ART ^ NEUROSCIENCES

SEMILLA 02: The thread of your fragments

0. CONTACT DETAILS

0.1 Surname and first name

Villagrán Sancho, Diego

0.2 Contact e-mail address

diegovs96@gmail.com

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

- **Twitter**: @diego17bwc.
- **Pubmed**: https://pubmed.ncbi.nlm.nih.gov/?sort=date&term=Villagr%C3%A1n-Sancho+D&cauthor_id=37303102.
- **Press:**
  - https://medicinagaditana.es/el-dr-diego-villagran-colegiado-del-comcadiz-en-2021-recoge-el-premio-jesus-galan-2021-de-la-fundacion-para-la-proteccion-social-de-la-organizacion-medica-colegial/
  - https://www.medicosypacientes.com/articulo/dr-diego-villagran-sancho-como-medico-residente-valoro-cada-vez-mas-la-empatia-y-el-afan-de/
- **Scientific dissemination:**
  - https://www.youtube.com/watch?app=desktop&v=p0f6Z1M2FJM

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

Degree in Medicine from the University of Seville. Fourth year resident in Neurology at the Virgen del Rocío University Hospital. Tutor of MIR residents Asturias 2021-2023. Trainee intern in Psychiatry at Warneford Hospital, Oxford (2017). Observer at the Memory and Aging Center of the University of California San Francisco (2024).

0.5 Gender

Male

0.6 Age range

20-30

1. ESSENTIAL DIMENSION

1.1 Seed name

The thread of your fragments: Prisoners of conscience.

1.2 Seed summary

Learning and memory are the most important processes for understanding and adapting to our environment. Learning is the overall process of acquiring information, while memory involves being able to encode, store and retrieve that information. Some consider memory to be the most important of all cognitive functions. As Eric R. Kandel said, ‘we are what we are because of what we learn and what we remember’. So much so that, on most occasions in routine clinical practice, the complaints of relatives consist of ‘memory problems’ of their loved one, even though the deficit is actually in another cognitive function. The creation of a memory requires multiple structures in complex interconnection, such as the hippocampus, the parahippocampal cortex, and others that make up the limbic system and the so-called Papez circuit. But it not only depends on specific parts, but also involves a different form of communication between neurons, synapses, with particular characteristics that allow this communication to be maintained over time. It is also a process that is particularly influenced by emotions, and which maintains a peculiar bidirectional relationship with them.

We are emotion and memory. When either of these two qualities is compromised, the consequences can irreversibly shake our ‘I’. We all think of Alzheimer's disease when we speak of ‘forgetfulness’, but there is a wide spectrum between ‘absent-mindedness’ and severe impairment of our ability to remember. There is a feeling of strangeness whenever we forget something, don't recognise someone, don't remember a specific moment... We lose part of who we are. Imagine then that this feeling of strangeness is magnified and takes up a large part of our day. If we are unable to remember what is happening in front of us (anterograde amnesia), we lose the thread, we are isolated and

unconnected sensations in time, which do not form around a meaning or generate learning. But if, in addition, we do not remember much of our past (retrograde amnesia), what would define our behaviour or our attitude? If we lose both, we can imagine a constant twilight state, a consciousness without origin or destination... We would live in a permanent confabulation to fill in the gaps. But can there be any identity left in that collusion, in that isolated feeling in us?

1.3 Metaphor

An endless awakening, a meaningless instant that changes endlessly: do I know who I am if I don't know what I'm doing here or recognise my surroundings? Can I worry if I don't remember having forgotten? The need to confabulate is born, to fill the spaces with the remnants of our memory and our emotions.

A new being is then created, eternally changing according to the moment, wandering, but at the same time immobile and isolated, surrounded by a lagoon of forgetfulness. It is our emotions and impulses that take over the steering of the ship when the captain is away.

1.4 Keywords

Memory, attention, hippocampus, amnesia, consolidation, Alzheimer, confabulation, dementia, amyloid.

1.5 Scientific field (general)

Neurology

1.6 Scientific subfield (specific)

Memory
Dementia

1.7 Resources (File)

Shared folder

1.8 Resources (Links)

Synapses involved in memory:
https://www.youtube.com/watch?v=KyQUBukwwO8

2021 continuum quote in Behavioural Neurology and Psychiatry:
Fernandez-Romero R, Spica DM. Memory Dysfunction. Contin Lifelong Learn Neurol. 2021;27(6):1562–85.
https://journals.lww.com/continuum/abstract/2021/12000/memory_dysfunction.6.aspx

Brief description of the limbic system:
https://my.clevelandclinic.org/health/body/limbic-system

Books that address similar topics:
- The man who mistook his wife for a hat. Chapter “A question of identity”. Author: Oliver Sacks.
- Musicophilia. Chapter “In the moment: Music and amnesia”. Author: Oliver Sacks.
Links: https://www.oliversacks.com/oliver-sacks-books/musicophilia-oliver-sacks/
https://www.oliversacks.com/oliver-sacks-books/the-man-who-mistook-his-wife-for-a-hat/

2. ADDITIONAL DIMENSIONS

2.1 SYNAESTHITIC DIMENSION

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

2.1.1 What colours does this seed suggest to you?

Indigo blue, conveying immensity and immersion. Sometimes a more lilac tone if I think about the restlessness that can occur.

2.1.2 What sounds or music does this seed inspire you?

A music box with a dancer, old, dissonant, representing the repetitive component of oblivion and the uncomfortable tone for those who witness it.

2.1.3 What aromas would you associate with this seed?

Smell of wet wood and damp sheets.

2.1.4 What flavours does this seed avoke in you?

To stale bread and dust.

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 are your personal reason to suggest this seed?

I have always enjoyed learning about human behaviour. I believe that neurology, psychiatry and psychology are reductionist approaches to the whole of neuroscience, the field of science that tries to understand how our brain works, often identified by many authors as the place where our soul resides. There are many sub-specialties that address the enormous spectrum of the study of the human brain, but I believe that the one that comes closest to the qualities that make our brain exceptional from an evolutionary point of view is the study of the cognitive.

For as long as I can remember, I have been very curious. My father was a psychiatrist at the time, and he has always had a special interest in how other people behaved, a hobby he shared with witty remarks about the people around us at family dinners in restaurants, at Christmas meals, when shopping at the supermarket... This tendency to observe, partly inherited and partly learned, was coupled with a deep interest in the study of the human body. I have always been more adept at anything that involved knowledge of molecular biochemistry, and I have never had much patience, a combination that led me to move away from my initial impulse to go into psychiatry and to reconcile myself with neurology. This in turn explains why, within the field of Neurology, I have an inevitable impulse towards those subjects that give significant value to the emotional and behavioural dimension of the individual, such as the study of cognitive impairment and dementia.

2.2.2 What metaphysical reflections does this seed provoke in you?

The challenge of being able to identify where consciousness and the soul are generated has been addressed since the pre-Socratic philosophers. Descartes was one of the first philosophers to locate the soul in the pineal gland, in the brain. Today we know the structures that allow us to maintain consciousness understood as a waking state, but not at what moment, or thanks to what, we acquire the perception of our own existence and of our self, a quality that has been considered distinctive with respect to other species. I like to approach the influence of memory on our self by understanding it in terms of Freud's dimensions of the person: the Ego, the Ego and the Superego. Memory is one of the ego's fundamental tools for keeping the irrepressible impulses of the ego in contact with reality. Thus, when we lose this tool, it exposes a dramatic window into our ego, our primitive self, which can be radically opposed to our hitherto

socially adapted superego. Are we then reduced to impulses when memory is sufficiently affected? Can we lose awareness of our own self in this case? If the loss of memory can deprive us of our perception as individuals, is it memory that differentiates us from other animals, can it be where the soul lies?

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

If a person is deprived of his ability to retain memories, what kind of life experience is left for him? If he were able to be self-critical of his situation, would he want to go on living?

2.2.4 What aesthetic dimensions does this seed suggest to you?

The automation of electronic devices has been a fundamental tool for the adaptation of these patients to their situation, making it possible to have timed prompts that allow these patients to orient themselves and remember. This repetitive process of generating cues to remember reminds me of the metronome, the beats of music.

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

Would you be able to describe the usual process when researching this topic?
Think that the process itself can be as inspiring as the topic itself.

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The approach to a patient with cognitive impairment usually involves:

- Clinical interview with the patient and family.
- Neurological examination and neuropsychological tests.
- Blood tests to assess acquired causes of cognitive impairment such as vitamin B12 deficiency, syphilis or HIV.
- Cranial CT scan to assess the existence of reversible causes such as tumours, infections, etc., as well as to observe atrophy of certain areas of the brain.
- Definition of a syndrome according to the cognitive functions involved and association with an underlying pathology (Alzheimer's, tauopathy, dementia due to Lewy bodies, etc.).

- Explanation of the findings and clinical suspicion, as well as initiation of treatment according to the aetiology and targeted cognitive exercises.

In case of diagnostic difficulties, different complementary tests may be necessary:

- Magnetic resonance imaging (MRI): allows a clearer view of the anatomy of the brain. Here is an example of corticobasal degeneration (CBD) as the cause of a patient's dementia.

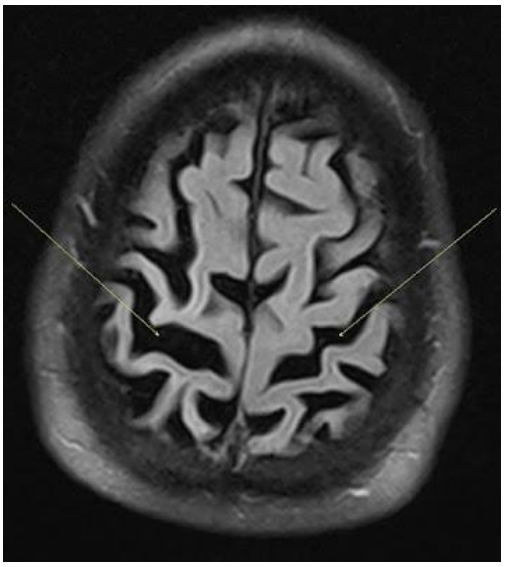

Figure 1. Axial MRI scan showing evident perirhinal cortical asymmetry with greater atrophy of the right hemisphere than the left, a common finding in CBD.

- Fluorodeoxyglucose positron emission tomography (FDG-PET): this allows us to study the distribution of glucose consumption, and therefore energy, in the different areas of the brain.

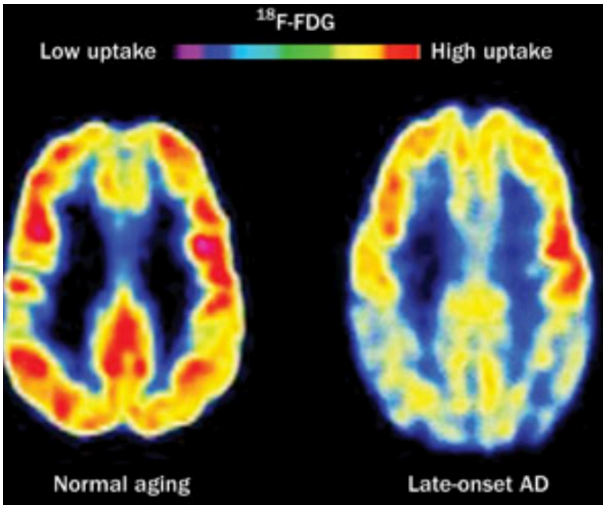

Figure 2. FDG-PET showing the differences between the glucose consumption of an aged healthy brain and one affected by Alzheimer's disease, showing a clear hypometabolism with bilateral parietal predominance in the image on the right (adapted from https://www.researchgate.net/figure/Changes-revealed-by-PET-in-the-AD-braina-18F-FDG-PET-patterns-characteristic-of_fig2_49820537).

- Amyloid PET: allowing us to identify amyloid deposition in different areas of the brain.

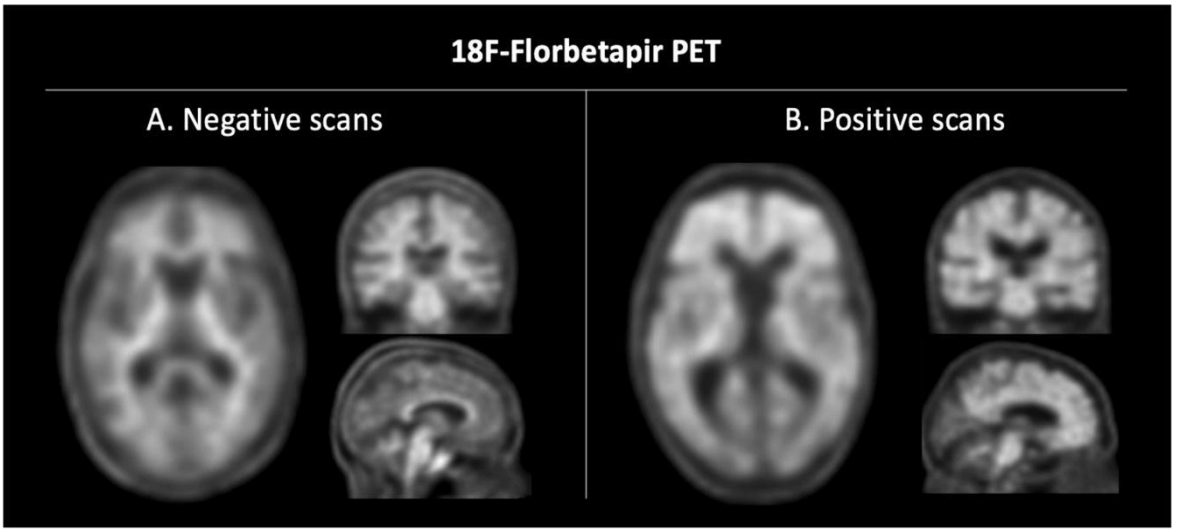

Figure 3. PET images using the radiopharmaceutical 18F-florbetapyr which binds as a ligand to amyloid, the image being pathological when the hyperintensities in the image are in the cortex, not only in the white matter, as we can see in image B. Adapted from: Pietroboni, A.M., Colombi, A., Carandini, T. et al. Amyloid PET imaging and dementias: potential applications in detecting and quantifying early white matter damage. Alz Res Therapy 14, 33 (2022).

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.

There are other less accessible imaging tests such as tau-PET, which, just as we identify amyloid by labelling, allows us to identify the increased deposition of tau in the brain. There is also the possibility of analysing these pathogenic proteins

in other fluids, such as beta-amyloid, t-tau and p-tau in CSF or serum, and alpha-synuclein in CSF and skin.

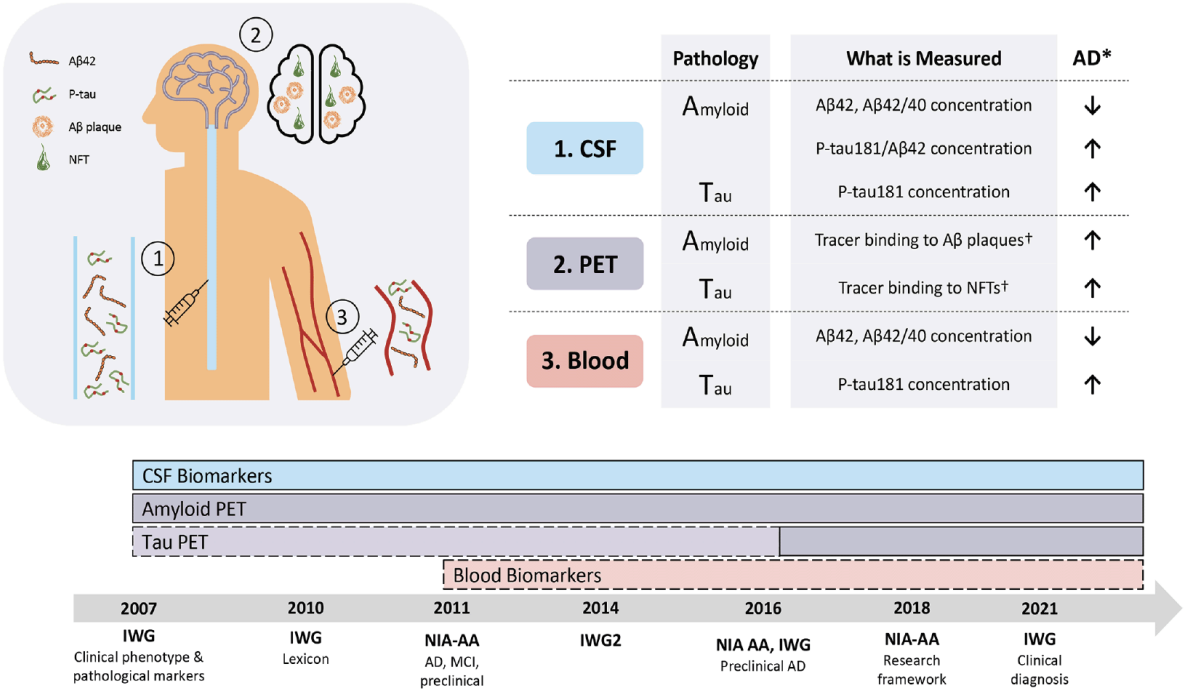

Figure 4. Development of tools for the study of these pathologies over the years. Iaccarino, L., Burnham, S.C., Dell'Agnello, G. et al. Diagnostic Biomarkers of Amyloid and Tau Pathology in Alzheimer's Disease: An Overview of Tests for Clinical Practice in the United States and Europe. J Prev Alzheimers Dis 10, 426-442 (2023).

3 PERSONAL SUGGESTIONS

Although a more technical perspective would have to be given, the image that comes to mind is that of an elderly individual looking face to face with a depersonalised and primitive version of himself. To this, musical and visual elements could be added to convey the sense of bewilderment and unease that many patients experience in this situation.

4 INVOLVEMENT OF THE SCIENTIST IN THE CREATIVE TEAM

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

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

Participate as one more artist

4.2- If you would like to participate as an artist, what creative means would you like to use?

In the case of participating as an artist, I could contribute to the process of composing musical pieces. My experience comes from having been part of musical groups as a percussionist and as a guitarist.