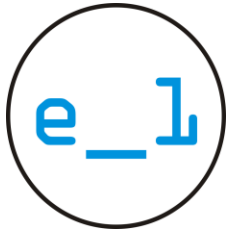


„The neurophysiology of an artist  
in a performance“  
\_experiment\_e1/2015-2017



# The neurophysiology of an artist in a performance \_experiment\_e1/2015-2017

## **Research Domain**

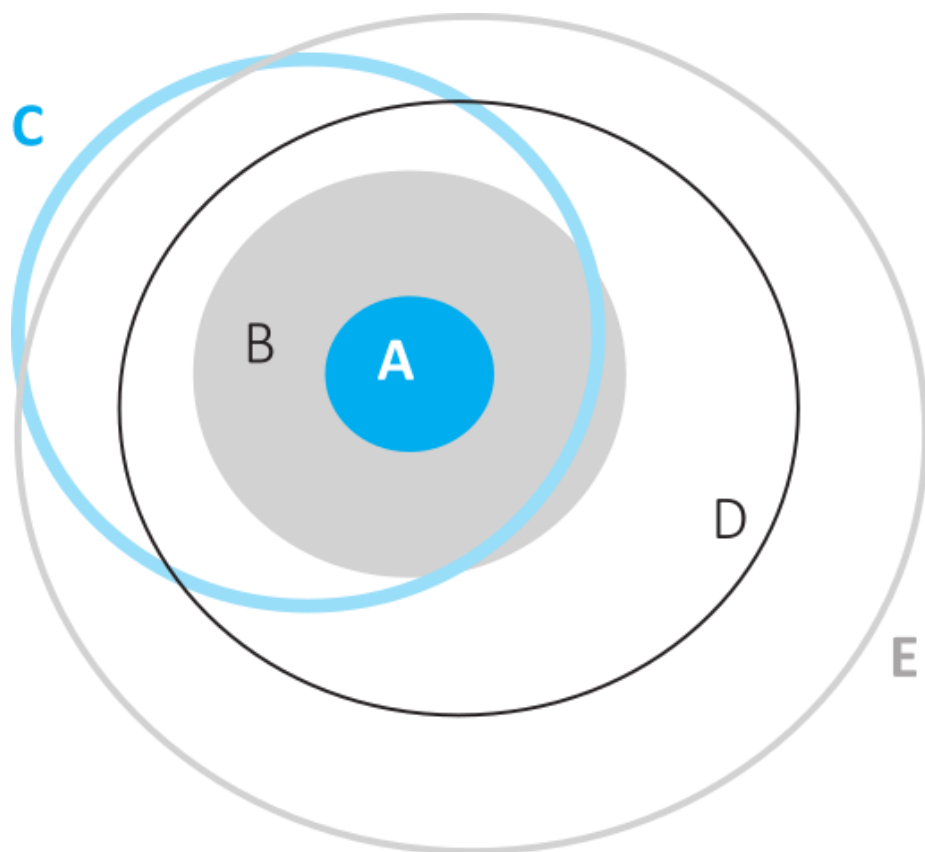
Searching for new forms of recording ephemeral pieces of art by measuring psychophysiological states of the creator and recording simultaneous sounds from the area of the artistic event.

## **Assumption**

Performance is an intellectual activity of the creator and the conscious use of the body as the main tool of artistic expression.

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# The neurophysiology of an artist in a performance \_experiment\_e1/2015-2017



## Method

Case study – a natural experiment;

A - performer / action

B - recipients

C - researchers

(measuring cognitive states and recording sounds)

D - researchers / observers

(interviews with artists and audience)

E - documenting the experiment

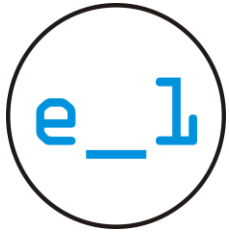
(videos, photos).

^ Place – Toruń;

Center of Contemporary Art. (CSW) Znaki Czasu,

Wozownia Art. Gallery,

Neurocognitive Lab at ICNT, NCU



# The neurophysiology of an artist in a performance \_experiment\_e1/2015-2017

## RESEARCH QUESTIONS

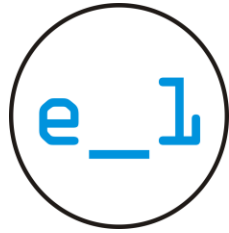
Does the use of measuring apparatus determine the performance of an artist at an emotional, physical or aesthetic level? (An interview with the artist.)

Does the background work of people, as well as the measuring apparatus placed on the body of the artist, influence the reception of the performance?  
(An interview with a group of recipients, 5 randomly selected people.)

Is it possible to use the measuring apparatus effectively in the performance conditions?  
(An attempt to create an original system of procedures.)

Can defined artifacts created by the measuring apparatus during an artistic action be a collection of relevant information about the performance? (Data analysis and visualization.)

Can a study using fMRI be a useful tool for obtaining information about the artist's brain activity during the performance? (Does not apply to the performance in real time, the study is based on the BOLD phenomenon using the AV material from the artistic performance.)



## MindWave Mobile

2 channels / bluetooth / AAA battery  
/ sampling rate: 512Hz



### Performance „Far away look!”

**Danuta Milewska**

pretest 1\_e1 / 26-09-2015 /

Na Skarpie in Toruń / Poland

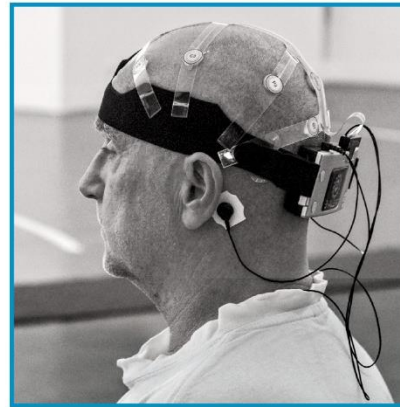
In cooperation with Toruń Cultural Agency

**Description:** In her art Milewska points out problems of keeping attention in giant tower blocks environment. The level of her concentration will be measured with a special mobile device – Mind Wave Mobile (EEG) – its mechanism helps to measure bio electrical brain activity.

## USED EQUIPMENT (technical details)

## B-Alert x24 qEEG

20 channels of medical-grade EEG / plus 4 auxiliary channel / bluetooth / rechargeable battery (6 hours) / sampling rate: 256 samples-second / resolution 16 bit



### Performance „Crucifixion”

**Wacław Kuczma**

pretest 2\_e1 / 17-03-2016 /

Centre of Contemporary Art\_in Torun

In cooperation with Centre for Modern

Interdisciplinary Technologies Nicolaus Copernicus University in Toruń / Poland

**Description:** A second attempt to experiment was the „Crucifixion” performance by Wacław Kuczma. He exploited a large glass pane and a ladder to show the physical pain and exhaustion associated with the crucifixion.



## EMOTIV EPOC EEG

14 channels / 2 reference / rechargeable battery (6 hours) / bluetooth / sampling rate: 128 SPS or 256 SPS / resolution 14 bit



### Performance „get out. get in”

**Irena Lipińska**

pretest 3\_e1 / 29-10-2015 /

Academy of Fine Arts in Wroclaw

In cooperation with Laboratory

of Neuropsychology and Usability in Bydgoszcz / Poland

**Description:** A third attempt to experiment was performance „out.get get in” by Irena Lipińska. She based on the improvised movement depending on the existing space and the level of viewers’ engagement.

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# The neurophysiology of an artist in a performance \_experiment\_e1/2015-2017



eye-tracking, heat map  
/ Tobii Glasses 2

pretest1\_e1  
photo V. Kuš / FUNom

e\_1

# The neurophysiology of an artist in a performance \_experiment\_e1/2015-2017



pretest 2\_e1

photo V. Kuš / © FUNom

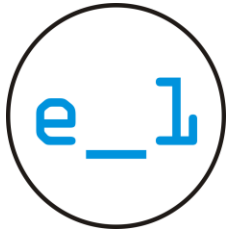
e\_1

# The neurophysiology of an artist in a performance \_experiment\_e1/2015-2017



pretest 3\_e1

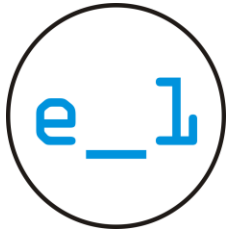
photo V. Kuš / © FUNom



# The neurophysiology of an artist in a performance \_experiment\_e1/2015-2017

## COMPARISON OF SELECTED (SPECIFIC TO PERFORMANCE) CHARACTERISTICS OF THE DEVICES (0-BAD, 6-VERY GOOD)

	quality of connection	quality of recorded data	friendliness of software	convenience of use for artist	possibility to visualize data	artifacts decontamination	mobil software (android) yes/no	cognitive state metrics	the visual weight of the device (0-low, 6-high)
MaidWave Mobile	2	4	5	1	3	eye blink (TGAM chip)	yes	attention, meditation	4
B-Alert x24 qEEG	5	6	5	5	6	EMG, ECG, eye blink, spike, excursion, saturation	no	drowsy, workload, distraction, high engagement, low engagement	2
EMOTIVE EPOC EEG	1	3	5	4	5	EMG, eye-blink	no	calm, meditation, excitement, engagement	4

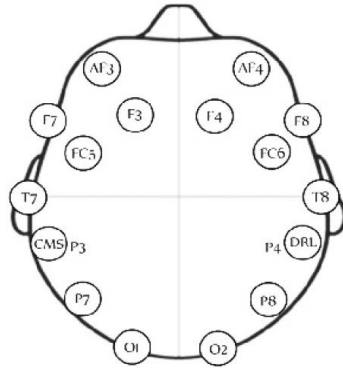


# The neurophysiology of an artist in a performance \_experiment\_e1/2015-2017

Machines that cooperate with us (measuring apparatus)

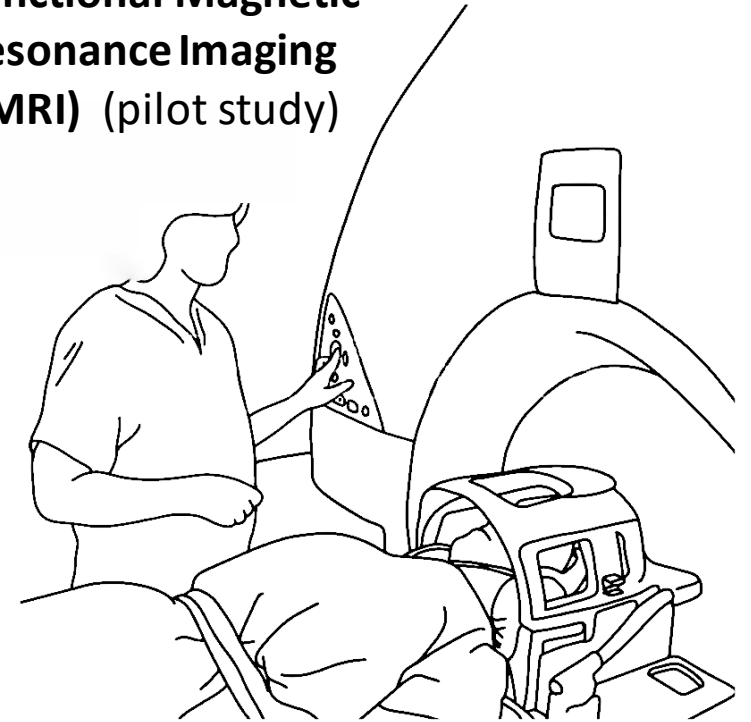


/ EEG EMOTIV EPOC



/ B-Alert X24 qEEG

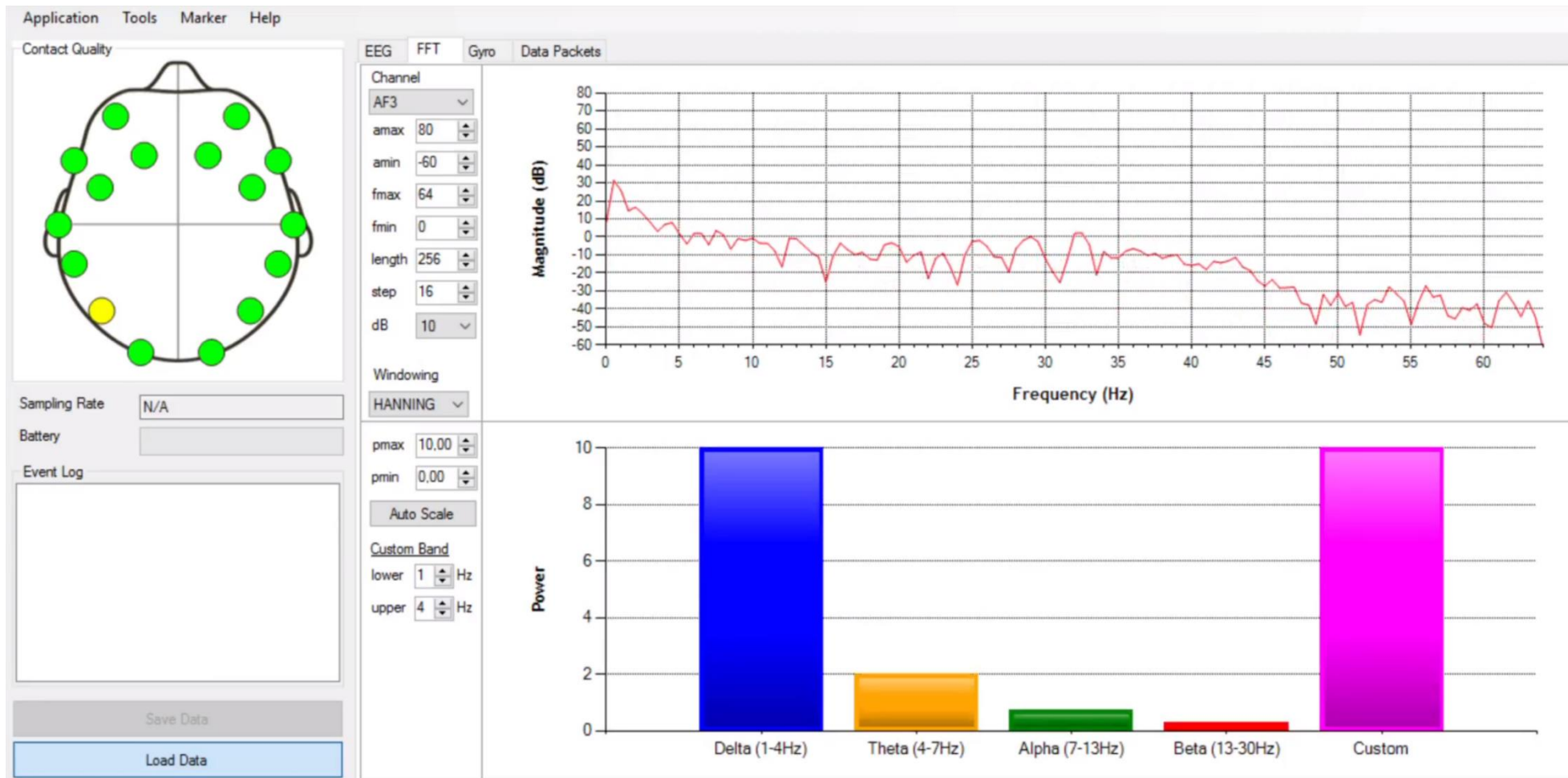
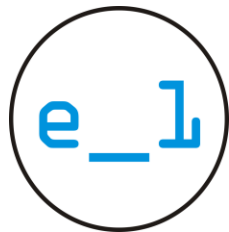
Functional Magnetic  
Resonance Imaging  
(fMRI) (pilot study)



## PARTNERS

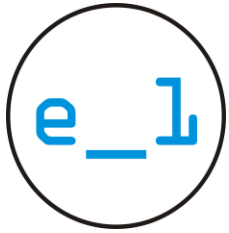
- / The Neurocognitive Laboratory of ICNT
- / fMRI Facility of ICNT
- / Laboratory of Neuropsychology and Utilities

# EEG EMOTIV EPOC \_ INTERFACE

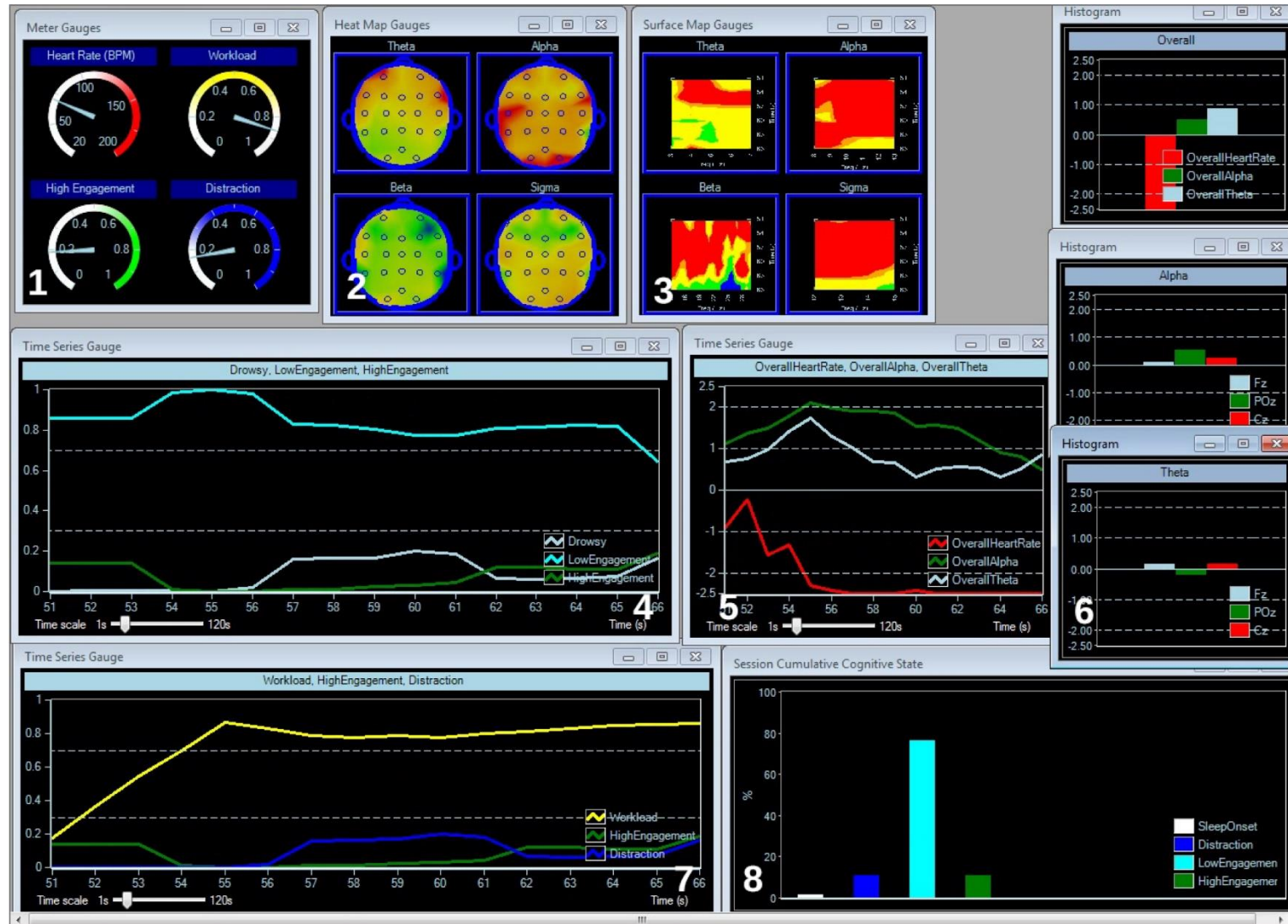


SESSION 1\_e1 / performance Elżbieta Jabłońska / PrtScn video / © FUNom / PNiU

**delta** / dream, deep meditation **theta** / emotions **alpha** / rest **beta** / rhythm of readiness **gamma** / (custom) motor functions



## B-Alert X24 qEEG \_ INTERFACE / B-Alert Acquisition Software



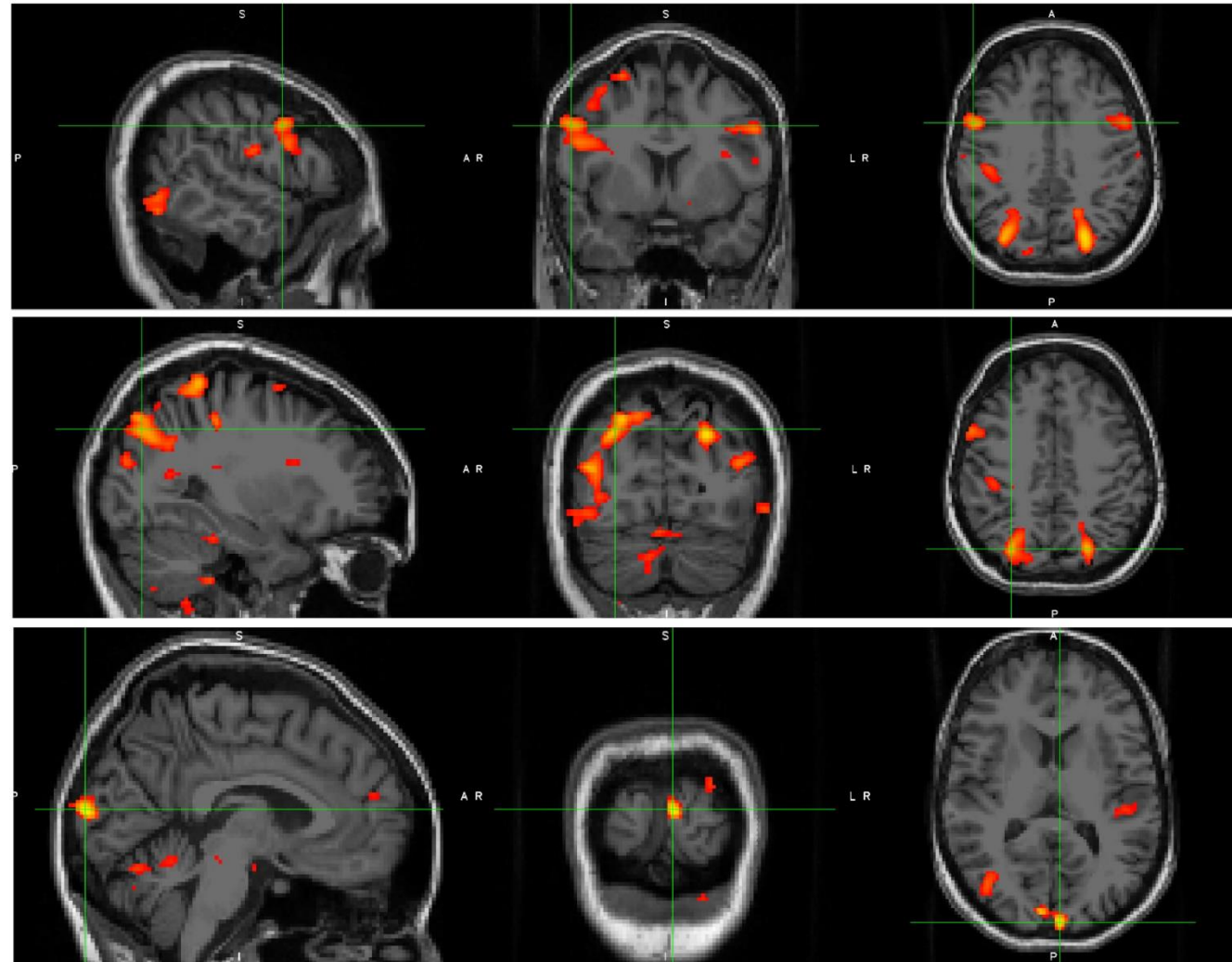
elaboration Ł. Kędziora / © FUNom

1 Meter gauges / 2 Heat map gauges / 3 Surface map gauges / 4-6 Time series gauge / 7 Histogram / 8 Session cumulative cognitive state

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## Functional Magnetic Resonance Imaging (fMRI) \_NEUROIMAGING

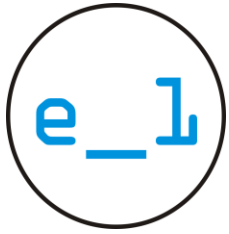


**GM Broca's area  
BA44/45 / speech  
functions**

**GM Inferior parietal  
lobule  
/ facial recognition  
functions**

**Visual cortex V1  
/ motion perception  
recognition functions**

elaboration J. Nikadon  
/ © FUNom / ICNT



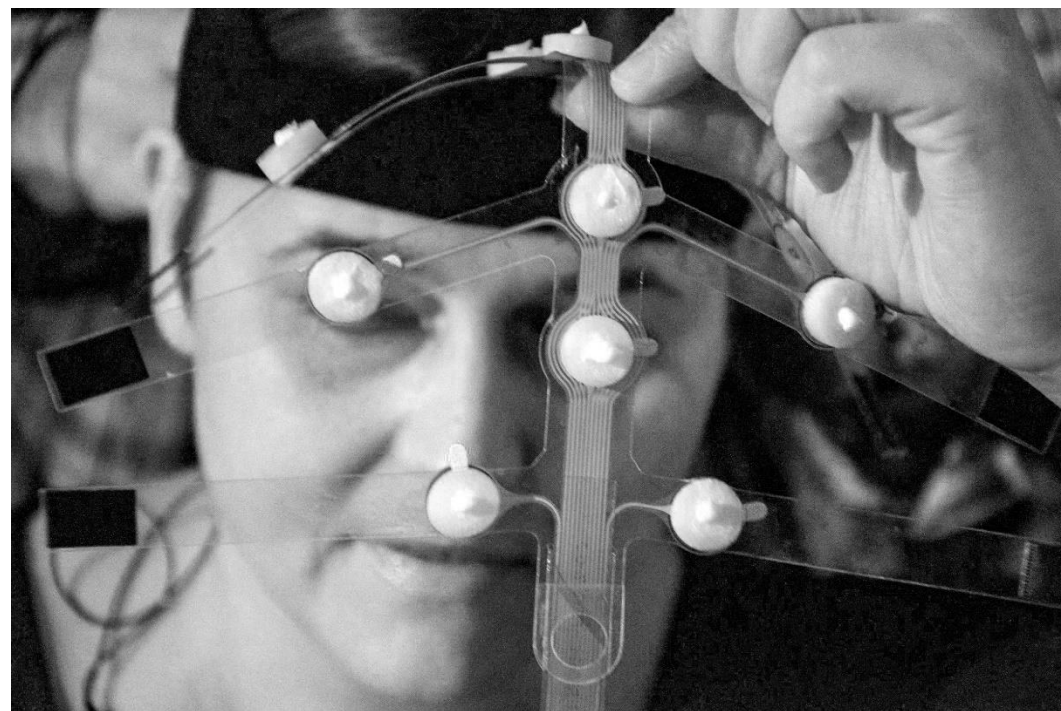
## Artists taking part in the experiment (7 sessions /18 artists)



photo V. Kuš / FUNom

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# The neurophysiology of an artist in a performance \_experiment\_e1/2015-2017



SESSION 1\_e1 / performance Elżbieta Jabłońska, Agnieszka Sowa

photo V. Kuś / © FUNom

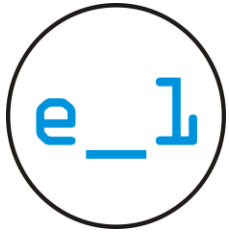
e\_1

# The neurophysiology of an artist in a performance \_experiment\_e1/2015-2017



SESSION 2\_e1 / reperformance Ola Sojak-Borodo

photo V. Kuš / © FUNom



# The neurophysiology of an artist in a performance \_experiment\_e1/2015-2017

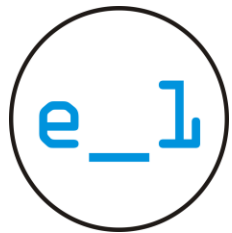


SESSION 2\_e1 / reperformance Ola Sojak-Borodo

PrtScn video Ł. Matulewski / © FUNom

^ Video from the pilot study in the Laboratory of functional Nuclear Magnetic Resonance (fMRI) at the Centre for Modern Interdisciplinary Technologies (ICNT) at the Nicolaus Copernicus University in Toruń.

[https://youtu.be/s1WfjqSt\\_Mg](https://youtu.be/s1WfjqSt_Mg)

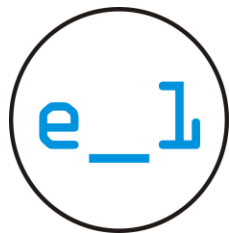


# The neurophysiology of an artist in a performance \_experiment\_e1/2015-2017



SESSION 3\_e1 / test / performance Małgorzata Kaczmarek

photo V. Kuś / © FUNom

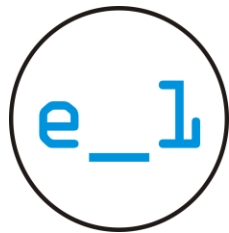


# The neurophysiology of an artist in a performance \_experiment\_e1/2015-2017



SESSION 4-1,3/3\_e1 / performance Justyna Piotrowska, Dariusz Fodczuk

photo V. Kuś / © FUNom



# The neurophysiology of an artist in a performance \_experiment\_e1/2015-2017



SESSION 5-1/2\_e1 / performance Danuta Milewska

photo V. Kuś / © FUNom

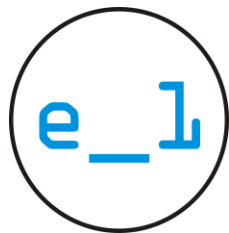
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## The neurophysiology of an artist in a performance \_experiment\_e1/2015-2017



SESSION 6-2/4\_e1 / performance Anna Kalwajtys

photo V. Kuś / © FUNom

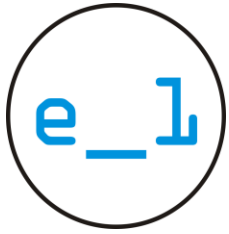


# The neurophysiology of an artist in a performance \_experiment\_e1/2015-2017



SESSION 7-3/4\_e1 / performance Anka Leśniak

photo V. Kuś / © FUNom



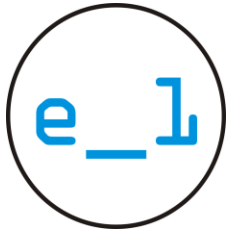
# The neurophysiology of an artist in a performance \_experiment\_e1/2015-2017

## **PRELIMINARY CONCLUSIONS**

Information on the psychophysiological state of an artist obtained along the activities by means of measuring apparatus (interface observations) in real time or in the process of reproducing a record at the level of performance documentation can be of help for viewers during the reception of the work of art. However, due to the body movement and facial expressions of the performer, there are numerous artifacts that largely depict cognitive states, which do not allow the researchers to conduct proper scientific studies based on quantitative research, but in the field of art science they are an interesting illustration of the emotional states of the artist-performer. The sounds recorded using microports turned out to be an interesting record taking us into the space of the artist's experience, they revealed what was not directly heard during the action, including the artist's breath.

### **CURRENTLY**

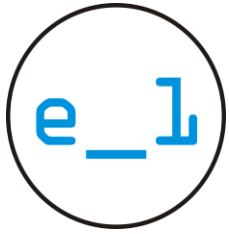
I preparation: a monograph of the experiment edited by Viola Kuś



# The neurophysiology of an artist in a performance \_experiment\_e1/2015-2017

## **FURTHER RESEARCH**

We are in the process of developing a research project involving fMRI (Lab at ICNT, NCU, Torun) and we are trying to create appropriate paradigms that would allow us to create a reflection of the artist's brain similar to that during a performance. We are also thinking about the implementation of mobile functional Near-Infrared Spectroscopy (fNIRS - Gowerlabs LUMO ecosystem). The use of this device would enable us to do research in real time at the level of quantifiable laboratory tests, because, as in magnetic resonance, brain activity is measured by hemodynamic reactions related to the behavior of neurons.



## RESEARCH TEAM

Viola Kuś / author of the idea of the experiment, research coordinator

Łukasz Kędziora / B-Alert x24 qEEG, Equivital EQ02 sem

Kamil Kęska / simultaneous sound, sound intensity recorder

Jan Nikadon / functional Magnetic Resonance Imaging (fMRI)

dr Piotr Szymański / EMOTIV EPOC EEG, Eyetracker Tobii Pro Glasses 2

Aleksandra Wypych / functional Magnetic Resonance Imaging (fMRI)

/ substantive consultant - Joanna Dreszer PhD (ICNT)

/ researchers / observers: Anieli Kokosza, Anetta Kuś, Dagmara Sobczak,

Julia Śliwińska, Magdalena Zamorska PhD

## ARTISTS IN THE EXPERIMENT

Dariusz Fodczuk

/ Marcin Gumieła

/ UTP Choir

/ Elżbieta Jabłońska

/ Bartek Jarmoliński

/ Małgorzata Kaczmarek

/ Anna Kalwajtys

/ Antoni Karwowski

/ Michał Kowalski

/ Wacław Kuczma

/ Viola Kuś

/ Anka Leśniak

/ Danuta Milewska

/ Justyna Orłowska

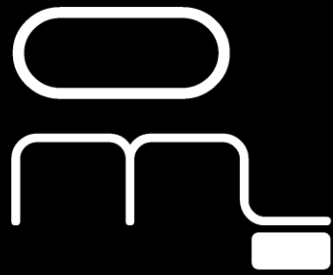
/ Justyna Piotrowska

/ Natalia Reszka

/ Agnieszka Sowa

/ Aleksandra Sojak-Borodo

**PRESENTATION / ELABORATION**  
**Viola Kuś**



[www.funom.org](http://www.funom.org)

