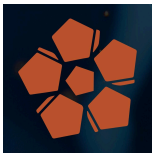


ART ^ NEUROSCIENCES

SEED 13 - NeuroHarmony

0. CONTACT DETAILS

0.1 Surname and first name

Neuroscience of Wellbeing Research Group: Martín Monzón, Isabel María; Amores Carrera, Laura; Samaniego Sancho, Daniela; Durán García, Emilio; Ocaña Campos, Francisco Manuel.

0.2 Contact e-mail address: isabelmartin@us.es

0.3 Let us get to know you a little bit through your participation in websites, blogs, social networks, etc.

https://investigacion.us.es/sisius/sis_showpub.php?idpers=10994

https://www.researchgate.net/profile/Isabel-Martin-Monzon

https://scholar.google.es/citations?user=lp8aij8AAAAJ&hl=es

https://grupo.us.es/neurobi/en/group-members

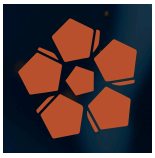
https://www.instagram.com/dra.isabel_martin_monzon/

https://theconversation.com/profiles/isabel-maria-martin-monzon-534513

0.4 What is your background and in which institution do you work?

The contact author* is a PhD in Psychobiology and a Senior Lecturer in Psychobiology. The rest of the team are Psychologists (2), Biologists and Educational Psychologists (1). They are all members of the Neuroscience of Wellbeing Research Group.

*Isabel María Martín Monzón.



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0.5 Gender: Female

0.6 Age range: 41 – 50 years old

1. ESSENTIAL DIMENSION

1.1 Seed name

NeuroHarmony: a concept that encapsulates the dynamic and synchronised interaction between the factors that shape the human brain throughout life. It reflects the balance between the connectome (a neuroplastic network that adapts to experiences), environmental stimuli, and epigenetic factors. In addition, it underlines the interdependence between the brain and the microbiota, whose dialogue influences cognitive, emotional and behavioural processes. This concept represents a state of balance where internal and external factors align to optimise brain well-being and prevent neurodegenerative diseases, integrating brain plasticity, microbiota-brain interaction and epigenetic influence.

1.2 Seed summary

The connectome, an ever-changing network of neural connections, adapts through brain plasticity, allowing the brain to reorganise itself and learn from new experiences. Epigenetic factors influence this plasticity by modifying gene expression according to the environment, while the microbiota, the microorganisms in our body, also affect the brain, modulating neurotransmitters and mood. These interactions can impact the development of neurodegenerative diseases such as Alzheimer's or Parkinson's, where both genetic factors and the environment play a fundamental role in their appearance and progression.

1.3 Metaphor. *Is there any metaphor that helps to explain this seed in a more intuitive way? An imaginative text can inspire as much as a poem.*

The work proposes an immersive experience that represents the human brain as a living and dynamic universe, where the connectome, a network of connections in constant transformation, is influenced by experience, epigenetic factors and interaction with the microbiota. Through three-dimensional binaural music, synchronised multicoloured beams of light and visual projections, the audience is invited on a journey that covers the stages of life, from birth to old age. This show highlights brain plasticity, its ability to adapt and the delicate balance between body and mind, underlining how our experiences, relationships and environment shape the brain, generating both possibilities for prevention and development of neurodegenerative diseases.

1.4 Keywords (separated by commas)

Connectome, neural networks, cognition, emotion, brain-microbiota, epigenetics, neuroplasticity, homeostasis, well-being, cognitive resilience.

1.5 Scientific field (general)

Neuroscience

1.6 Scientific subfield (specific)

Psychobiology

1.7 Resources (File)

The proposal combines various forms of media to illustrate the dynamic functioning of the brain, from diagrams and graphical representations of the human connectome, neural networks and their interaction with the microbiota, to visualisations of epigenetic factors that influence brain development and neuroplasticity throughout life. Included are immersive animations and videos showing the evolution of the connectome from birth to old age, simulations of neural networks and their adaptation to stimuli, as well as binaural music and artificially generated sounds that evoke synapses.

1.8 Resources (Links)

https://theconversation.com/lo-que-pensamos-y-sentimos-afecta-a-la-microbiota-y-viceversa-192960

https://theconversation.com/el-ejercicio-fisico-puede-ayudarnos-a-crear-nuevas-neuronas-y-a-mejorar-la-memoria-166285

https://www.humanconnectome.org/

https://dsi-studio.labsolver.org/

2. ADDITIONAL DIMENSIONS

2.1 SYNAESTHETIC DIMENSION

This dimension seeks to associate certain sensory characteristics to the seed.

2.1.1 What colours does this seed suggest to you?

White would evoke purity and the potential for new connections, while orange would symbolise the active interaction of neural networks. Yellow would reflect moments of learning and brain growth. Blue could suggest a serene mind in its optimal state. Red, on the other hand, would indicate alerts or injuries, reflecting the intensity of critical situations, and green would indicate regeneration and neuroplasticity, highlighting the brain's ability to adapt and heal.

2.1.2 What sounds or music does this seed inspire you?

The music used could encompass a variety of styles that seek to reflect different facets of the brain and its activity. Binaural music, for example, could create an immersive experience that would simulate neural connection, while electronic and pulsating rhythms would symbolise the energy of learning and changes in brain connections. Experimental and classical compositions would depict the complexity and balance of the brain, while chaotic music would evoke moments of intensity, such as those associated with neurodegenerative diseases. Nostalgic tunes from the 50s-60s could be used to evoke old age and memory, and therapy music is designed to support concentration and rehabilitation. Finally, interaction sounds, such as alarms or interference, represent the loss of brain connections or the impact of diseases.

2.1.3 What aromas would you associate with this seed?

Baby cologne and sweet aromas, for the emergence of connections; aromas such as pepper or ginger to represent synaptic pruning and the strengthening of connections; scents such as lavender or pine to represent calm and homostasis; and the smell of eucalyptus to represent brain renewal and adaptation.

2.1.4 What flavours does this seed evoke in you?

The sweet taste of vanilla, symbolising the early stages of brain development. Spices such as cinnamon or ginger represent the intensity of experiences and transformation processes, such as synaptic pruning. Exotic and tropical fruits showing the diversity of experiences and learning throughout life, while coffee

would evoke routine and homeostasis. Finally, hazelnut, associated with the later stages of the brain, including the disease.

2.2 EMOTIONAL DIMENSION

This dimension seeks to explore the personal meaning of the seed.

2.2.1 What was your motivation to dedicate yourself to this field of research? What personal reasons lead you to suggest this seed?

Because I am very interested in knowing how to improve the well-being of the individual. To do this, it is necessary to know the development of the central nervous system, factors that modulate it and affect it. I am interested in generating prevention or improvement strategies in cases of neurological pathologies or neuropsychological disorders, as well as the general well-being of the individual.

I am a neuropsychologist and I have treated patients throughout my career, in whom I have observed that, in addition to a good neuropsychological neurorehabilitation strategy, a 360º approach is essential where epigenetic factors are taken into account (diet, social relationships, exercise...) that can favour a better prognosis of the pathology. It is possible to improve brain damage (connectome lesions – white matter – or grey matter) through good strategies proposed on the basis of well-being. The search for a neural harmony (NeuroHarmony) to adapt to the environment in which we live.

2.2.2 What metaphysical reflections does this seed provoke in you?

Achieving a balance in our central nervous system, to maintain a balance in emotions, behaviour and condition, depends not so much on genetics, but on the interaction of the individual with the environment (epigenetics).

We can improve our well-being with the right knowledge and tools. Our commitment and future lines of work are aimed precisely at trying to promote brain well-being.

2.2.3 What ethical reflection or challenges would you associate with this seed?

The main reflection or ethical challenge that I raise is the need for today's society to realise that they must be active entities in the realisation of strategies to improve their brain health (having moments of stillness, meditation, Mediterranean diet, sport, cognitive challenges...). They have in their hands, with the help of professionals, the ability to reproduce the best physiological functioning of the human body.

2.2.4 What aesthetic dimensions does this seed suggest to you?

Light of different colours, as well as varied music throughout the different epigenetic interactions throughout life.

2.3 PROCEDURAL DIMENSION

This dimension seeks to explore the scientific processes that are usually followed when investigating this topic.

2.3.1 Description of the research process

The brain connectome study (Figure 1) seeks to map and understand the complex networks of neural connections that underpin cognitive functions and behaviour. Below are some of the most common techniques to be able to carry out your research.

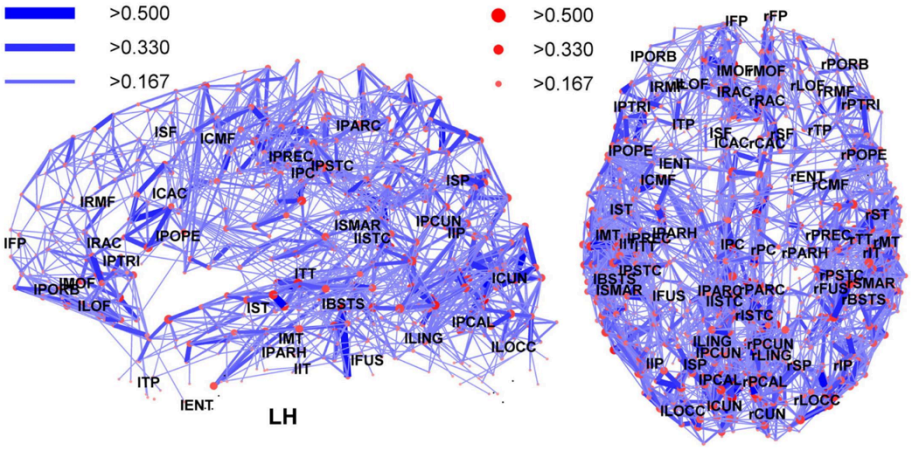


Figura 1. *Dorsal and lateral representations of human brain connectivity. Source: Agmann et al. (2008). Mapping the structural core of human cerebral cortex. PLoS Biology, 6, 7, e159.*

Structural and functional analysis (neuroimaging/electrophysiology)

The brain connectome is studied using neuroimaging techniques and electrophysiological tools that analyse both its structure and functional activity. Among neuroimaging techniques, Diffusion Tensor Imaging (DTI) maps white matter, while functional magnetic resonance imaging (fMRI) and magnetoencephalography (MEG) explore neuronal activity and its synchronisation between regions.

As for electrophysiological tools, electroencephalogram (EEG) measures brain electrical activity, and techniques such as transcranial magnetic stimulation (TMS) and transcranial direct current stimulation (tDCS) assess and modulate brain plasticity. These combined methodologies offer a comprehensive view of the connectome and open up new possibilities for personalised treatments.

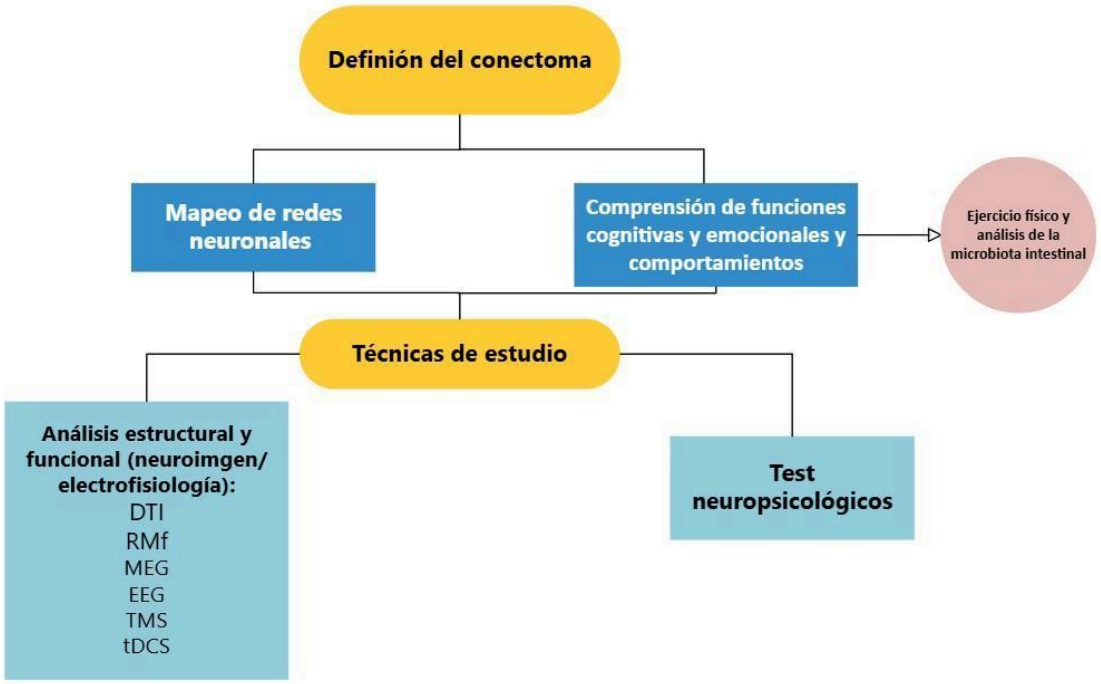
Neuropsychological tests

The study of the connectome using neuropsychological tests evaluates cognitive skills such as memory, attention and language to infer the organisation of brain networks. By combining these results with neuroimaging, correlations are identified between brain connectivity and cognitive deficits, such as in patients with brain damage or Alzheimer's. In addition, in healthy individuals, the variability of connectivity is studied according to factors such as age or lifestyle. By integrating this data with connectome analysis, more accurate cognitive rehabilitation strategies can be designed to improve the connectivity of affected neural networks.

External factors that allow the study of the connectome: physical exercise and analysis of the intestinal microbiota

Physical exercise and the gut microbiota influence the brain connectome, improving neuronal connectivity and neuroplasticity. Exercise, by releasing BDNF, optimises key brain networks, while the microbiota modulates connectivity through the gut-brain axis, affecting neurotransmitters and inflammation. Techniques such as DTI and EEG show how both factors impact networks such as executive control. In addition, exercise favours microbial diversity, promoting beneficial metabolites for brain health, which highlights the importance of studying both factors in cognitive function.

2.3.2 Research process diagram



2.3.3 Link to the descriptive video of the process

2.3.4 What tools are typically used in this field of research? Whether instruments, technologies, hardware or software.

Image by Diffusion Tensor (DTI)
Functional Magnetic Resonance Imaging (fMRI)
Electroencephalography (EEG)
Magnetoencephalography (MEG)
Transcranial Magnetic Stimulation (TMS)
Transcranial Direct Current Stimulation (tDCS) Neuroimaging Analysis Software
Cognitive assessment batteries

3. PERSONAL SUGGESTIONS

4. INVOLVEMENT OF THE SCIENTIST ON THE CREATIVE TEAM

4.1 What role would you like to have in the process of co-creating the SciArt work?

Participate punctually in the conceptual discussion and co-creation of the work.