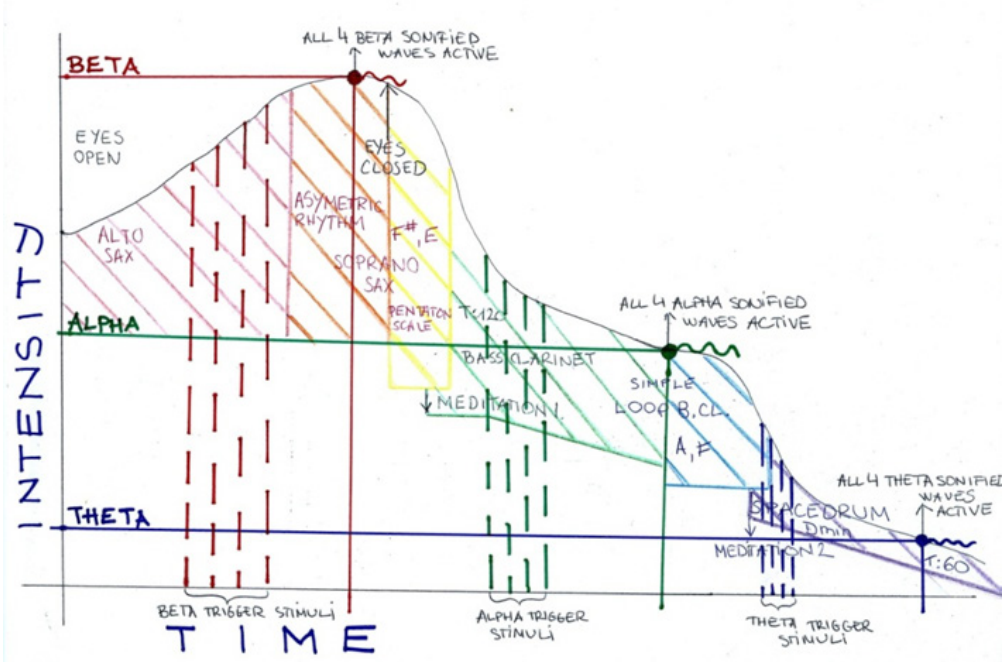

Figure 3. The Score Diagram.

The constructed compositional diagram 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' transfer of emotions between all of us by experiencing everyone else's reactions through the interaction. The map shows the composer's 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; what was specified is for example, when to enter with alto/soprano saxophones or bass clarinet, where to use a pentatonic scale or asymmetric rhythms, to perform sudden indications of noise or more aggressive dynamics, when to evoke meditative musical atmosphere, and when to play recorded voices. The score was a proposition, and its successful realization proves that it is possible to manipulate brain activity and distribute personal experience into a collective one, amplifying compassion and solidarity between us.

The artistic concept of a Mother's Brain

"Our willingness to risk ourselves – our stories, our identities, our commitments – in relation to others constitutes our very chance of becoming human" (Butler 2005). The autoethnographic method uses personal experiences to describe cultural experience (Jones, Adams, and Ellis 2016, 22), and in this work, a mother's voice with deep emotions was revealed and reflected in order to make meaning and construct relationships in music.

The mother–daughter relationship has a long-lasting effect on women's lives. From early childhood, an unspoken pact is forged between mother and child, a mutual agreement not to question the unbreakable bond between them. This bond, rooted in the fear of losing love, reflects the mother's inability to guarantee unconditional love – a sentiment she herself may not have experienced (Friday 1977, 3). The fear of losing love can influence the choices and behaviors of both mothers and daughters. When the child shares the same gender as the mother, it becomes a reflective mirror, evoking a tidal wave of emotions encompassing love, fear, or anxiety. Additionally, as discussed by Nancy Friday (1977), the emotional intricacies embedded in the mother–daughter bond add another layer of complexity. The transmission of values, fears, and aspirations through generations makes the process of fostering independence while maintaining a supportive connection particularly delicate.

The purpose of personification was not solely to understand worry and fear but to provoke the audience, making them think about taken-for-granted cultural experiences of motherhood and how our identities are gendered or aged. Mothers' emotional reactions in the sound form illustrate the value of personal experience, the importance of self-reflexivity, and the collective distribution of thoughts and emotions (anxiety, fear, love, happiness) through sound improvisation.

In order to further explore the thinking process and possibilities of thought manipulations and emotional responses during the performance, recorded sentences uttered by the daughters were added. A rhythm and pitch are two structural criteria that apply to both speech and music (Besson and Schon 2003, 271). Higher structures like sentence, phrase, or theme are relevant in speech and in music as well (Besson and Schon 2003, 272). A mother recognizes the attitude, emotion, and meaning in a daughter's voice, sound, word, or sentence. Combining the words and sentences with a personal connotation associated with codified music content evoked strong emotions among the participants. These sentences were recorded during the research process, without the mothers' presence, so it was a surprising factor in the performance. Their 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. There were recorded laughs (age 3, 7); crying (age 3); little children's recitations (age 3, 7); sentences such as: "Get out of my room!" (age 22), "Leave me alone!" (age 14), "My tummy hurts" (age 7), "I am tired. That's enough" (age 43), "I am self-confident" (age 22), "What will I become in my next life?" (age 7), "I am fine" (age 14), and "Mother, I love you" (all of them). At this stage, multilayered provocation of brain activity was achieved, including voices, improvised content, and the sound projection of their brain frequencies.

To conceptualize this matter, mothers were asked to think and write down their biggest worries concerning a current period of their daughter's life. Sentences were exhibited together with their mother–daughter photo portraits (Figure 4) during the performance.

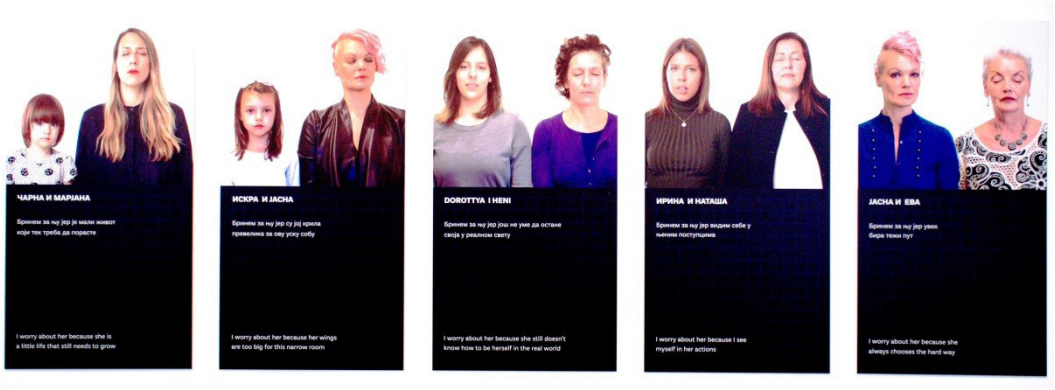

Figure 4. Daughters and mothers.

Sentences:

Marjana – mother of Čarna (age 3): I worry about her because she is a little life that still needs to grow.

Jasna – mother of Iskra (age 7): I worry about her because her wings are too big for this narrow room.

Heni – mother of Dorottya (age 14): I worry about her because she still doesn't know how to be herself in the real world.

Nataša – mother of Irina (age 22): I worry about her because I see myself in her actions.

Eva – mother of Jasna (age 43): I worry about her because she always chooses the hard way.

All of them wished their daughters the freedom to shape their own social portrait, struggling with different fears as they grow and mature. We all have a shared experience: wondering if our daughters will be able to overcome the social obstacles that we, as females, had to go through ourselves.

Documentation of the Work

After the performance, the documentation of the research and performance was exhibited in the SASA Gallery for Science and Technology in Belgrade for two weeks in December 2019 (Živojinović 2020). The exhibition included the two videos, exhibited OpenBCI, posters showing the compositional process and the interfaces, the texts of work's poetics, and the daughters-mothers photo portraits. The complete documented work is available as a web presentation (Jovicevic 2019).

The research aimed to generate not only the material for the final performance, but also new artistic, epistemological, and discursive outputs, as well as a unique compositional and performance practice. Although I learned a great deal from this process, the research was just an entrance to a new realm of artistic research in my practice. The next step in my research involves the self-training of the brain activity while improvising. The goal is to establish awareness and learn how to make the internal and conscious manipulation of brain activity. There are great contemporary examples in brain art (Nijholt 2019, 4) that challenge me to establish a new technique, not only in deep listening but also in aware improvisation, as well as to develop a better understanding of my own musical vocabulary. Further scientific part of research with my expert colleagues will include studies of emotion induction using different audio contents, extraction of temporal, frequency and nonlinear EEG features and application of different machine learning approaches for classification of human emotions in response to music.

List of References

Berger, Hans. 1927. *Über Das Elektrenkephalogramm Des Menschen.* Archiv für Psychiatrie und Nervenkrankheiten 87, 527–570.

Besson, Mireille, and Daniele Schon. 2003. "Comparison Between Language and Music." In *The Cognitive Neuroscience of Music,* 269–293. Oxford: Oxford University Press.

Borck, Cornelius. 2018. *Brainwaves-A Cultural History of Electroencephalography*. London and New York: Routledge.

Brainworks. "What are Brainwaves?". www.brainworksneurotherapy.com/what-are-brainwaves, accessed 15 November 2023.

Butler, Judith. 2005. *Giving an Account of Oneself*. New York: Fordham Press.

Fiddder, Julia, "My Mothers' Daughter". www.seafoundation.eu/mothers-daughter-julia-fidder/, accessed 12 November 2023.

Friday, Nancy. 1977. *My Mother/My Self – The Daughter's Search for Identity*. Dell: Dell Publishing Co.

Gerard, C., C. Drake and M.C. Botte. 2005. "Rhythm perception: interactions between time and intensity." *Contemprary Music Review* 9: 192–203.

Hadjidimitriou, S.K. and L.J. Hadjileontiadis. 2012. "Toward an EEG-based recognition of music liking using time-frequency analysis." *IEEE Transactions on Biomedical Engineering* 59, no. 12: 3498–3510.

Holman Jones, Stacy, Tony Adams, and Carolyn Ellis. 2016. "Coming to Know Autoethnography as More than a Method." In *Handbook of Autoethnography*, 17–48. London-New York: Routledge.

Jasna Jovicevic Sextet. 2018. *Flow Vertical*. Essex: FMR Records. [FMRCD475]

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

Jovicevic, Jasna. 2019. *I Sit and Worry About Her*, artwork is described at www.jasnajovicevic.com/music-mind, accessed 15 November 2023.

Klem, George H., Hans Otto Lüders, H.H. Jasper and C. Elger. 1999. "The ten-twenty electrode system of the International Federation". *Electroencephalography and Clinical Neurophysiology* no. 52: 3-6.

Lorber, Judith, Rose Laub Coser, Alice S. Rossi, and Nancy Chodorow. 1981. "On 'The Reproduction of Mothering': A Methodological Debate". *Signs* 6, no. 3: 482–514.

Martin, Emily. 2001. *The Woman in the Body: A Cultural Analysis of Reproduction*. Boston: Beacon Press.

Millet, David. 2001. "Hans Berger: From Psychic Energy to the EEG". *Perspectives in Biology and Medicine* 44, no. 4: 522–542.

Miranda, E.R. and A. Brouse. 2005. "Interfacing the Brain Directly with Musical Sys-

tems: On Developing Systems for Making Music with Brain Signals". *Journal Leonardo* 38 no. 4: 331–336.

Nijholt, Anton. 2019. "Introduction: Brain-Computer Interfaces for Artistic Expression". In *Brain Art, Brain-Computer Interfaces for Artistic Expression*, 1–32. Switzerland: Springer.

OpenBCI. 2000. "Open Source Brain-Computer Interfaces". www.openbci.com, accessed 15 November 2023.

Open Vibe. "Software for Brain Computer Interfaces and Real Time Neurosciences", www.openvibe.inria.fr, accessed 20 January 2020.

Peretz, Isabelle and Robert J.Zatorre, eds. 2003. *The Cognitive Neuroscience of Music*. Oxford: Oxford University Press.

PhMuseum. 2020. "The Dynamics of the Mother–daughter Relationship". www.phmuseum.com/news/the-dynamics-of-the-mother–daughter-relationship, accessed 15 November 2023.

Samson, Severine and Nathalie Ehrle. 2003. "Celebral Substrates for Musical Temporal Processes." In *The Cognitive Neuroscience of Music*, 204–216. Oxford: Oxford University Press.

Shan, Eleaine. 2012. *Music and the Mind: How the Brain is Affected by Song*. Texas: Thesis Submitted to the Faculty of Baylor University.

Šuvaković, Miodrag. 2008. *Epistemologija umetnosti*. Beograd: Orion Art Books.

Zatorre, Robert J. 2003. "Neural Specializations for Tonal Processing." In *The Cognitive Neuroscience of Music*, 231–246. Oxford: Oxford University Press.

Zivojinovic, Bojan. 2019. "Process of research and production of music experiment *I sit and worry about Her* – Jasna Jovicevic". www.youtu.be/iI6iGA5tj6Y. "Performance *I sit and worry about Her*-Jasna Jovicevic". www.youtu.be/mAww21eWKKo, accessed 15 November 2023.

CONTINUOUS BRAIN ACTIVITY IN ARTISTIC RESEARCH *I SIT AND WORRY ABOUT HER* (summary)

The text delves into the complexities of the creative processes underlying a sound experiment titled *I Sit and Worry about Her*. Produced by the Center for the Promotion of Science in Belgrade, this transdisciplinary initiative converges neuroscience, technology, and social engagement to authentically articulate the perpetual concerns of motherhood within the ambit of artistic research. Distinguished as a national laureate in the 2019 EU AI Lab Program by Ars Electronica, the project's far-reaching impact is evidenced by its performances at esteemed venues such as SASA – Science and Technology Gallery, Ars Electronica Festival, and Other World Group Exhibition.

At the crux of the endeavor is the meticulous exploration of brain activity as a pivotal determinant. The integration of electroencephalogram technology (EEG) emerges as an indispensable facet, affording an investigation into the mother–daughter relationship through affective representations. A profound focus on large-scale cortical networks and the application of EEG technology serves as a vehicle for experimenting with unconventional modes of interactive communication during musical improvisation. The research not only seeks to deepen musical practices but endeavors to present an original perspective on the personal experiences of contemporary motherhood, situating itself within broader sociocultural narratives, illuminating the interplay between culture, psychology, and gender roles.

The experiment involves the participation of four mothers, each subjected to extensive EEG analysis during improvised musical sessions – lab work. Throughout the collaborative five-month research, the author collaborated with EEG technology and biomedicine experts, employing a practice-based approach to investigate responses to audio stimuli and develop methodologies influencing brain waves.

After research, during the performance, mothers, seated in stillness, listen to improvised music and audio samples triggering emotional responses, while their brain activities were recorded in real-time. The sonified projections of brain activity created an interactive communication platform, fostering a dynamic, self-making improvised musical piece, symbolizing the perpetual maternal worry for daughters. The immobility of performers emphasized the body as a mediator, interpreting sound not by instrument or voice but through sensory observations and minimal physical gestures, redirecting individual experiences toward a collective course of unpredictability.

The article elucidates the intentions and outcomes intrinsic to the creative process that underscores *I Sit and Worry about Her*.

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