

# IV International Congress of Psychobiology

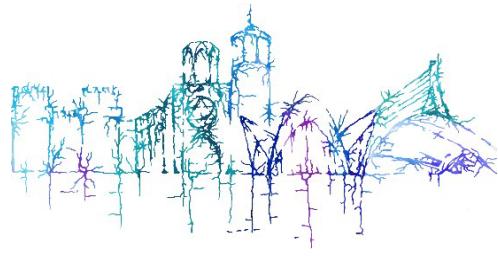
## IV Congreso Internacional de Psicobiología

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ABSTRACT BOOK



**IV** PSYCHO  
BIOLOGY  
International Congress





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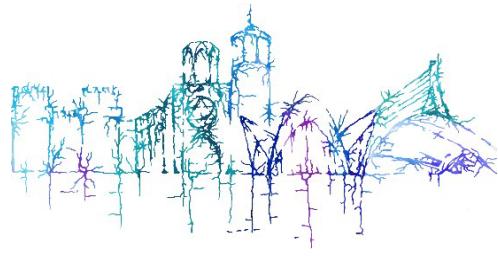
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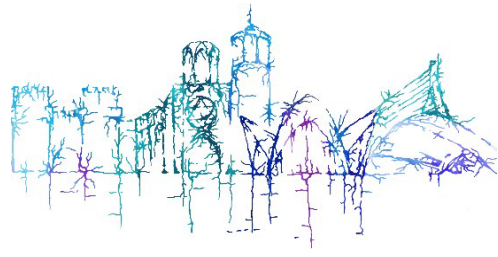
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***PROGRAM AT A GLANCE***

**IV** PSYCHO  
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Hour	TUESDAY	Hour	WEDNESDAY	Hour	THURSDAY	Hour	FRIDAY
		8:30-10:00	Reception				
		9:00-10:15	<span style="color: purple;">■</span> Oral Communications 1 <span style="color: darkblue;">■</span> Oral Communications 2	9:00-10:00	<span style="color: purple;">■</span> PLENARY CONFERENCE (NICOLAS ROHLEDER)	9:00-10:30	<span style="color: purple;">■</span> Simposium 9 <span style="color: darkblue;">■</span> Simposium 10
		10:15-11:45	<span style="color: purple;">■</span> Simposium 1 <span style="color: darkblue;">■</span> Simposium 2	10:00-11:30	<span style="color: purple;">■</span> Simposium 5 <span style="color: darkblue;">■</span> Simposium 6	10:30-12:00	<span style="color: purple;">■</span> Simposium 11 <span style="color: darkblue;">■</span> Simposium 12
		11:45-12:15	COFFEE-BREAK	11:30-12:00	COFFEE-BREAK	12:00-12:30	COFFEE-BREAK
		12:15-13:00	<span style="color: red;">■</span> OPENING CEREMONY	12:00-13:00	<span style="color: purple;">■</span> PLENARY CONFERENCE (CARMEN SANDI)	12:30-13:30	<span style="color: red;">■</span> CLOSING CONFERENCE (PHILIPPE COURTET)
		13:00-14:00	<span style="color: red;">■</span> INAUGURAL CONFERENCE (ÁLVARO PASCUAL-LEONE)	13:00-14:15	<span style="color: purple;">■</span> Oral Communications 6 <span style="color: darkblue;">■</span> Oral Communications 7 <span style="color: green;">■</span> Oral Communications 8	13:30-14	<span style="color: red;">■</span> CLOSING CEREMONY
		14:00-16:00	WELLCOME COCKTAIL: Palacio Exposición	14:15-16:00	BREAK		
16-20:00	Reception	16:00-17:30	<span style="color: purple;">■</span> Simposium 3 <span style="color: darkblue;">■</span> Simposium 4	16:00-17:30	<span style="color: purple;">■</span> Simposium 7 <span style="color: darkblue;">■</span> Simposium 8		
16-17:50	workshops I & II	17:30-18:15	COFFEE-BREAK/ POSTERS 1	17:30-18:15	COFFEE-BREAK/ POSTERS 2		
18-19:50	workshop III	18:15-19:30	<span style="color: purple;">■</span> Oral Communications 3 <span style="color: darkblue;">■</span> Oral Communications 4 <span style="color: green;">■</span> Oral Communications 5	18:15-19:30	<span style="color: darkblue;">■</span> Short communications 1 <span style="color: green;">■</span> Short communications 2		
		19:30- 20:00	GUIDED VISIT: San Nicolás	19:00-19:45	<span style="color: purple;">■</span> ASAMBLY SOCIETY		
		21:30	UNIVERSITY RECEPTION	21:30	DINNER		

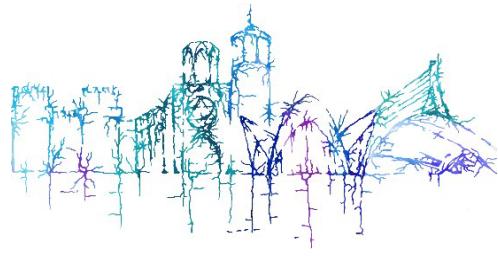
**PSICOLOGÍA:**

- SALÓN DE ACTOS
- Aula A6
- Aula A8

**FILOLOGÍA: SALÓN ACTOS**  
*MANUEL SANCHIS GUARNER*

# IV PSYCHO BIOLOGY

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***PLENARY LECTURES***

# IV PSYCHO BIOLOGY

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**PROMOTING RESILIENCE AND BRAIN HEALTH ACROSS THE LIFESPAN**

Álvaro Pascual-Leone, MD, PhD <sup>(1, 2, 3)</sup>

*1.Senior Scientist, Hinda and Arthur Marcus Institute for Aging Research*

*2.Medical Director, Deanna and Sidney Wolk Center for Memory Health Hebrew Senior Life*

*3.Professor of Neurology and Director of the Berenson-Allen Center for Noninvasive Brain Stimulation at Beth Israel Deaconess Medical Center at Harvard Medical School, Boston, MA, USA.*

*4.Director of the Guttmann Barcelona Brain Health and Neurorehabilitation Institute*

Thanks to advances in medicine and public health, we are living longer and longer. However, more years of life are now largely associated with more years of disability, not more years of health and well-being. Brain disorders are the greatest cause of disability throughout life, greater than disability from cancer or cardiovascular disease combined.

The current challenge is to reduce the impact of brain disorders and the disabilities they cause. Treating neurological and psychiatric diseases is a necessary but not sufficient strategy. We need to empower individuals to define their health goals, and to achieve them. It is essential to identify the neurobiological substrates of symptoms and causes of disability, and to support each individual to maintain brain health throughout life, making the brain more resistant to unexpected events or diseases that may appear, and promoting resilience and brain reserve.

Advances in neuroscience and neuro-technology allow us to identify and modulate the spatio-temporal patterns of brain activity associated with cognitive functions, emotions and behaviors. A healthy brain is a brain with appropriate plasticity mechanisms, and characterization of plasticity mechanisms allows us to obtain measures of brain health and guide plasticity to the optimal outcome for each individual. Likewise, brain resilience mechanisms are associated with a spatiotemporal pattern that can be identified and modulated to increase abilities to cope with insults, injury, disease or brain stressors.

The identification and modulation of spatio-temporal patterns of brain activity offers the possibility of personalized and precise medicine and health. The use of mobile technologies allows empowering each individual to define their brain health goals, monitor progress and make them possible.



**STRESS PATHWAYS TO DISEASE**

Nicolas Rohleder, PhD

Chair of Health Psychology, Friedrich-Alexander-Universität Erlangen-Nürnberg, Erlangen, Germany

Psychosocial stress is an important precursor of disease, reduced quality of life, and shorter life expectancy in humans. The biological pathways between stress exposure and pathophysiological processes underlying disease have received substantial attention, primarily focusing on the role of the hypothalamus pituitary adrenal (HPA) axis and sympathetic nervous system (SNS). How activation of these stress systems translates into physiological disease, however, remains insufficiently understood. Recent research has therefore focused on systemic low-grade inflammation as a pathway, because stress systems are known to affect the inflammatory system, elevated inflammatory system activity often accompanies chronic psychosocial stress, and because inflammation plays a key role in the pathophysiology of diseases such as cardiovascular disease, type2 diabetes, and cancer. Results will be presented addressing different aspects of stress system control of inflammatory mechanisms in the context of chronic and acute psychosocial stress. We will report longitudinal data linking chronic stress to accelerated increases in low-grade inflammation and the potential mediating factors. We will further present results showing how individual responses to repeated acute stressors can differ between individuals showing adaptive and maladaptive response patterns, and how such patterns can be altered via targeted interventions.



**PLENARY LECTURE**

**Thursday, 21<sup>st</sup> July, 12:00-13:00h**

**Salón de Actos *Manuel Sanchis Guarner* (Faculty of Philology, Translation and Interpretation)**

**BRAIN MITOCHONDRIA AND METABOLISM AT THE CORE OF ANXIETY  
AND RELATED BEHAVIORS**

Carmen Sandi, PhD

*Brain Mind Institute, Swiss Federal Institute of Technology Lausanne (EPFL)*

There is important inter-individual variation in stress coping responses and motivated behavior, and trait anxiety is revealing as a key moderator of this variation. Our work in animals and humans identifies the involvement of mitochondrial function and metabolism in the brain's motivation hub, the nucleus accumbens, in the link between stress, anxiety and motivated actions. I will present work in rodents and humans; the latter one involving virtual reality and neuroimaging to capture the impact of anxiety on brain function and behavior. Our findings have implications for the understanding of the mechanisms involved in individual differences in vulnerability to stress.



**FROM SOCIAL STRESS TO SOCIAL PAIN IN SUICIDAL BEHAVIOUR**

Philippe Courtet, MD, PhD

*University of Montpellier - Hôpital Lapeyronie (FRANCE)*

Social isolation and interpersonal difficulties are potent risk factors of suicidal behaviour, and they are a source of social pain. At a neuroanatomical level, suicidal vulnerability is associated with dysfunctional insula activation during social exclusion, a region involved in social and physical pain processing. Moreover, both prefrontal brain activity and behaviour are altered during decision making in the presence of social feedback in suicide attempters, where they avoid negative social feedback despite the expected outcome. Then, suicide attempters may be more vulnerable to social stress, increasing the risk of more deleterious decisions, suggesting that a suicidal act is a means to escape intolerable social suffering despite negative long-term consequences (i.e. death). Clinically, psychological pain has been associated with suicidal behaviour and it may predict suicidal events above the severity of depression and suicidal ideation.

Consistently with the opioidergic hypothesis of rejection sensitivity, the demonstration of a bidirectional reciprocal association between the use of opioids drugs and suicidal behaviour suggests the involvement of this system in suicide.

Negative social interactions in daily life are both common triggers of suicidal behaviour and strong inducers of inflammatory responses, suggesting that suicidal patients display an increased inflammatory response to social rejection.

Suicidal patients show altered cortisol responses to a social stressor as well as a decrease in basal heart rate variability. Preliminary results in controlled laboratory studies suggest that suicidal patients have a dysregulation of the autonomic nervous system in response to stressful situations.

Coupling the investigation of biological systems with psychobiological studies of social stress may help to identify biomarkers of suicidal behaviour, allowing the early identification of suicidal subjects and to propose innovative therapeutic and preventive actions.

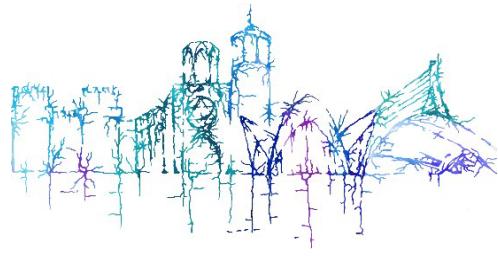




***SYMPOSIA***

# IV PSYCHO BIOLOGY

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## SYMPOSIUM 1

### CAN STRESS HAVE POSITIVE EFFECTS?

Wednesday, 20<sup>th</sup> July 2022, 10:15-11:45h

Salón de Actos, Faculty of Psychology and Speech Therapy

*Chair: María A Aguilar*

*Department of Psychobiology, University of Valencia, Spain, [asuncion.aguilar@uv.es](mailto:asuncion.aguilar@uv.es)*

It is well known that chronic stress can induce negative consequences, such as the development of anxiety, depression or substance abuse. However, people cope with stress differently, and responses to adversity vary among individuals. In fact, some subjects display the ability to overcome the negative effects of stress, a phenomenon known as resilience. The focus of the present symposium is to present several studies in experimental mice and human beings showing that, in some cases, exposure to stress can improve cognitive processing and protect against the negative consequences of subsequent stress exposure. In the first presentation, Montagud et al. show that self-perceived stress levels in university students correlate positively with their reading comprehension and academic performance. In the second presentation, Garcés-Arilla et al. show the influence of personality traits of neuroticism and extraversion on the coping styles, the cortisol response to the stressful situation of examination and the academic performance in university students. In the third presentation, Martínez-Caballero et al. report similar positive effects of social stress on the performance of an object recognition test by female mice. Finally, García-Pardo et al. shows how exposure to a brief stressor during early life (a single episode of maternal separation) or during adolescence (an acute social defeat experience) can enhance the resilience of mice to the long-term consequences of social stress later on in life. In summary, these studies demonstrate that stress can induce positive effects under some circumstances, including an increase in cognitive abilities and inoculation against the effects of subsequent stressful experiences. Research on the potential positive effects of stress is important to determine ways to enhance resilience and reduce the incidence of mental disorders associated with stress, such as emotional, cognitive or drug-use disorders.



**EXPOSURE TO INTERMITTENT REPEATED SOCIAL DEFEAT  
FACILITATES OBJECT RECOGNITION IN FEMALE MICE**

**Maria Angeles Martínez-Caballero<sup>1</sup>, Claudia Calpe-López<sup>1</sup>, M. Pilar García-Pardo<sup>2</sup>, María A Aguilar<sup>1</sup>**

*<sup>1</sup>Department of Psychobiology, University of Valencia, Spain*

*<sup>2</sup>Department of Psychology and Sociology, University of Zaragoza, Spain*

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Clinical and preclinical studies suggest that stress induces cognitive deficits in males, while females show an increase in arousal. The main source of stress in humans is derived from social interaction, which is well modeled in male rodents by exposure to social defeat. However, this paradigm presents difficulties in the case of female rodents with low levels of aggression. The objective of this study was to evaluate the effects of exposure to vicarious social defeat on female mice's performance of object recognition. A control group was not exposed to stress, while another group experienced four episodes of vicarious social defeat (VSD) separated by intervals of 72 hours. To induce VSD, females visualized an agonistic encounter in which a male of the same strain was defeated by an aggressive OF1 opponent. To evaluate anxiety levels, both groups performed the elevated plus maze (EPM) twenty-four hours after the last episode of VSD. On the following day, they initiated the object recognition test. Mice were first exposed to two objects after which one of the objects was substituted by a novel object. A discrimination index (DI) was calculated. Mice exposed to VSD showed anxiety (lower percentage of time spent in the open arms of the EPM) but a higher DI, thus indicating better recognition memory. In conclusion, our results suggest that exposure to social stress induces positive effects on cognitive processing in female mice. Funding: Ministry of Science, Innovation and University (Spain), AEI/10.13039/501100011033, grant PID2020-118945RB-I00.

**Keywords:** social defeat, stress, mice, female, object recognition test.



**EXPOSURE TO A BRIEF STRESSOR DURING EARLY LIFE OR ADOLESCENCE INOCULATES AGAINST THE LONG-TERM EFFECTS OF SOCIAL STRESS ON COCAINE REWARD IN MALE MICE**

**M. Pilar García-Pardo<sup>1</sup>, Claudia Calpe-López<sup>2</sup>, Maria Angeles Martínez-Caballero<sup>2</sup>, María A Aguilar<sup>2</sup>**

*<sup>1</sup>Department of Psychology and Sociology, University of Zaragoza, Spain*

*<sup>2</sup>Department of Psychobiology, University of Valencia, Spain*

E-mail correspondence: [magarpar@unizar.es](mailto:magarpar@unizar.es)

Exposure to intermittent repeated social defeat (IRSD) increases the vulnerability of mice to the rewarding effects of cocaine in the conditioned place preference (CPP) paradigm. In line with the “inoculation of stress” hypothesis, the aim of this presentation is to show that a brief stressful experience (maternal separation (MS) in early life, or social defeat (SD) in adolescence) can provide protection against the long-term effects of IRSD on cocaine CPP. Six groups of male mice were employed; two groups were separated from their mother (6 hours on postnatal day (PND) 9), another two groups experienced an episode of social defeat (SD) with an aggressive resident mouse on PND 27, and the remaining two groups were not exposed to any manipulation (controls). On PND 47, 50, 53 and 56, some of the mice that had experienced MS or PSD were exposed to social defeat (MS+IRSD and SD+IRSD groups), while others were allowed to explore an empty cage (MS+EXPL and SD+EXPL groups). Control mice (CONTROL+IRSD and CONTROL+EXPL groups) underwent the same procedure. Three weeks after the last episode of defeat, all the mice underwent the CPP procedure with cocaine (1 mg/kg). Acquisition of cocaine-induced CPP was observed only in mice exposed to IRSD alone (CONTROL+IRSD). An acute episode of MS or SD prevented the effects of IRSD. These results suggest that exposure to a brief episode of stress early in life or during adolescence increases the subsequent resilience of animals to the effects of social stress on vulnerability to cocaine.

**Keywords:** social defeat, stress inoculation, mice, cocaine, maternal separation.



## STRESS, NEW TECHNOLOGIES AND READING HABITS IN UNIVERSITY STUDENTS

**Sandra Montagud Romero<sup>1</sup>, M<sup>a</sup> Carmen Blanco Gandía <sup>2</sup>, Carmen Ferrer Pérez <sup>2</sup>**

*<sup>1</sup>Psychobiology Department, University of Valencia, Spain*

*<sup>2</sup>Psychology and Sociology Department, University of Zaragoza, Spain*

E-mail correspondence: [sandra.montagud@uv.es](mailto:sandra.montagud@uv.es)

There is a vast literature focused on unraveling the impact of stressful experiences on basic cognitive functions such as memory or attention, and also on psychological well being. However, no previous studies have assessed the effect of stress on reading comprehension, which is a process that deeply impacts on academic performance. The aim of our project was to evaluate if the stress levels of undergraduate students had an impact on their reading comprehension, and therefore modulate their academic performance. Additionally, we also evaluate the effect of other key variables such as the Information and Communication Technologies (ICT) and reading habits that could also be affecting students' levels of reading comprehension.

For that purpose, the comprehension levels of 108 students from the University of Zaragoza was evaluated using the Deep Cloze Test. Student stress levels were characterized with two different measures: self-reported levels through the Spanish version of the Depression, Anxiety and Stress Scales, in its 21-item version (DASS-21), and physiological levels through salivary cortisol measures (baseline and after Deep Cloze assessment). Additionally, an ad hoc questionnaire was employed to gather data of reading and ICT habits.

Results confirmed that reading comprehension levels positively correlate with academic performance (final marks). Stress levels evaluated with DASS-21 questionnaire correlated positively with reading comprehension and academic performance (greater marks). Unsurprisingly, the number of books that students read in a year positively correlates with their reading comprehension and academic achievement, whereas the use of smartphones, computers and tablets negatively correlates with these variables. Interesting interactions were also observed between stress levels and ITC use. These findings suggest that self-reported stress levels and ITC and reading habits have an impact on reading comprehension of university students and on their academic performance.

**Keywords:** reading comprehension, stress, cortisol, undergraduates, new technologies.



**THE DIFFERENT EFFECTS OF AN ACUTE NATURAL STRESSOR ON  
PSYCHOBIOLOGICAL RESPONSE AND ACADEMIC PERFORMANCE  
IN STUDENTS ACCORDING TO PERSONALITY**

**Sara Garcés-Arilla<sup>\*1</sup>; Vanesa Hidalgo<sup>1</sup>; Camino Fidalgo<sup>1</sup>; Teresa Peiró<sup>2</sup>; Magdalena Méndez-López<sup>1</sup>**

<sup>1</sup> *Department of Psychology and Sociology, University of Zaragoza, IIS Aragón*

<sup>2</sup> *Department of Nursing, University of Valencia*

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Academic examination is a regular source of stress for students which can trigger cognitive, hormonal, and emotional responses. The aim of this study was to analyse the different coping styles, the psychobiological response to a stressor (examination) and academic performance based on personality traits. Seventy-one university students (8 men) participated in both a non-stressful session and a stressful session separated by two days. The sample was divided into two groups: a vulnerable group characterised by high neuroticism and moderate extraversion and a non-vulnerable group characterised by low neuroticism and high extraversion. The results show that vulnerable group had higher levels of cortisol in both the non-stressful session and before examination in the stressful session. Vulnerable group also showed more subjective stress and a poorer emotional regulation compared to the non-vulnerable group. Moreover, vulnerable group tended to use both active and passive coping strategies. Correlations showed that in the vulnerable group, the neuroticism is related to a more subjective stress and better academic performance, and extraversion is positively associated with the use of active coping strategies. In non-vulnerable group, neuroticism is associated with higher anxiety levels. Also, in this group, perceived stress is linked with the use of active strategies of coping.

Funding: Gobierno de Aragón (Dpto. Ciencia, Universidad y Sociedad del Conocimiento) and FEDER "Construyendo Europa desde Aragón" (group: S31\_20D), Fundación Universitaria "Antonio Gargallo" (2019/B002), and Fundación Ibercaja and Universidad de Zaragoza (JIUZ-2019-SOC-01).

**Keywords:** stress, personality traits, cortisol, coping strategies, academic performance.

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## SYMPOSIUM 2

### NEW THERAPEUTIC CHALLENGES AND FUTURE PERSPECTIVES IN COGNITIVE IMPAIRMENT

Wednesday, 20<sup>th</sup> July 2022, 10:15-11:45h

Aula A6, Faculty of Psychology and Speech Therapy

*Chairs: Jorge L. Arias<sup>1,2,3</sup> and Natalia Arias<sup>2,3,4</sup>*

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Over the last decade, there has been a growing interest in brain disorders represented by a collection of syndromes characterised by abnormalities in memory, cognition, sensation, behaviour, and personality. Neurological disorders are the second leading cause of death worldwide, and the identification of new therapies for these conditions is paramount. The burden of neurological diseases is recognised as a global public health challenge that will increase as the population age in the next few decades.

Through decades of research, health professionals have developed a set of systematic criteria for diagnosing brain disorders and identifying pharmaceutical and psychological treatments. However, understanding the neural substrates and pathological mechanisms involved in these diseases is limited. In addition, reliable neurological biomarkers for identifying brain disorders are insufficient. Moreover, certain brain disorders remain unaffected by neuropharmacological therapies, and the treatment options are far from optimal efficacy and specificity. Therefore, it is essential to find alternative therapies for brain disorders that are efficient in clinical practice.

To overcome these challenges, this symposium will explore different invasive and non-invasive brain stimulation methods, including transcranial magnetic stimulation (TMS), photobiomodulation (PBM), and transcranial direct stimulation (tTDS). These technologies may help shed light on the causal relationship between neurological dysfunction and behaviour. Also, a novel mechanism underlying memory retrieval will be discussed as potential brain intervention methods for cognitive impairment. Finally, regenerative medicine and precision medicine will be discussed as alternative therapeutical strategies for neurological diseases.

Some notable areas to address:

- Challenges in the understanding of pathological mechanisms of cellular damage in disease, as well as molecular processes.
- Novel mechanisms for the retrieval of hippocampal memory as a therapeutic target for ageing and neurodegeneration.
- Challenges and future perspectives in non-invasive therapies.



## MODULATION OF BRAIN METABOLIC ACTIVITY AND MEMORY THROUGH MAGNETIC STIMULATION

**Candela Zorzo<sup>1,2</sup>, Marta Méndez<sup>1,2</sup>, Alberto M. Pernía<sup>2,3</sup>, Juan A. Martínez<sup>2,3</sup>, Jorge L. Arias<sup>1,3</sup>**

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Repetitive transcranial magnetic stimulation (rTMS) is a non-invasive neuromodulation technique that allows modifying brain excitability outside the skull. The use of rTMS is promising to treat several disorders that affect our nervous system, however, there are still many unknowns about its mechanism of action, as well as in the modulation of memory processes. Our objective was to determine its effects on the nervous system of healthy rodents, taking into account brain oxidative metabolism, neuronal activation and the study of glial cells, the latter being indicators of possible inflammatory effects. We apply rTMS with different stimulation protocols, modifying the number of trials, pulses and days of administration. We study the oxidative metabolism through the histochemistry of cytochrome c oxidase (CCO), the neuronal activation through the immunohistochemistry of c-Fos, and the study of glial cells through the immunohistochemistry of GFAP and Iba1, selective markers of astrocytes and immunoreactive microglia, respectively. Regarding possible impact on spatial memory, we used the Morris water maze. The results showed that rTMS is able to modify CCO activity in cortical and hippocampal regions, produces an increase in neuronal activation, and does not lead to changes in glial cell density. We also observe that, although it does not lead to facilitation of spatial memory, it is capable of achieving a more efficient use of the brain networks that support it. In conclusion, these experiments add information about the mechanism of action of rTMS, and its potential use in the modulation of cognitive functions.

**Keywords:** transcranial magnetic stimulation, cytochrome c oxidase, glia, spatial memory.



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## PHOTOBIMODULATION IN THE BRAIN: WHAT WE KNOW AND WHERE WE ARE

**Natalia Arias<sup>1</sup>, Juan A. Martínez<sup>3,4</sup>, Miguel J. Prieto<sup>3,4</sup>, Jorge L. Arias<sup>2,3</sup>**

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Photobiomodulation (PBM) describes the use of red or near-infrared (NIR) light to stimulate complex IV of the mitochondrial respiratory chain (cytochrome c oxidase, CCO) and increase ATP synthesis. CCO sits at a convergence in apoptotic mechanisms, which underlie major pathways implicated in the progression of neurodegeneration. So, there is convincing evidence that CCO remains a viable target for anti-aging and anti-neurodegenerative therapeutics. Specific modulation of CCO however, remains relatively unexplored. Special interest has been taken in the excitation of mitochondrial CCO which serves as a primary photoacceptor in the red to NIR region. Moreover, brain PBM therapy enhances the metabolic capacity of neurons and stimulates anti-inflammatory, anti-apoptotic, and antioxidant responses, as well as neurogenesis and synaptogenesis. Its therapeutic role in disorders such as dementia and Parkinson's disease, as well as to treat stroke, brain trauma, and depression has gained increasing interest. Our results will describe the state-of-the-art preclinical and clinical evidence regarding the efficacy of brain PBM therapy, the differential effects of PBM interval schedules on brain CCO and proto-oncogene expression and its potential use as a psychobiological tool.

**Keywords:** photobiomodulation; cytochrome c-oxidase; pro-oncogen expression; light; cognition.



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**TRANSCRANIAL DIRECT CURRENT STIMULATION PROMOTES  
NEUROPLASTICITY AND MOTOR FUNCTION IN HEALTHY AND  
STROKE MICE**

**Saviana Antonella Barbati<sup>1</sup>, Maria Bolla<sup>1</sup>, Fabiola Paciello<sup>1</sup>, Claudio Grassi<sup>1,2</sup>, Maria Vittoria Podda<sup>1,2</sup>**

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Transcranial direct current stimulation (tDCS) has recently come to the fore as a promising tool for modulating cognitive and motor functions. In the last ten years, our group has focused its research on studying tDCS effects on primary motor cortex (M1) plasticity in healthy and stroke mouse models looking at the underlying molecular mechanisms. Focal infarct on M1 was induced by photothrombosis in 6-week-old C57BL/6 mice using Rose Bengal, a photochemical dye. After 72 hours, mice were subjected to tDCS or sham stimulation for 3 consecutive days (3×tDCS, 35.4 A/m<sup>2</sup>). Motor function and motor recovery were assessed performing grip strength, grid walking and single pellet reaching tests. Western immunoblotting, ELISA, qRT-PCR and Golgi-Cox staining were carried out to investigate cellular and molecular mechanisms behind tDCS effects. Our results showed that 3×tDCS improved motor performance in healthy mice and ameliorated motor deficits in stroke mice. Indeed, already 24 hours after stimulation, tDCS-mice showed a significant enhancement of neuromuscular strength and forelimb motor skills compared to the relative control. Interestingly, tDCS also ameliorated motor performance of the paretic limb in stroke mice. In both physiological and stroke models these functional-tDCS-positive effects were accompanied by increased spine density at layer II/III pyramidal neurons in M1 and by a boosted expression/activation of plasticity-related molecules including CaMKII and BDNF. Overall, our data demonstrate that tDCS treatment ameliorates motor function and speeds up motor recovery after stroke by modulating plasticity-related mechanisms, promoting its use in support of standard treatments.

**Keywords:** primary motor cortex, photothrombosis, transcranial direct current stimulation, plasticity, brain.



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## A NOVEL MOLECULAR MECHANISM OF MEMORY RETRIEVAL IN HIPPOCAMPUS

**Keiko Mizuno<sup>1</sup>, Natalia Arias<sup>2</sup>, Ted Abel<sup>3</sup>, Peter Giese<sup>4</sup>**

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Contextual fear conditioning (CFC) induces gene transcription for several hours in the hippocampus, which is required for long-term memory formation. Most transcriptions return to baseline within 24 hours after conditioning. However, we identified the transcription of interleukin 3 regulated (Nfil3), a type of basic leucine Zipper that lasts for at least 7 days in the mouse hippocampus (Mizuno et al., *Neurobiol Learn Mem.* 2020). This result suggests that there are long-lasting transcriptions in the hippocampus that go beyond the traditional consolidation window. Such long-lasting transcription may be fundamental for memory maintenance. We have researched for the function of Nfil 3 in hippocampus memory, using CFC. Using Nfil3 knock-out mouse and CA1-specific knock-down by virus injection, we found that Nfil3 might be required for memory consolidation. However, further study using Rolipram, a drug that inhibits phosphodiesterase (PDE) enzymes that break down cAMP, has shown to rescue memory impairment in Nfil3 knock-out mouse. Therefore, the function of Nfil3 is required for retrieval, but not memory storage. This is the first finding that transcription is required for retrieval of memory. Our work suggests that Nfil3 is a possible new drug target for treating memory retrieval deficits, which occur in PTSD, dementia, and ageing.

**Keywords:** memory retrieval, Nfil3, transcription, PTSD, dementia.



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**THE USE OF ANTISENSE OLIGONUCLEOTIDE THERAPIES TO  
NEURODEGENERATIVE DISEASES: REFLECTIONS AND  
PERSPECTIVES FOR THE FUTURE**

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Amyotrophic lateral sclerosis (ALS) is a progressive neurodegenerative disease characterised by the degeneration of motor neurons in the brain and spinal cord. It results in progressive muscular paralysis and death due to respiratory failure within 2-5 years from symptom onset. In 2011, a hexanucleotide GGGGCC repeat expansion was identified in the chromosome 9 open reading frame 72 (C9ORF72) gene. Expansion in this gene is the most common cause of familial ALS and frontotemporal dementia (FTD). The expansion is transcribed from the sense and the antisense strands leading to the formation of intranuclear RNA foci that bind several RNA binding proteins. In addition, the expansion also causes a decrease in C9ORF72 transcript and protein levels and is translated into five dipeptide repeat (DPR) proteins that can accumulate forming cytoplasmic and intranuclear inclusions. In this talk, I will reflect on using non-degrading antisense phosphorodiamidate morpholino oligomers (PMOs) capable of binding to the expanded G4C2 RNA. Furthermore, antisense oligonucleotides (ASOS) have been shown to bind to the repeats and degrade the expanded mRNA strands. I will also discuss how the PMOs and ASOS may become an alternative therapeutic strategy for ALS and FTD.

**Keywords:** amyotrophic lateral sclerosis, C9ORF72, gene therapy, RNA, DPRs.



### **SYMPOSIUM 3**

## **PREFRONTAL DEFICITS IN MENTAL HEALTH: FROM EXECUTIVE CONTROL TO SOCIAL BEHAVIOR**

Wednesday, 20<sup>th</sup> July 2022, 16:00-17:30

Salón de Actos, Faculty of Psychology and Speech Therapy

*Chairs: Adrián Alacreu-Crespo<sup>1</sup> and Philippe Courtet<sup>2</sup>*

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There are growing number of studies reporting deficits in prefrontal brain areas and its functions in several mental health disorders. Indeed, altered impulsivity have been shown as a transdiagnostic marker, and disrupted social cognition is increasingly more reported in several mental health disorders. Due to the importance of prefrontal functions in mental health, here we propose a symposium showing five research focusing in a mental health disorder and its relation with a prefrontal function such as working memory, executive control or social cognition. The first communication (I) study apply neuromodulation to improve inhibitory control in hipersexual patients with Parkinson disease. The second communication (II) is a meta-analysis studying the effect of impulsivity in suicide completers. The third communication (III) is a study of decision making using cognitive modelling with a Bayesian approach in a population of patients with eating disorder, (IV) is a cross-sectional study showing the relationships between social cognition with executive functions in patients with a recent first episode of psychosis.



## A CIRCUIT-BASED APPROACH TO REPAIR HYPERSEXUAL BEHAVIOUR

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The balance between cognitive control and enhanced desire towards sexual cues has been hypothesized to be biased toward the latter in individuals with hypersexuality, suggesting possible functional changes along the mesocorticolimbic circuitry. Here, we provide evidence for this hypothesis by comparing the neurobiological substrate of sexual disturbance over response inhibition associated to medication states in hypersexual Parkinson's disease (PD).

We assessed the impact of sexual cues on response inhibition using a novel erotic stop signal paradigm inside an fMRI in 16 hypersexual, 17 non-hypersexual patients and 17 controls. Task-related activations, functional and anatomical connectivity models were performed. Additionally, a separate sample of 20 hypersexual patients received excitatory neuromodulation (sham-controlled) over the pre-supplementary motor area (pre-SMA; based on fMRI group-based results) aiming to improve inhibitory control over sexual behaviour.

Compared with their non-hypersexual peers, patients with hypersexuality exhibited worse response inhibition after sexual cues, recruiting a network involving caudate, pre-SMA, ventral tegmental area and anterior cingulate cortex. Dynamic causal modelling revealed distinct best models to account for cortico-subcortical interactions with reduced task-related inputs in pre-SMA and descending connectivity to caudate in hypersexual compared to non-hypersexual patients (while medicated). This was sustained by enhanced fractional anisotropy and reduced mean diffusivity in the pre-SMA-caudate pathway. Importantly, pre-SMA stimulation improved response inhibition when exposed to sexual cues in hypersexual patients.

We identified a specific fronto-striatal and mesolimbic circuitry underlying uncontrolled sexual behaviours, with recovery options by applying neuromodulation.

**Keywords:** Hypersexuality, Parkinson disease, Neuromodulation, Inhibitory control.





## IMPULSIVITY AMONG SUICIDE COMPLETERS: A META-ANALYSIS OF PSYCHOLOGICAL AUTOPSY STUDIES

**Sergio Sanz-Gómez<sup>1</sup>, Adrián Alacreu-Crespo<sup>2</sup>, Constanza Vera-Varea<sup>3</sup>, Maria Isabel Perea-Gonzalez<sup>1</sup>, Diego de la Vega<sup>1</sup>, Lucas Giner<sup>1</sup>**

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To perform a meta-analysis on the role of impulsivity in completed suicide. Methods: Inclusion criteria were: 1) data range between 1997 to 2020; 2) Psychological; 3) English or Spanish; 4) assessed adult suicides; 5) included impulsivity assesment. Exclusion criteria were: 1) less than 25 cases; 2) assisted or terrorist suicide; 3) postmortem diagnosis made only from medical records or database; 4) comparison of a suicide group with an equivalent control group; 5) availability of mean and SD of impulsivity for each group. Search was conducted by three of us, who identified, selected and assessed the studies. 297 articles were identified. 78 articles met the inclusion criteria and nine were introduced in the meta-analysis. Suicidal completers had higher impulsivity scores than living controls (Hedges'  $g = 0.59$ , 95% CI [0.28, 0.89],  $p = 0.002$ ). However, the studies show high heterogeneity ( $Q = 90.86$ ,  $p < 0.001$ ,  $I^2 = 89.0\%$ ). The funnel plot showed a symmetrical distribution (Egger's test = -1.98,  $p = 0.078$ ) indicating no publication bias. An additional meta-regression was performed to assess the relationship between impulsivity and aggressiveness, which was found to be statistically significant ( $\beta = 0.447$ ,  $p = 0.045$ ). Individuals with high impulsivity would be exposed to a higher risk of completed suicide. In addition, aggressiveness would play a mediating role. It is important to note the difference in profiles between impulsive people who complete suicide and non-impulsive people, which may reflect different endophenotypes leading to suicide via different pathways.

**Keywords:** Suicide, Meta-analysis, Impulsivity, Post-mortem.



## DECISION MAKING IN EATING DISORDERS FROM A BAYESIAN COGNITIVE PERSPECTIVE

**Adrián Alacreu-Crespo<sup>1</sup>, Laura Embid<sup>1</sup>, Paula Ibáñez-Arrué<sup>1</sup>, Maude Sénèque<sup>2,3</sup>, Kathlyne Dupuis Maurin<sup>2,3</sup>, Francisco Molins<sup>4</sup>, Patrick Lefebvre<sup>5</sup>, Eric Renard<sup>2,5,6</sup>, Philippe Courtet<sup>2,3</sup>, Sebastien Guillaume<sup>2,3</sup>**

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Several past research show decision making impairment as one of the most prominent cognitive impairment in Eating disorders (ED). Several research has shown worse decision making in ED compared to healthy population. Regarding subtypes of ED, studies show contradictory results. However, previous research focus in a simple decision making outcome without taking into account sub-components in decision process as feedback or learning. In this sense, a bayesian cognitive modelling approach is able to extract these sub-components and may help to understand the past contradictory results. Our aim is to apply a cognitive model the Prospect-Valence Learning model (PVL) to a task of decision making, the Iowa gambling task (IGT), in a sample of ED patients. We had recruited of N= 308 ED patients, and N= 68 healthy controls (HC), at the department of Endocrinology of the University hospital of Montpellier. From ED patients N= 120 had the restrictive subtype of anorexia (AN-r), N= 93 the purgative subtype of anorexia (AN-p) and N= 95 bulimia (BN). All patients were diagnosed by consensus of a group of professionals using the DSM-V criteria. Participants completed a sociodemographic questionnaire and the Eating disorder inventory and completed the IGT. IGT was analyzed using the PVL model that extracts four parameters: feedback sensitivity, loss aversion, learning/memory, and choice consistency. Our results show not differences in the IGT net scores between groups ( $p > .050$ ). However, when applying the PVL, results showed higher feedback sensitivity and loss aversion in all groups of ED compared to HC, and lower choice consistency in all groups of ED compared to HC. There were not differences between subgroups of ED. This results, confirms the impairment of decision making in ED patients and shows that the main impairment appears in feedback interpretation and not in the learning of task.

**Keywords:** Eating disorder, Cognitive modeling, Hierarchical bayesian analysis, Decision making.



**RELATIONSHIP BETWEEN SOCIAL COGNITION AN EXECUTIVE  
FUNCTION IN PEOPLE WITH A RECENT-ONSET PSYCHOSIS**

**Raquel López-Carrilero<sup>1,2,3\*</sup>, Mercedes Lo Monaco<sup>2\*</sup>, Eva Frígola-Capell<sup>14</sup>, Marta Ferrer-Quintero<sup>1,2,3,4</sup>, Luciana Díaz-Cutraró<sup>1,2,5</sup>, Marina Verdaguer-Rodríguez<sup>1,2</sup>, Helena García-Mieres<sup>1,2,3</sup>, Regina Vila-Badia<sup>1,2,3</sup>, Paola Punsoda<sup>2</sup>, Irene Birulés<sup>2,4</sup>, Trinidad Peláez<sup>2</sup>, Esther Pousa<sup>6,7,8,9</sup>, Eva Grasa<sup>3,6</sup>, Ana Barajas<sup>16,17</sup>, Isabel Ruiz-Delgado<sup>12</sup>, María Luisa Barrigón<sup>11</sup>, Fermín Gonzalez-Higueras<sup>13</sup>, Esther Lorente-Rovira<sup>3,10</sup>, Alfonso Gutiérrez-Zotes<sup>3,15</sup>, Jordi Cid<sup>14</sup>, Teresa Legido<sup>9</sup>, Rosa Ayesa<sup>3,18</sup>, Stephen Moritz<sup>19</sup>, Spanish Metacognition Group, Susana Ochoa<sup>1,2,3</sup>**

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Social Cognition (SC) is defined as the mental processes underlying the capacity of people to perceive, process and comprehend social information. On the other hand, Executive Functions (EF) are high-level cognitive processes that enable individuals to regulate their thoughts and actions during goal-directed. SC and EF have been described in psychosis being variables of importance in social functioning and recovery of the patients. However, the relationship between SC and EF in first episode psychosis (FEP), particularly the exploration of gender differences, deserve further studies. Our main aim was to explore the relationship between EF and different domains of SC in FEP patients. A second aim is to explore gender differences in the relationship between these domains. A cross-sectional study of 191 patients with recent onset of psychosis, who were recruited from two main multicenter clinical trials from 10 public centers in Spain. A comprehensive cognitive battery was used to evaluate SC (emotional recognition using the Face Test, Theory of Mind (TOM) with the Hinting Task and attributional style assessed with IPSAQ) and EF (TMT, WSCT, Stroop test and Digit span -WAIS III-). Pearson correlation and linear regression model were done. In the total sample, a correlation between TOM, emotional recognition and EF was found. In general, females showed this correlation pattern, while males also showed a correlation between attributional style and inhibitory control. Studies focused on the different domains of SC and EF are needed in order to improve treatments for patients in the early stages of psychosis, more over the results regarding the different cognitive profiles in CS between male and female patients could be useful in designing personalized interventions by gender.

**Keywords:** psychosis, social cognition, executive functions.



**SYMPOSIUM 4**  
**PSYCHOBIOLOGY OF DUAL DISORDERS**

Wednesday, 20<sup>th</sup> July 2022, 16:00-17:30

Aula A6, Faculty of Psychology and Speech Therapy

*Chair: Ana Adan<sup>1,2</sup>*

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In the last decades, several works have provided evidence of cognitive impairment in different cognitive domains, in severe mental illness (SMI) as well as in substance use disorders (SUD). However, only recent studies on dual disorders, understood as the coexistence or concurrence of at least one SUD and another mental disorder in the same person, exploring the differences in this field. Similarly, although there is evidence of a circadian rhythmic involvement in several mental disorders, the assessment of its possible impairment in SUD and dual disorders is only an incipient area of interest, very limited to aspects related to sleep.

This symposium reviews the current knowledge on neurocognition and circadian rhythms in dual disorders patients, taking into consideration three comorbid SMI with high prevalence and worse prognosis: schizophrenia, major depression and bipolar disorders. New empirical data are presented, emphasizing the cognitive domains and rhythmic parameters that are most resistant to reestablishment in patients adhered to SUD treatment, in the early remission phase. These are considered in relation to several clinical characteristics and as possible predictive variables of the severity, prognosis and functional outcome of dual patients. The aim of this symposium is to present a more comprehensive approach in the individualized therapeutic strategies of dual patients, including cognitive rehabilitation therapy as well as the use of chronobiological approaches (handling hourly habits, light therapy and melatonin) for treatment programs when needed.



## COGNITIVE FUNCTIONING AND PERSONALITY IN PATIENTS WITH SCHIZOPHRENIA WITH/WITHOUT COMORBID SUBSTANCE USE

**Julia E. Marquez-Arrico<sup>1,2</sup>, Álvaro Gonzalez-Sanchez<sup>1,2</sup>, Ana Adan<sup>1,2</sup>**

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Two studies were conducted to explore cognitive functioning and personality characteristics in patients with schizophrenia according to the presence (SZ+) or absence (SZ-) of a comorbid substance use disorder (SUD). Cognitive functioning was assessed through a neuropsychological test's battery in 90 patients (SZ+=30, SZ-=30; SUD=30). A sample of 110 patients (SZ+=55; SZ-=55; SUD=55) completed the Temperament and Character Inventory-Revised for exploring personality.

While no differences were observed among the groups for premorbid IQ (vocabulary) and attention span, patients with SZ+ and SZ- performed worse than SUD in verbal learning/memory, processing speed, and global performing. No differences were observed between SZ+ and SZ- in cognitive functioning except for the premorbid non-verbal IQ (blobs) with SZ- performing worse. When considering the abstinence period, we observed that at four months of abstinence SZ+ and SZ- were similar in performance. Verbal learning/memory and global functioning were worse for SZ+ with an older age, while SZ- did not show any age related-changes on cognitive performance. Schizophrenia diagnosis was linked to cognitive impairment, which was not necessarily worse when coexisting with a SUD.

Regarding temperament dimensions higher Harm Avoidance and lower Persistence were linked to schizophrenia diagnosis independently of the presence/absence of a SUD. For character dimensions, lower Self-directedness was associated to comorbidity (SZ+) while higher Self-transcendence was linked to both SZ+ and SZ-.

The cognitive functioning and personality characteristics assessment in patients with schizophrenia according to the coexistence of a SUD may lead to useful information about differential vulnerability and for design personalized treatment strategies.

**Keywords:** Cognitive functioning, schizophrenia, substance use disorders, personality characteristics.



## NEUROPSYCHOLOGICAL FUNCTIONING OF DUAL PATIENTS WITH COMORBID MAJOR DEPRESSION DISORDER OR BIPOLAR DISORDER

**Nuria Miguel<sup>1</sup>, Mercè Jòdar<sup>2,3,4</sup>, Ana Adan<sup>1,5</sup>**

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Major depression disorder (MDD) and bipolar disorder (BD) are highly prevalent comorbid mental disorders in patients with dual disorders (DD). Additionally, it is widely known that any kind of depressive symptomatology and substance use disorders (SUD) are associated with a variable grade of cognitive impairment, which usually leads to an important functional impairment due to the synergistic potentiation of both disorders. Objectives: To review the state of the art of the cognitive impairment found in patients with DD with comorbid BD or MDD, considering the relevance of the depressive symptomatology in each case. Methods: Following the PRISMA protocol, 8 studies were finally chosen from the literature of the past 15 years. In a secondary search, 11 more studies were added to the review. Results: Most of the studies were based in DD with comorbid BD. The most affected cognitive domains were executive functions such as impulsivity and reward-based decision making and memory, both verbal and visual. Not all studies found a greater impairment due to the comorbidity and in those controlled the influence of the depressive symptomatology, the results were contradictory. Conclusions: More research is needed regarding the influence of the depressive symptomatology in cognitive performance of DD patients, and specially in those with comorbid MDD. Other disorder-related factors, age and type of substance use should be controlled for both BD and MDD; and unstudied factors, such as gender or genetics, should be considered to improve knowledge in this area.

**Keywords:** Dual disorder, major depression disorder, bipolar disorder, cognition.



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## COGNITIVE PERFORMANCE OF UNDER TREATMENT DUAL DISORDER PATIENTS: INFLUENCE OF COMORBID MENTAL ILLNESS

Álvaro Gonzalez-Sanchez<sup>1,2</sup>, Julia E. Marquez-Arrico<sup>1,2</sup>, José Francisco Navarro<sup>3</sup>, Ana Adan<sup>1,2</sup>

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Comorbidity of substance use disorders (SUD) and severe mental illness (SMI) is observed in at least the 50% of the patients with either SUD or SMI. The most common SMI in dual patients are schizophrenia (SZ), bipolar disorder (BD), and major depressive disorder (MDD). Comorbidity is a phenomenon that has its own clinical features, and is associated with neurocognitive changes that go beyond psychiatric symptoms, which has important therapeutic implications. The present study explores the cognitive performance of 120 males under treatment with dual disorder, 40 for each group considered (SZ+, BD+ and MDD+) who are mainly policonsumers. The results showed that all three groups performed worse than norms in all the tasks (except for perseverative errors of the Wisconsin Card Sorting Test). Specifically, all patients showed difficulties in learning new information, short-term memory and recognition. The data collected also indicate differences among groups, with SZ+ group having a worse performance in short term memory, verbal learning, attentional span, and recognition. This poor performance worsens as time goes on during tasks. Although without significant differences, SZ+ patients also performed worse in tasks involving executive functioning. This data evidenced a different cognitive profile for SZ+ group compared with BD+ and MDD+, which presented a very similar performance. This research showed that the neurocognitive functioning of dual patients was modulated by the comorbid SMI, with SZ+ group presenting major difficulties. Future studies should explore in detail the role of such difficulties as indicators or endophenotypes for dual schizophrenia spectrum disorders.

**Keywords:** dual disorder, cognitive functioning, comorbidity, substance use disorders.





**CIRCADIAN RHYTHM ALTERATIONS IN DUAL DISORDERS. RELEVANCE OF COMORBID MENTAL DISORDER AND OTHER CLINICAL FACTORS**

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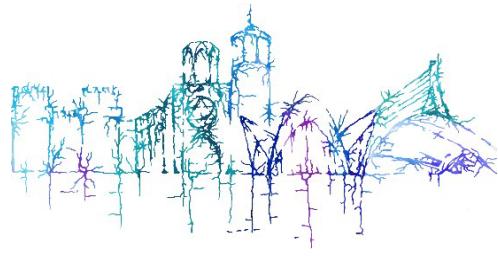
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Circadian rhythmicity in both substance use disorders (SUD) and several mental illnesses play an important role in treatment adherence and clinical course, however research when two diagnoses coexist is very limited. The objective of this presentation is to review the existing findings, with emphasis on the use of objective measurements of endogenous circadian functioning (i.e. distal skin temperature), in patients with SUD and with comorbid diagnoses of schizophrenia, major depression and bipolar disorder. Clinical factors that have been related to the quality of circadian rhythmicity and whose consideration can improve the intervention of these patients are also detailed. Circadian rhythm involvement is evident in various parameters during the early remission phase of SUD. It highlights a lower amplitude and stability of the rhythm, as well as a delay in acrophase. In functional terms, there is evidence of a adequate duration and quality of sleep already in the first months of treatment (with or without psychotropic drugs) and a daytime period with impaired activation that shows more difficulty in recovery. This has a greater impact on dual patients, especially those with comorbid schizophrenia or bipolar disorder, who show a rhythmic pattern considered immature. The age of onset of substance use, the time of abstinence and the type of treatment (inpatients/outpatients) are factors that influence the circadian indicators of these patients. Current evidence emphasizes that the evaluation of the circadian rhythm of dual patients during treatment, focused on the diurnal period, can be a marker of adherence and recovery prognosis.

**Keywords:** circadian rhythms, diurnal period, distal skin temperature, severe mental illness, substance use disorders.

# IV PSYCHO BIOLOGY

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## SYMPOSIUM 5

### AGING AND DEMENTIA: UNDERSTANDING HETEROGENEITY

Thursday, 21<sup>st</sup> July 2022, 10:15-11:45

Salón de Actos, Faculty of Psychology and Speech Therapy

*Chairs: Jose D. Barroso Ribal<sup>1</sup> and Daniel Ferreira Padilla<sup>2</sup>*

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The heterogeneous trajectories of aging have always subsitaded great interest of the scientific community. While some individuals successfully arrive at senescence preserving functionality and normal cognitive performance, others decline even from the middle-age, lose their independence and develop dementia. To disentangle the contributors to such heterogeneity has become a priory in order to identify individuals at risk and promote protective mechanisms. The ultimate goal of this session is to discuss different approaches that aim to disentangle the aspects that may have an impact on the aging process, ultimately contributing to a more successful senescence or, on the contrary, to disease. The session includes some of the leading European researchers in the field of aging, subjective cognitive decline and dementia. The first presentation will cover the last advances in multivariate methods to study cognitive and neural networks in aging. The second and third presentations will cover the contribution of clinical aspects and different pathologies to subjective cognitive decline, including cerebrovascular disease and hallmark biomarkers of Alzheimer's Disease. The fourth presentation will cover the latest advances in pathological aging and disease biomarkers towards the implementation of personalized medicine in dementia patients.



## **BRAIN, COGNITIVE RESERVE, COMPENSATORY MECHANISMS AND VARIABILITY IN NORMAL AGING**

**Jose D. Barroso Ribal<sup>1</sup>**

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Graph theory, a sophisticated multivariate approach, has proven to be useful when capturing unknown complex associations between multiple cognitive variables and neural networks in aging. We assess whether cognition is organized following a structure (i.e. cognitive connectome) using graph theory, and whether such connectome is dependent on age. We also studied Cognitive and Neural compensatory mechanisms associated with verbal fluency linked to the concepts of Cognitive Reserve (CR) and neural efficiency. Finally, focusing on early detection of neurodegenerative disorders, we investigated variability in cognition and associations with CR, neuroimaging markers, and subjective cognitive complaints in aging.

Using GENIC-Database, a relatively large community-based sample including a wide range of age (i.e. between 25 and 87-year-old), we have investigated an extensive number of clinical and demographic data, cognitive performance and structural and functional neuroimaging markers from a multivariate perspective

We identified a cognitive connectome that is rather stable during aging in cognitively healthy individuals, with the observed differences highlighting the importance of executive functions and processing speed. We translated the connectome concept from the neuroimaging field to cognitive data. Furthermore, we found that higher performance in phonemic fluency at older ages is associated with greater functional connectivity partially facilitated by higher CR, presumably reflecting compensatory mechanisms to minimize the effect of aging. Finally, studying variability shows that differences do not occur in the same magnitude and direction across individuals, cognitive domains and tasks. These may be useful for early detection of subtle cognitive impairment.

**Keywords:** Graph theory, cognitive reserve, neural efficiency, variability, neuroimaging.



## BRAIN CHANGES IN SUBJECTIVE COGNITIVE DECLINE

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Subjective cognitive decline (SCD) is defined by self-report cognitive decline in absence of objective cognitive impairment. SCD has been associated with increased risk of future cognitive impairment and dementia. It is important to characterize SCD in the general population in order to successfully identify individuals at risk suitable for early interventions and prevention of cognitive decline. Thus, the SCD project in GENIC has focused on the characterization of SCD individuals based on different clinical, demographic features, cognitive performance and multiple neuroimaging biomarkers of neurodegeneration.

Using a relatively large community-based sample including a wide range of age (i.e. between 25 and 87-year-old), we have investigated the association of SCD with an extensive number of clinical and demographic data, cognitive performance and several neuroimaging markers of neurodegeneration from a multivariate perspective.

SCD by definition is reported in the absence of objective impairment. Nevertheless, underlying neurodegeneration processes seem to be associated with SCD in our cohort, including reduced hippocampal volume, cortical thinning in several frontal and temporal areas, worse white matter (WM) integrity across the whole WM skeleton and greater WM lesion burden. Our findings suggest that SCD may be a sensitive behavioral marker of underlying neurodegeneration in individuals recruited from the community. We identified underlying cerebrovascular pathology as one of the possible contributors to neurodegeneration in SCD. Future studies should test for the contribution of other underlying pathologies, such as amyloid beta and tau levels, to the neurodegeneration in SCD.

**Keywords:** subjective cognitive complaints, neuroimaging biomarkers, screening, dementia risk.



**SUBJECTIVE COGNITIVE DECLINE IS RELATED TO BIOMARKERS FOR ALZHEIMER'S DISEASE AND NON-DEGENERATIVE FACTORS: RELEVANCE OF AGE AND TYPE OF COMPLAINTS**

**Mariola Zapater-Fajari<sup>1</sup>**

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**Objectives:** Subjective cognitive decline (SCD) has been suggested as one of the first signs of Alzheimer Disease (AD). However, a current discussion is that SCD does not only reflect brain pathologies but also other non-neurodegenerative factors. We carried out two studies whose aims were: (1) to investigate the relationship between SCD with psychological factors (anxiety, positivity and depressive symptomatology) and stress biomarkers (hypothalamic-pituitary-adrenal axis, HPA axis), (2) to study the relationship between SCD and biomarkers of brain pathology (A $\beta$ 42/40 and p-tau).

**Methods:** In the Study 1 participated 73 older adults (aged 55 to 75 years old, 46% female). Subjective memory complaints (SMCs), trait anxiety, positivity, and salivary cortisol were measured. The sample of the Study 2 was composed by 217 individuals (all aged 70 years, 53% female). We assessed subjective memory (SMCs) and concentration complaints (SCCs), depressive symptomatology, and amyloid and tau pathologies.

**Results:** We found that SMCs were related to anxiety and positivity independently of age. However, the relationship between SMCs and HPA axis was only found in middle-aged people (from 55 to 65 years) (Study 1). In Study 2, SCCs and SMCs were differently related to AD biomarkers (amyloid-beta positivity and tau positivity, respectively), and to depressive symptomatology.

**Conclusions:** These findings emphasize the nature of SCD as an indicator of preclinical AD. They also expand the currently limited data on the differential association of types of subjective cognitive complaints (SMCs and SCCs) with distinct syndromic and biomarker profiles. Finally, these studies shed light about the relationship between SCD and non-degenerative causes at different age periods of the aging process, as well as through the AD continuum. Study 1 was supported by the Spanish Science, Innovation and Universities Ministry (FPU17/03428; PSI2016-78763; PID2020-119406GB-I00/AEI/10.13039/501100011033).

**Keywords:** Subjective cognitive complaints, Alzheimer's disease biomarkers, cortisol, non-degenerative factors.



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## **THE SYNERGISTIC EFFECT OF CONCOMITANT BRAIN PATHOLOGIES IN NEURODEGENERATIVE DISEASES**

**Nira Cedres**<sup>1,2</sup>

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**Objectives:** Modern neuroimaging and neuropathological studies have revealed that different brain pathologies often coexist in the brain of people with neurodegenerative diseases. The traditional concept of distinct diseases is increasingly replaced by the recognition of multiple pathologies underlying common diseases such as Alzheimer's disease (AD). The goal of our research has been to understand the unique and synergistic role of different pathologies in the pathogenesis of AD.

**Methods:** We investigate brain pathologies in-vivo using state-of-the-art biomarkers of AD, cerebrovascular disease and, recently, Lewy pathology. We also investigate all these pathologies post-mortem. We combine large cohorts from multiple sites across the world.

**Results:** AD pathologies are the hallmarks of AD, but cerebrovascular and Lewy pathologies often co-exist in the brain of patients at the stage of AD dementia and even at pre-dementia stages. The spatial distribution of these pathologies determines clinical expression, as well as prognosis and treatment response. We have identified multiple factors that play a role in complex interactions, including protective and risk factors. Other studies expanding to other common neurodegenerative diseases such as dementia with Lewy bodies (DLB) and vascular dementia cross-validate the findings in AD.

**Conclusions:** We suggest that the trade between spatial location of common concomitant pathologies and their actual load determine what brain networks will be targeted and what clinical symptoms will emerge. Recognizing this complexity is a step forward towards personalized medicine in neurodegenerative diseases.

**Keywords:** Alzheimer's disease, comorbidity, neurodegeneration, dementia.

# IV PSYCHO BIOLOGY

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## SYMPOSIUM 6

### INTERACTIONS BETWEEN DIET, STRESS, GENOTYPE AND MICROBIOTA PROGRAMMING BRAIN CIRCUITS

Thursday, 21<sup>st</sup> July 2022, 10:15-11:45

Aula A6, Faculty of Psychology and Speech Therapy

*Chairs: Beatriz Carrillo and Paloma Collado*

*Department of Psychobiology, National University of Distance Education (UNED),  
Spain; University Institute of Research-UNED-Institute of Health Carlos III (IMIENS)*

Multiple factors can affect the development and functioning of the brain networks that support behaviors such as eating, learning and memory or anxiety. The correct function of the brain systems depends on them being accurately programmed during the early stages of life and interferences during this period could provoke disorders like obesity, anxiety, spatial memory and learning problems, mood disorders and attention deficit hyperactivity disorder.

In this symposium we summarize some important environmental factors on brain function like diet, stress or microbiota, which affect the development of healthy or diseased organisms differently depending on sex. The programming effect of estrogen is widely known, and compounds that can mimic estrogen's actions like genistein, a phytoestrogen present in soybeans, could interfere with the hypothalamic structure and function programming (LONG TERM EFFECT OF GENISTEIN TREATMENT IN EARLY POSTNATAL STAGES IN THE POMC, OREXIN AND GPER EXPRESSING NEURAL POPULATIONS IN THE HYPOTHALAMUS, by José Manuel Fernández-García).

The genetic information that each individual carries, like the APOE genotype, is also a risk factor for the correct development of different systems, and interacts with factors such as diet or age, affecting differentially males and females when they are adults (LONGITUDINAL CHARACTERIZATION OF APOE GENOTYPE: NEW INSIGHT INTO MOLECULAR AND NEUROBEHAVIORAL DIFFERENCES, by Laia Guardia-Escote).

In the same way, not only a diet high in fat and sugar but also stress factors program the circuits interacting on spatial memory, microbiota or behavioral flexibility differently depending on sex (PROGRAMMING OF NEUROBEHAVIORAL DEVELOPMENT BY EARLY-LIFE EXPOSURE TO COMMON ADVERSE ENVIRONMENTAL FACTORS, by Héctor González-Pardo).

Finally, most recent data leads us to consider the interaction between the gut microbiota-brain axis in the development of diseases, mood disorders or cognitive function (THE GUT MICROBIOTA-BRAIN AXIS AND ITS INFLUENCE ON BRAIN AND BEHAVIOUR, by Isabel María Martín Monzón).



**LONG TERM EFFECT OF GENISTEIN TREATMENT IN EARLY  
POSTNATAL STAGES IN THE POMC, OREXIN AND GPER  
EXPRESSING NEURAL POPULATIONS IN THE HYPOTHALAMUS**

**José Manuel Fernández-García<sup>1,2,3</sup>, Beatriz Carrillo<sup>1,2</sup>, Paloma Collado<sup>1,2</sup>, Patricia Tezanos<sup>4</sup>,  
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Phytoestrogens are naturally occurring plant compounds that are structurally or functionally similar to mammalian estrogens and their active metabolites. Genistein is a phytoestrogen with high concentrations in soybeans, and due to its similar molecular structure to estradiol, can bind to estrogen receptors and therefore could interfere with the modulatory role of this molecule during early stages of development. The objective of this study is to evaluate the long-term effects of exposure to different doses of genistein during development in the POMC, orexin, and GPER expressing neural population that regulate food intake and energy metabolism in the hypothalamus. Male and female offspring Wistar rats were treated from postnatal day 6 to postnatal day 13 by subcutaneous injection with sesame oil, a low dose or a high dose of genistein. A quantitative analysis was performed by immunohistochemistry of neuronal populations expressing POMC and GPER in the arcuate nucleus divisions of the hypothalamus and orexin in the lateral hypothalamus. Results showed a reduction in POMC expressing neurons in females in the arcuate nucleus, while in the GPER expressing neural population in the same nucleus the analysis shows a dose dependent effect of treatment in males in all subdivisions except in the medial subdivision. No effect was found in the expression of orexin in the lateral hypothalamus. These results indicate a dose and sex dependent interference of genistein in the modulator role of estradiol in these early stages of development and a specificity of the arcuate nucleus subdivisions in their response to this hormone.

**Keywords:** Genistein, POMC, orexin, GPER, Arcuate nucleus.

**Grants:** PSI2017-86396-P (Ministry of Economy and Competitiveness, Spain).



## LONGITUDINAL CHARACTERIZATION OF *APOE* GENOTYPE: NEW INSIGHT INTO MOLECULAR AND NEUROBEHAVIORAL DIFFERENCES

**Laia Guardia-Escote<sup>1,2,3</sup>, Judit Biosca-Brull<sup>1,2</sup>, Jordi Blanco<sup>1,4</sup>, Pia Basaure<sup>1</sup>, Maria Cabré<sup>1,5</sup>, Rikst Nynke Verkaik-Schakel<sup>6</sup>, Torsten Plösch<sup>6</sup>, Maria Teresa Colomina<sup>1,2</sup>**

<sup>1</sup>*Research in Neurobehavior and Health (NEUROLAB), Universitat Rovira i Virgili, Spain*

<sup>2</sup>*Department of Psychology and Research Center for Behavior Assessment (CRAMC), Universitat Rovira i Virgili, Spain*

<sup>3</sup>*Department of Pharmacology, Toxicology and Therapeutical Chemistry, Universitat de Barcelona, Spain*

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<sup>5</sup>*Department of Biochemistry and Biotechnology, Universitat Rovira i Virgili, Spain*

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Apolipoprotein E (apoE) gene belongs to the ten most studied genes of all time. In humans, it mainly presents three different isoforms, apoE2, apoE3 and apoE4, which are differently distributed in the population. APOE genotype can be underlying functional differences and constitute a risk factor for several diseases. Besides, it can present a complex interaction with other factors such as sex and age. The main objective of this study was the longitudinal characterization of APOE genotype on different behavioral and molecular endpoints. For that purpose, we used both male and female apoE3- and apoE4-TR mice. First, we studied the epigenetic regulation in the hypothalamus of 45-day-old mice, targeting genes implicated in the feeding control pathway such as leptin receptor, proopiomelanocortin, neuropeptide Y and insulin-like growth factor 2. Then, recognition memory was assessed in young adults by an Object Recognition Test, and the contribution of the cholinergic and GABAergic system was studied by a pharmacological challenge. At three months of age, animals were fed a high fat diet during a period of eight weeks, and afterwards spatial learning and memory was studied by means of a Morris Water Maze. Results showed significant differences between APOE genotypes throughout the study. Overall, the current results provide new insight on the age- and sex-dependent differences between APOE genotypes, featuring the underlying mechanisms during lifetime.

**Keywords:** Apolipoprotein E, epigenetics, cholinergic system, learning and memory.

**Grants:** PSI2014-55785-C2-R and PSI2017-86847-C2-2R, Ministry of the Economy and Competitiveness (MINECO, Spain).



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**PROGRAMMING OF NEUROBEHAVIORAL DEVELOPMENT BY  
EARLY-LIFE EXPOSURE TO COMMON ADVERSE ENVIRONMENTAL  
FACTORS**

**Héctor González-Pardo<sup>1,2,3\*</sup>, Isabel López-Taboada, Saúl Sal Sarria<sup>1,2</sup>, Nélida Conejo  
Jiménez<sup>1,2,3</sup>**

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Early exposure to widespread and prevalent adverse environmental factors such as psychosocial stress (parental neglect or child maltreatment) and prolonged consumption of foods rich in saturated fats and simple carbohydrates or sugars (Western-type diet) have been shown independently to epigenetically program neurodevelopment and behavior in animal rodent models. In addition, recent research suggests that the microorganisms that constitute the mammalian gut microbiota are sensitive to these environmental factors and may also significantly influence neurodevelopment and behavior. However, the complex potential interactions between these common environmental factors on brain function and behavior, as well as the influence of biological sex, remain largely unexplored.

Aiming to shed light on this subject, we evaluated in adult male and female Wistar rats the independent and combined effects of maternal consumption of a diet rich in fats and sugars extended until early adulthood of the offspring, and exposure to early psychosocial stress (by maternal separation) on spatial learning and memory, behavioral flexibility, together with anxiety- and depressive-like behaviors, regional brain metabolic capacity, gut microbiota composition and associated metabolites, levels of brain oxidative stress and neuroinflammation. The results show a clear sexual dimorphism in the influence of both environmental factors on brain function, the microbiota and spatial memory, behavioral flexibility, and stress coping responses, that display a sex-specific complex interaction.

**Keywords:** Early life stress, high-fat and high-sugar diet, sex differences, microbiota, brain metabolism.

**Grants:** PSI2017-83038-P (Ministry of Economy and Competitiveness, Spain).



## **THE GUT MICROBIOTA-BRAIN AXIS AND ITS INFLUENCE ON BRAIN AND BEHAVIOUR**

**Isabel María Martín Monzón**

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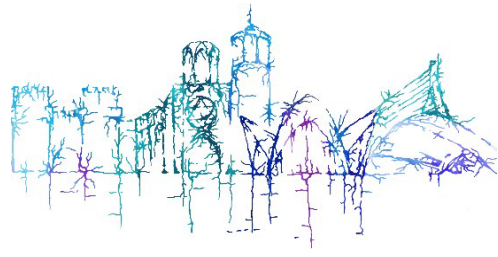
The gut-brain axis consists of bidirectional communication between the central and the enteric nervous system, linking emotional and cognitive centers of the brain with peripheral intestinal functions. Recent advances in research have described the importance of gut microbiota in influencing these interactions. In this work we summarize the available evidence supporting the existence of these interactions, as well as we present a systematic review about the association between dysbiosis on the gut microbiota and the presence of neurological or neuropsychiatric diseases. Furthermore, this study analyzes the potential benefits of psychobiotics supplementation for these pathologies. Searches were conducted in the electronic databases PubMed and PsycINFO. 17 articles were included in this review, the majority were published after 2019. The results showed that intestinal dysbiosis affects the development of cognitive impairment, Alzheimer's disease, Parkinson's disease, mood disorders and attention deficit hyperactivity disorder. Furthermore, it was found that different psychobiotics, mainly dietary fibers and probiotics of the Lactobacillus family, improved different cognitive functions such as cognitive performance and induce a reduced cortisol response. Improvement in different cognitive functions is possible when understanding gut microbiota-brain axis, enteric nervous system, neural-immune system, neuroendocrine system, and central nervous system's relationship.

**Keywords:** Microbiota, gut-brain axis, psychobiotics, cognitive disorders, dysbiosis.

**Grants:** PID2020-117359GB-I00 (Ministerio de Ciencia e Innovación); P20\_01112 (proyecto FEDER Junta de Andalucía).

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## SYMPOSIUM 7

### PSYCHOBIOLOGY OF DISORDERED EATING: FROM ANOREXIA NERVOSA TO OBESITY

Thursday, 21<sup>st</sup> July 2022, 16:00-17:30

Salón de Actos, Faculty of Psychology and Speech Therapy

*Chairs: Fernando Gámiz and David García-Burgos*

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Eating disorders and obesity cases are rising at alarming rates. Recently, there has been a great increase in the understanding of the biological and environmental mechanisms that control food intake and body weight. However, despite recent progress, more research is needed. In this symposium, we focus on the mechanisms by which hormonal and neurobiological signals interact with behavioral and food stimuli in the case of weight-related problems. We will attempt to give some evidence of how critical periods of development, from prenatal stages to adolescence, are especially sensitive to influences related to pathological or ultra-processed food intakes. Thus how different eating disorders can affect both the configuration and function of the nervous system. In this symposium, we will also discuss the predictors involved in the treatment of eating disorders.



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## ROLE OF GONADAL STEROIDS IN THE DEVELOPMENTAL ORIGINS OF OBESITY

**Paloma Collado<sup>1,2</sup>, Beatriz Carrillo<sup>1,2</sup>, José Manuel Fernández-García<sup>1,3</sup>, Noemí Blanco<sup>1</sup>, Rocío García-Úbeda<sup>1</sup>, Antonio Ballesta<sup>1</sup>, Daniela Grassi<sup>4</sup>, Helena Pinos<sup>1,2</sup>**

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The early stages of life are crucial for the appropriate development of the neural circuits that regulate homeostasis, and the balance of all the factors involved in their programming determines the greater or lesser vulnerability of organisms to suffering from eating disorders in the long term. It has been widely demonstrated that severe dietary imbalances during critical periods of development produce alterations in energy metabolism and in the hypothalamic circuits that regulate it. Our recent studies have shown that prenatal undernutrition produces alterations in the neuronal population of the arcuate nucleus of the hypothalamus in newborn rats and that, in the long term, a low-protein or high-fat diet alters the genetic expression of the anorexigenic peptide POMC and body weight. Since these alterations favour the onset of eating disorders, mainly obesity, it is important to know the factors involved in the programming of the systems that regulate food intake. As in the case with leptin and ghrelin, our studies have revealed that gonadal steroids, in periods of high susceptibility during development, participate in the programming of the neurohormonal systems that regulate feeding. Moreover, estradiol plays a relevant role in the modulation of the alterations produced by under- and over-nutrition. It is important to highlight that most of the effects found are produced differentially in males and females, so it is essential to investigate the mechanisms underlying the programming of energy metabolism in both sexes so that risks can be accurately determined in each of them, and appropriate treatments can be established.

**Keywords:** obesity, gonadal steroids, programming, sex differences, rats.

**Grants:** PSI2017-86396-P, PID2020-115829GB-I00, SI3/PJI/2021-00508.





## ULTRA-PROCESSED FOODS AND DRINKS EXPOSURE, BRAIN, BEHAVIOR, AND OBESITY

**Oren Contreras-Rodríguez<sup>1,2</sup>, Marta Reales-Moreno<sup>1,3</sup>, Pietro Tonini<sup>9</sup>, Silvia Fernández-Barrès<sup>4</sup>, Dora Romaguera<sup>7,8</sup>, Josep Puig<sup>1</sup>, María Arnoriaga-Rodríguez<sup>3,6,7</sup>, Carles Biarnés<sup>1</sup>, Anna Motger-Alberti<sup>3,6</sup>, Montserrat Solanas<sup>5</sup>, Rosa María Escorihuela<sup>2</sup>, José Manuel Fernández-Real<sup>3,6</sup>**

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Ultra-processed foods and drinks (UPF) are formulation of ingredients that result from industrial processes. Most have lower nutrient density, but higher energy density compared to unprocessed foods, being high in saturated and trans fats, added sugars, and salt. In addition, UPF usually contain chemicals and additives, these latest aiming to intensify their sensory qualities, making them palatable and highly attractive. The current presentation aims to first summarize previous work that suggest that UPF exposures may be a potentially harmful factor for the brain networks involved in eating behaviour. Then, new findings linking direct estimations of UPF intake, brain structural properties, and behavioural outcomes from our own group will be shown, as well as the interaction with obesity. For instance, current research is being conducted in 152 adults, where diet information and UPF intake were collected through validated food frequency questionnaires. Structural T1-MRI scans were obtained, and depressive symptoms assessed. Associations between UPF intake, gray and white brain volumes, and depression were investigated. Mean (SD) UPF intake in the overall study participants was 7.71 (5.83) % of total daily food intake, with a tendency towards a higher UPF intake in the individuals with obesity. Also, UPF intake was negatively associated with brain volumes in particular brain networks, but positively associated with depressive symptoms. UPF consumption have the potential to impact on the brain networks implicated in eating behaviour. Much work remains to be done in humans before being able to weight the specific impact of UPF intake on mental health.

**Keywords:** Ultra-processed products, Brain volume, Depressive symptoms, Obesity.



## EXECUTIVE FUNCTIONING, OBESITY AND ADVERSE EXPERIENCES IN ADOLESCENT

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To study, in adolescents, (i) adverse experiences and juvenile victimization in normal vs excess-weight; and (ii) the relationship between adverse experiences, excess of weight and executive functioning. 67 adolescents (10-20 years; 32 females) were recruited from the Consorci Sanitari de Terrassa. Exclusion criteria were underweight, drug use, psychiatric, developmental, neurological, systemic disorders, or an estimated QI below 85. Participants were assigned into the normal-weight or excess of weight group following criteria of Cole and Lobstein, 2012. WISC/WAIS vocabulary subtest (QI proxy). Executive functioning. Following Diamond (2013): Working memory (Number and letter subtest); Inhibitory control (Stroop interference score) and Cognitive flexibility (WCST perseverative errors). Juvenile Victimization Questionnaire (Pereda et al, 2014). Hospital Anxiety and Depression Scale (HADS, Zigmond and Snaith, 1983). Normal-weight (n= 37) and excess of weight (n=30) groups were not statistically different in terms of age, sex, neuropsychological, anxiety/depression scores or number of adverse experiences. Comparing groups with different number of adverse experiences (0,1,2,3,  $\geq 4$ ), differences were found for anxiety and depression scores. For the whole sample, the number of adverse experiences correlated with WCST perseverative errors, and with anxiety/depression scores. Regression analyses found a significant effect of the number of adverse experiences on WCST perseverative errors. Excess of weight did not explain the variance of any of the dependent variables. Obesity and adverse experiences have been related with dysexecutive functioning. Exposure to adverse experiences in childhood has also been related to obesity risk. Such interconnected factors need to be considered in future research targeting adolescents.

**Keywords:** Obesity, executive functioning, adolescence, adverse experiences.



## PREDICTORS OF TREATMENT OUTCOME IN EATING DISORDERS

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Eating disorders (ED) are complex medical conditions that significantly affect mental and physical health. It is known that the onset and course of these disorders is the result of the interaction of multiple factors, including biological components (genetic vulnerabilities, hormonal alterations and dysfunctions in specific neurotransmitters), personality traits (such as impulsivity, harm avoidance or reward dependence), neuropsychological alterations (in executive functions and decision-making processes), psychological features (such as emotional regulation or coping strategies), environmental variables (family dynamics) and sociocultural factors.

Despite the huge number of studies evaluating the efficiency of interventions among ED (mostly adherence to the therapeutic guidelines and attenuation of eating symptoms), it is not clear what is the specific role of the multiple risk factors (variables associated with the onset and the progression), nor how other aspects such as the duration of the disorder or the presence of other comorbid psychopathologies can impact.

This communication presents the results of empirical studies (longitudinal data) that explore the contribution of neuropsychological, psychopathological and personality domains in the cognitive behavioral treatment in ED. It is also discussed the potential moderator effect of the diagnostic subtype (anorexia, bulimia and binge eating disorder) on the identification of predictors and their impact on therapeutic efficiency.

# IV PSYCHO BIOLOGY

International Congress





**SYMPOSIUM 8**  
**SOCIAL AND COGNITIVE NEUROSCIENCE OF FACE**  
**PROCESSING**

Thursday, 21<sup>st</sup> July 2022, 16:00-17:30

Aula A6, Faculty of Psychology and Speech Therapy

*Chairs: Jaime Iglesias and Ela I. Olivares*

*Department of Biological and Health Psychology, Faculty of Psychology  
Universidad Autónoma de Madrid, Spain*

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Face information processing is a topic that is addressed in complementary lines of research in Cognitive, Social and Clinical Neuroscience. The face is an omnipresent stimulus that is crucial for person recognition and acquired prosopagnosia involves deficits in recognition of familiar faces but also in the encoding of new faces. This complex visual stimulus transmits information about a trait that is so decisive in social interactions as trustworthiness. It is also a means for communication of our emotions and intentions, providing keys for the analysis of intersubjectivity in autistic spectrum disorders. From a clinical perspective, neurodegenerative diseases such as Parkinson's and Alzheimer's entail differential processing deficits of face identity and emotion facial expressions, which might be markers of their evolution. In relation to all these subjects, the present symposium is specially focused on: 1) event-related potentials (ERPs) concerning altered neurocognitive mechanisms for unfamiliar face processing in acquired prosopagnosia; 2) the implicit preference for trustworthy faces in macaque monkeys and the dissociation between implicit and explicit detection of trust in Williams syndrome; 3) the processing of identity and affective facial expressions in young children with autistic spectrum disorders; 4) the recognition of emotion facial expressions in Parkinson's disease and the usefulness of ERPs for its analysis; and 5) the perception of facial expressions in aging and Alzheimer's disease. Each of these communications raises implications and relevant lines of research on our social brain from a psychobiological perspective.



**EVENT-RELATED POTENTIALS AND SOURCE RECONSTRUCTION  
REVEAL ALTERED PERCEPTION OF NEW FACES IN  
PROSOPAGNOSIA**

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Prosopagnosic individuals are commonly characterized by memory and recognition deficits related to familiar faces. However, it is still insufficiently studied if these patients also present altered perceptual mechanisms for creating face representations of new faces they meet. In this ERP study, we presented to a prosopagnosic individual (EC) a matching task in which both external and internal facial features were displayed consecutively and followed by a complete matching or mismatching face. We intended to simulate the formation of face recognition units after brain injury. In contrast to typical participants, EC presented a very poor performance and no face sensitive P1, N170 and P2 responses on the right side of the scalp, in correspondence with the location of her damaged posterior cortices. Also, she showed a mismatch effect around 400 ms post-stimulus that was reduced in duration (as compared to controls) and confined to left parietal, right frontocentral and dorsofrontal regions, suggestive of reduced neural circuitry to process face configurations, as revealed by source reconstruction with a Bayesian method in late latencies. Interestingly, features acting as primes at the beginning of the trial did not elicit in EC an expected P300 effect, suggesting that diagnostic visual information for unfamiliar face processing was not sufficiently attended nor encoded. Our findings underline the suitability of using both ERPs and source reconstruction as non-invasive approaches to disentangle the dynamic of those brain mechanisms supporting altered face processing in special populations.

**Funding:** Ministerio de Ciencia, Innovación y Universidades (PGC2018-094937-B-100), Spain.

**Keywords:** ERPs, perception, prosopagnosia, source reconstruction, unfamiliar faces.



## **IMPLICIT PREFERENCE FOR TRUSTWORTHY FACES WITHIN THE FRAMEWORK OF PHYLOGENETIC AND CLINICAL STUDIES**

**Manuela Costa<sup>1</sup>, Angela Sirigu<sup>2</sup>**

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It has been shown that human judgements of trustworthiness are based on subtle processing of specific facial features. However, it is not known if this ability is a specifically human function, or whether it is shared among primates. Using eye-tracking recording, we report (Costa et al. Nature Communication 2018) that macaque monkeys (*Macaca Mulatta* and *Macaca Fascicularis*), like humans, display a preferential attention to trustworthiness-associated facial cues in computer-generated human faces. Monkeys looked significantly longer at faces categorized a priori as trustworthy compared to untrustworthy. This suggests the existence of an evolutionarily-rooted mechanism for detecting trust quickly and effortlessly. Another important issue is whether spontaneous first impression of trust can be impaired in a population with unique social phenotype such as Williams Syndrome (WS). We found evidence (Costa, Gomez et al. Cortex 2020) that spontaneous representation of trustworthiness is impaired in WS, while top-down mechanisms of trust recognition appear partially preserved. The exploration of this dissociation between implicit and explicit detection mechanism may be crucial to reducing maladaptive hypersociability in this complex pathology.

**Keywords:** Trust, eye-tracking, implicit preference, primates, clinical implications.



**LET ME COMMUNICATE IN ANOTHER WAY WITH YOU:  
PROCESSING OF AFFECTIVE FACIAL EXPRESSIONS AND IDENTITY  
IN YOUNG CHILDREN WITH AUTISM SPECTRUM DISORDER**

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One of the attentional focuses of our research group is socio-affective communication in children with Autism Spectrum Disorder (ASD), a severe neurodevelopmental disorder that permanently disrupts social interaction and communication (DSM-5). Its impact on non-verbal communication is especially relevant because it grounds complex cognitive functions (including speech) and social interactions. Non-verbal communication establishes primarily through gaze and the exchange of affective facial expressions, demanding an adequate processing of the face and its emotional expressions. This process is altered in autistic children, seriously disrupting socio-emotional reciprocity. But there is no agreement on whether the processing-alteration resides in “bottom-up” processes (e.g., attention to visual components of facial expressions) or “top-down” processes (e.g., recognition of person identity and emotions). Therefore, we conducted a narrative literature review to explore how autistic children's abilities to process affective facial expressions and identity are related to early and late event-related potentials. We were expecting that these brain responses would help clarifying why these children respond idiosyncratically to facial and non-facial socio-affective stimuli as our previous research data indicated. Results analyzed showed that many autistic children do not recognize the identity or meaning of basic affective expressions due to developmental prosopagnosia or a non-holistic face processing, that is, either in “bottom-up” or “top-down” processes. We conclude that this may explain their preference for giving divergent socio-communicative responses to mainly non-facial social stimuli while making a surprising use of alternative “top-down” processes showing basic proto-communication skills as communicative intention.

**Funding:** Ministerio de Ciencia, Innovación y Universidades (PGC2018-094937-B-100), Spain.

**Keywords:** Autism, socio-affective communication, facial expression- and identity-processing, event-related potentials.





## **BEHAVIOURAL AND EVENT-RELATED POTENTIALS STUDIES ON FACIAL EXPRESSION PROCESSING IN PARKINSON'S DISEASE**

**Alba Jiménez-Bascuñán, Jaime Iglesias, Ela I. Olivares**

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Parkinson's disease (PD) includes in its symptomatology alterations in the processing of facial expressions. However, it is unclear what neural bases are involved in these alterations. A narrative review was conducted including both behavioural and event-related potential (ERPs) studies on facial expression processing in PD, with the aim to determine the relationships between these alterations and the brain regions associated with certain cognitive variables and components of brain electrical activity. The results of the behavioural studies reveal correlations between facial expression processing and several measures of executive function, dopaminergic treatment, and deep brain stimulation of the subthalamic nucleus. These findings suggest that facial expression processing is affected by disruptions in the mesocorticolimbic pathways due to the dopaminergic deficit inherent to the disease. Research carried out with ERPs find associations between the N170 component and executive function, as well as a normalization of its activity and localization after dopaminergic treatment. It must be noted, however, that some studies have found no correlation between these variables. In conclusion, alterations in facial expression processing in PD seem to be related to an inadequate functioning of prefrontal and limbic regions, due to the dopaminergic deficit that goes with the disease. Nevertheless, the absence of relationships in some works seems to indicate that facial expression processing is an independent process, albeit it would be hampered by the neural degeneration that occurs in PD.

**Funding:** Ministerio de Ciencia, Innovación y Universidades (PGC2018-094937-B-100), Spain.

**Keywords:** Parkinson's disease, facial expression processing, dopaminergic deficit, event-related potentials.



## EMOTIONAL FACE RECOGNITION IN HEALTHY ELDERLY AND PEOPLE WITH ALZHEIMER'S DISEASE

**Jaime Iglesias<sup>1</sup>, Andrea Álvarez-San Millán<sup>2</sup>, Anahí Gutkin<sup>3</sup>, Ela I. Olivares<sup>1</sup>**

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Emotion facial expressions recognition is affected with age, even more so in Alzheimer's disease, and in this case may be associated with interpersonal relationship difficulties, poor quality of life and caregiver burden. In the present study, we compared the performance of healthy elderly (HE), Mild Cognitive Impairment (MCI) and Alzheimer's disease (AD) participants to clarify whether differences in recognition of facial expressions constitute or not a specific deficit. The performance in the recognition of facial expressions was analyzed considering the general cognitive state and the scores obtained in certain visual processing tasks. Next, we compared the performance between these groups in a complementary task of recognition of facial expressions, displayed with 3 formats (full-face, top-face and bottom-face), and we analyzed the relationship between the performance in this test with the scores obtained in a wide neuropsychological battery. We also followed up the participants one year after the first administration of the facial emotion recognition task. Finally, we analyzed the scoring made by a sample of participants in the dimensions of valence and arousal of the expressions presented with the 3 display formats, which we also related to performance in certain neuropsychological tests. Results allow us to discuss certain differential characteristics of the social brain of HE, MCI and AD people and the importance of this ability as a marker of the evolution of neurodegeneration.

**Funding:** Ministerio de Ciencia, Innovación y Universidades (PGC2018-094937-B-100), Spain.

**Keywords:** Alzheimer's disease, Mild Cognitive Impairment, facial expression, emotion recognition, face perception.



## **SYMPOSIUM 9**

### **THE ADDICTION RESEARCH NETWORK (RIAPAd) CONTRIBUTIONS FROM PSYCHOBIOLOGY**

Friday, 22<sup>nd</sup> July 2022, 9:00-10:30

Salón de Actos, Faculty of Psychology and Speech Therapy

*Chair: José Miñarro López*

*Departamento de Psicobiología, Universidad de Valencia, Spain*

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The Addictive Disorders Network (RTA) was established in 2003, composed of a series of preclinical and clinical researchers and financed by the Carlos III Health Institute. In 2021, the call by Carlos III made a profound change and we requested the continuation of the Network within the call for Primary Care, calling it the Network for Research in Addiction Primary Care. Since its inception, this network has been composed of different clinical, basic and epidemiological research groups, whose common objective is to investigate the origins of addictive processes, their clinical manifestations and their social impact with the ultimate goal of providing therapeutic and social intervention tools that help reduce the impact of addictions and associated pathologies. Currently, the Network is composed of 17 groups from different autonomous communities (Andalusia, Catalonia, Valencia, Basque Country, Madrid, Galicia, Aragon, Navarra, Castilla y León). Of these 17 groups, four come from the area of Psychobiology: Dr. Fernando Rodríguez de Fonseca (Málaga), Dr. Olga Valverde (Barcelona), Dr. Emilio Ambrosio (Madrid), and Dr. Marta Rodríguez (Valencia). We will also have the opportunity to learn about the work of a young researcher, Marina Reguilón, from the Department of Psychobiology at the University of Valencia.



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## ALCOHOL USE DISORDERS AND COGNITIVE IMPAIRMENT: A TRASLATIONAL APPROACH

**Fernando Rodríguez de Fonseca**

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Alcohol abuse is a major contributor to cognitive impairment and dementia. However, we lack objective biomarkers of early neuronal damage induced by alcohol, that can detect the harm before the appearance of subjective memory loss, a main claim of patients that precedes the diagnosis of dementia. Neurofilament light protein (NfL) is a well-known biomarker for neurodegeneration particularly in young individuals. Here, we investigate if substance abuse during life directly affects neuronal injury and cognitive disability through the evaluation of plasma NfL in patients with substance use disorders (SUD, N=60) compared to dementia patients (N=27) and controls (N=40). We used PRISM interview for SUD's diagnose and a set of neuropsychological tests (MoCA, TAVEC, ROCF, TMT B and digit span subtests) for the assessment of frontal and memory cognition. We found high concentrations of NfL and low circulant BDNF in SUD patients, especially in those with moderate-severe cognitive impairment. We found a negative correlation between NfLs and BDNF in the SUD group and the control group but not in the dementia group. Plasma levels of NfLs were associated with domains of executive function and memory cognition. Alterations in plasma concentrations of NfLs and BDNF were mediated by chronic alcohol abuse but not by lifetime use of cocaine, cannabis consumption or co-morbid affective disorders. NfLs were correlated with years of duration of AUD, whereas BDNF were associated with severity of alcohol consumption. In conclusion, despite still considering alcohol consumption one of the many risk factors for developing dementia, this study supports empirical evidence that alcohol abuse through life is a neurodegenerative disease that triggers an early-onset neuronal damage that eventually will favour the appearance of dementia. BDNF might be involved in a compensatory mechanism against brain damage in an early but no in advanced stages. The combined monitoring of cognitive evaluation, and BDNF/NfL measurement might help identify patients at risk of cognitive deterioration, and to start effective preventive/therapeutic interventions.

**Acknowledgments:** Red de Investigación en Atención Primaria de Adicciones (RIAPAd, RD21/009/0003).

**Keywords:** Alcohol, Addiction, Cognition, Dementia, BDNF, Neurofilaments.



**INVOLVEMENT OF ENDOCANNABINOID SYSTEM ON COGNITIVE ALTERATIONS OBSERVED IN A MICE MODEL OF FETAL ALCOHOL SPECTRUM DISORDER**

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Fetal alcohol spectrum disorder is the term used to describe the physical, mental and behavioral disabilities induced by prenatal and lactation alcohol exposure (PLAE). Numerous molecular mechanisms might be underlying the alcohol-induced teratogenicity, including neuroinflammation and alterations of the endocannabinoid system, which includes several mediators, their receptors and metabolic enzymes. In this context, preclinical data also revealed that the phytocannabinoid cannabidiol has anti-inflammatory properties and it could attenuate the neurodegeneration within hippocampus and entorhinal cortex caused by a rodent model of binge alcohol drinking. In fact, cannabidiol has emerged as a drug that might be useful to treat several neuropsychiatric disorders, but its mechanism of action has not been fully understood. In our study, we assessed the effects of cannabidiol on long-lasting cognitive deficits induced by early alcohol exposure. We have also assessed whether the modulation of endocannabinoid tone might restore the cognitive deficits induced by PLAE and its particular mechanism of action. We also analysed long-term pro-inflammatory and apoptotic markers within the prefrontal cortex and hippocampus in PLAE mice. To model alcohol binge drinking during gestational and lactation periods, we used pregnant C57BL/6 female mice with time-limited access to 20% v/v alcohol solution. Following the prenatal and lactation alcohol exposure, we treated the male and female offspring with cannabidiol from post-natal day (PD) 25 until PD34, and we evaluated their cognitive performance at PD60. Our results showed that cannabidiol treatment during peri-adolescence period ameliorates cognitive deficits observed in our fetal alcohol spectrum disorder-like mouse model, without sex differences.

**Acknowledgments:** Red de Investigación en Atención Primaria de Adicciones (RIAPAd, RD21/009/0001).

**Keywords:** alcohol, fetal alcohol spectrum disorder, endocannabinoids, mice, cannabidiol.



## **METABOLOMIC CHANGES INDUCED BY THE POLY-USE OF COCAINE AND ALCOHOL**

**L Garrido-Matilla, A Marcos, M Moreno-Fernández, C Poza, M Ucha, A Higuera-Matas,  
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Most people who use cocaine also use alcohol. When the metabolism of cocaine occurs with alcohol present, a new metabolite appears, cocaethylene, which is related to the production of seizures and an increased risk of sudden death, suicide, and alterations in the immune system. There are very few studies, however, on possible metabolites other than cocaethylene after the combined use of these two drugs. Thus, we have studied the plasmatic levels of several amino acids, as well as those of metabolites of several metabolic pathways in the prefrontal cortex, striatum and hippocampus, after intravenous chronic exposure and combined self-administration of cocaine and alcohol in young Wistar rats (51-72 days of age) of both sexes. We have analyzed: a) the self-administration behavior when the animals have had an access of 2 or 6 hours to both drugs (C+A; 1 mg/kg of cocaine plus 133 mg/kg of alcohol per injection), to cocaine alone (COC, 1 mg/kg/injection), and to Saline (SAL, 0.9% NaCl), daily for 10 days; b) the incubation of drug seeking behavior after 2 or 30 days of withdrawal (Wd2, Wd30); and c) chronic exposure (21 days). Blood plasma and brain samples were extracted after finishing the behavioral procedures to be analyzed by different metabolomic approaches. Self-administration behavior of COC and C+A groups was significantly higher than that of SAL group. Statistically significant differences were also found between C+A, COC and SAL groups in plasma amino acids and metabolites levels of the three brain regions studied.

**Acknowledgments:** Ministerio de Sanidad, Servicios Sociales e Igualdad (Red de Trastornos Adictivos, Reference: RTA-RD16/020/0022 del Instituto de Salud Carlos III- y Plan Nacional sobre Drogas, Reference : 2021I043); Ministerio de Ciencia e Innovación (Reference: PID2019-111594-I00); Comunidad de Madrid (Programa Operativo de Empleo Juvenil y la Iniciativa de Empleo Juvenil (YEI); BOCM de 28 de junio de 2019); UNED (Plan de Promoción de la Investigación); and Unión Europea (Reference: JUST/2017-AG- DRUGS-806996-JUSTSO).

**Keywords:** Poly-use, cocaine, alcohol, self-administration, Metabolomic.



## **SOCIAL STRESS, NEUROINFLAMMATION AND DRUGS OF ABUSE**

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Social interaction is known to be the main source of stress in human beings. Preclinical evidence reported over the last decade reveals that, when exposed to social defeat experiences, the rodent brain undergoes remodeling and functional modifications, which in turn lead to an increase in the rewarding and reinstating effects of different drugs of abuse. The mechanisms by which social stress causes changes in the reward system and induces these long-lasting effects on behavior are not fully unraveled. Numerous studies have been made on the social stress-induced changes in the dopaminergic system, corticotrophin releasing factor signaling, or epigenetics. A new perspective, based on the evidence that modifications of inflammatory parameters are related to the vulnerability to develop mental illnesses, proposed that social stress also induces the activation of the immune system, as recent preclinical research demonstrates. This dissertation will review the most important features that support the role of neuroinflammation in the increased rewarding effects of cocaine and ethanol induced by social stress. A brief overview of the translational value of these studies will also provide.

**Acknowledgments:** Ministerio de Ciencia e innovación. PID2020-11267RB. Red de Investigación en Atención Primaria de Adicciones (RIAPAd, RD21/009/0005).

**Keywords:** social interaction, stress, neuroinflammation, cocaine, ethanol.



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**SOCIAL DEFEAT INCREASED ETHANOL INTAKE IN MALE MICE.  
HOW TO POTENTIATE RESILIENCE**

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Large preclinical evidence shows that exposure to social defeat increases the consumption of ethanol. Nevertheless, not all subjects are equally affected by the changes induced by stress. When social defeat (SD) is experienced in the adult mice, the resilient phenotype to depressive-like behaviors after SD is associated with the resistant phenotype to drug-increased rewarding effects and a smaller neuroinflammatory response. This dissertation will review the main environmental and pharmacological interventions that potentiate resilience to these SD effects. Oxytocin administration before each SD blocks the increase in voluntary ethanol consumption observed in defeated mice and counteracts the increase in the neuroinflammatory response. Equally, the housed conditions modify the rodent's response to stress. Mice previously housed under EE conditions did not show an increase in ethanol self-administration or an increase in immune response. Exposure to controlled physical activity to a low-profile running wheel induces similar response. These interventions could be a promising tool to prevent and reduce the detrimental effects induced by social stress.

**Acknowledgments:** Ministerio de Ciencia e innovación. PID2020-11267RB. Red de Investigación en Atención Primaria de Adicciones (RIAPAd, RD21/009/0005).

**Keywords:** Social defeat, ethanol, neuroinflammation, oxytocin, resilience.





## **SYMPOSIUM 10**

### **AUTISM: GENES AND ENVIRONMENT**

Friday, 22<sup>nd</sup> July 2022, 9:00-10:30

Aula A6, Faculty of Psychology and Speech Therapy

*Chair: Cristian Pérez-Fernández*

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Autism spectrum disorders (ASD) are a heterogeneous group of neurodevelopmental pathologies characterized by altered sociability, decreased communication, increased stereotyped behaviors, locomotor alterations, significant inhibitory control dysfunctions, and altered decision-making. Although their genetic root is unquestionable, epidemiological, and experimental data suggest that some environmental factors could play a significant role in their appearance and severity degree. The present symposium aims to show to the scientific community some empirical data regarding the interactions between the physiological basis (both genetic and chemical models) and the environmental factors (toxics, pesticides, risky and social contexts, amongst others) on some of the most important behaviors (Ultrasound vocalizations, development, sociability, locomotor activity, decision strategy, amongst others) and molecular outcomes (gene and protein expression, electrophysiological recordings, metabolic profile, amongst others) related to ASD in preclinical and clinical models. Empirical results shown here go from the use of different transgenic (apoE3/4 transgenic mice) and KO models (fmr1-KO rats) to the exposure to widely used chemicals (e.g., Chlorpyrifos, Valproic acid) during critical developmental periods, describing their combined effects on ASD-like behaviors and related systems in rodents. At the same time, we put the focus on the influences of inhibitory/excitatory imbalances between the GABAergic and Glutamatergic system during critical stages of the neurodevelopment, as a possible mechanistic basis of this neurodevelopmental disorder. However, decision strategy is altered in those patients with ASD diagnosis, where environmental factors such as the nature of the context (risky or social) seem to influence those patients differently than healthy controls. Thus, being more logical and less emotional than the healthy volunteers in both risky and social contexts seems to be a robust clinical sign of ASD.



**SEX DIFFERENCES ON SOCIAL IMPAIRMENTS AND EXCITATORY-INHIBITORY IMBALANCE RELATED TO PRENATAL EXPOSURE TO CHLORPYRIFOS IN MICE**

**Judit Biosca-Brull<sup>1,2,3</sup>, Jordi Blanco<sup>1,3,4</sup>, Laia Guardia-Escote<sup>1,2</sup>, Pia Basaure<sup>1</sup>, Maria Cabré<sup>1,5</sup>, Maria Teresa Colomina<sup>1,2,3</sup>**

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Chlorpyrifos (CPF) is an organophosphate pesticide widely used in agriculture. Our laboratory has been studying the vulnerabilities of humans APOE isoforms in a humanized transgenic mice model exposed postnatally to CPF. However, the growing body of literature that associate massive use of CPF with neurodevelopmental disorders such as Autism Spectrum Disorder and the hypothesis that autism brains present an imbalance between excitatory and inhibitory neurotransmitters has brought us to study earlier exposures. Thus, the aims of this study are to evaluate, in both sexes, the effects of prenatal CPF exposure in social behaviors and their effects on GABA and glutamate related genes, looking for an association between CPF and autism. C57BL/6 and humanized apoE3 and apoE4 homozygous mice were exposed between gestational day (GD) 12 and 18 to 0 or 1 mg/kg/day of CPF, through the diet. Besides, C57BL/6 mice were exposed to 300 mg/kg/day of VPA on GD 12 and 13 by a subcutaneous injection to include a positive control of autism. Social behaviors were evaluated on postnatal day (PND) 45 by a Three-chamber test. On PND 46 mice were sacrificed and hippocampal samples were collected to study gene expression. Our results showed deficits in social memory, specifically, in C57BL/6 treated male mice, as well as apoE3 and apoE4 CPF-treated females. Furthermore, gene expression analysis showed that CPF generate a disequilibrium between glutamatergic and GABAergic neurotransmitters. Therefore, prenatal CPF exposure generates impairments in social behaviors in a genotype and sex dependent manner, in addition to alterations in excitatory/inhibitory balance.

**Keywords:** Autism, Chlorpyrifos, GABA, Glutamate, Social behavior.



**ELECTROPHYSIOLOGY IN HIPPOCAMPUS OF ANIMALS WITH  
PRENATAL ADMINISTRATION OF CHLORPYRIFOS AND ITS  
RELATIONSHIP WITH AN ANIMAL MODEL OF AUTISM**

**Miguel Morales-Navas<sup>1</sup>, María Isabel Carreño-Muñoz<sup>2</sup>, Cristian Pérez-Fernández<sup>1</sup>, Xavier Leinekugel<sup>3</sup>, María Teresa Colomina<sup>4</sup>, Fernando Sánchez-Santed**

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Autism Spectrum Disorder (ASD) is characterized by repetitive behaviors, cognitive impairments, and a lack of the production of social interactions. The etiology of this disorder is still unknown, but it seems to be a complex disorder in which genetics and environmental factors are related. Exposition to chlorpyrifos (CPF) during the development of the fetus has been highlighted as a possible agent that could be related to the development of this disorder. Some theoretical evidence has pointed out the possibility that in autistic brains, during the early development, the GABAergic neurons do not switch from excitatory to inhibitory behavior. The present study examines if Wistar rats prenatally exposed to a subclinical dose of CPF (1 mg/kg) show ASD-like phenotype and similar alterations in the electrophysiological behavior to what is expected from rats exposed to a single dose of valproic acid (400mg/kg), a validated model of autism, in the same administration window. To evaluate this, we have used silicon probes to record in head restraint subjects the electrophysiological behavior of the CA3 zone of the hippocampus, where extracellular inhibitory postsynaptic potentials are mostly present. Exposed animals showed decreased sociability and communication rates, although preliminary electrophysiological data do not give conclusive results. Taking this into account we are performing new analyses with a high-reliability standard. These data entail an important milestone because as far as we know there is no data available comparing the electrophysiological behavior of rats exposed prenatally to a pesticide to another positive control model of autism.

**Keywords:** Autism, Chlorpyrifos, Valproic Acid, Electrophysiology, Socialbility.



## INFLUENCES OF GESTATIONAL CHLORPYRIFOS EXPOSURE ON ASD-LIKE BEHAVIORS IN AN FMR1-KO RAT MODEL

**Cristian Pérez-Fernández<sup>1</sup>, María Matamala Montoya<sup>2</sup>, Miguel Morales-Navas<sup>1</sup>, Laia Guardia-Escote<sup>3,4</sup>, María Cabré<sup>3,5</sup>, María Teresa Colomina<sup>3,4</sup>, Estela Giménez<sup>6</sup>, Fernando Sánchez-Santed<sup>1</sup>**

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Exposure to pesticides seems to be linked to the prevalence increase of autism spectrum disorders (ASD), including gestational exposure to Chlorpyrifos (CPF). However, ASD severity degree results from the complex relationship between genetic background and environmental factors. Fragile X Syndrome is one of the most common monogenic causes of ASD. CPF exposure could potentiate these ASD-like behaviors observed in *fmr1*-KO models. Both *fmr1*-KO and wild-type male rats (F2 generation) were used in the present study. F1 pregnant females were randomly exposed to 1mg/kg/mL/day of CPF (s.c.) from GD12.5-15.5 or vehicle. The developmental evolution of the F2 males was assessed, and different behaviors associated to ASD were also analyzed, along with the gene expression profile of some of the most important components of the main neurotransmitter systems in the hippocampus. KO rats were heavier, emitted altered USVs, were socially inefficient, reacted more to a novel stimulus, were hyperactive when exploring a new context, but hypoactive when exploring anxiety-inducing environments, and had an upregulated hippocampal expression of the *grin2c* gene. When exposed to low doses of CPF during gestation, KO rats showed decreased climbing capacity, dysfunctional social interaction, and increased hippocampal expression for *kcc1* and *5ht2c* genes. Gestational CPF exposure increased the ASD-like phenotype in those animals with a genetic vulnerability, although its effect was less generalized than expected. It is the first time that this additive effect of CPF exposure and the *fmr1*-KO genetic vulnerability model is explored concerning social traits or any other behavior.

**Keywords:** Autism, Developmental neurotoxicology, Chlorpyrifos, Sociability, FMR1 protein.



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**HIGHLY LOGICAL AND NON-EMOTIONAL DECISIONS IN BOTH RISKY AND SOCIAL-CONTEXTS: UNDERSTANDING DECISION MAKING IN THE AUTISM SPECTRUM DISORDER THROUGH COMPUTATIONAL MODELING**

**Francisco Molins\*, Nour Ben Hassen Jemni, Dolores Garrote, Miguel Ángel Serrano**

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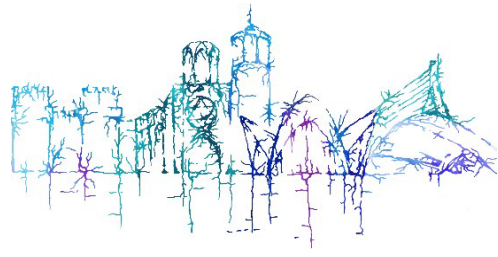
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Enhanced economic rationality was found when individuals with autism spectrum disorder (ASD) decide in risky-contexts, exhibiting more logical-consistency and non-emotional decisions (lower framing effect, FE) than do typical adults (TAs). However, this way of deciding could be also prevailing in social-contexts, leading to maladaptive decisions, as suggested the higher acceptance of unfair offers found in the ultimatum game (UG). Yet, these evidence are scarce and further research is needed. Our aim is to fill this gap. Moreover, recent developments in computational modeling allow the analysis of the cognitive subprocesses during UG and should be considered. We hypothesized that, regarding TAs, people with ASD will show lower FE in risky-contexts, and less emotional decisions in UG. Moreover, the way of deciding in both contexts will be directly associated. 27 individuals with ASD and 25 TAs were submitted to a framing-task and the UG. The Rescorla-Wagner cognitive model was used to analyze UG decisions. In the UG, the ASD group exhibited lower aversion to unfairness and higher acceptance of offers. Moreover, this was associated with the lower emotionality also found in the framing task, where no significant FE was manifested by the ASD group. Results seem to support expectations and further suggest an atypical decision-making, highly logical and non-emotional, as a robust feature of ASD.

**Keywords:** Autism spectrum disorder, decision-making, framing effect, ultimatum game, computational modelling.

# IV PSYCHO BIOLOGY

International Congress





## **SYMPOSIUM 11**

### **SOCIAL ISOLATION, LONELINESS AND STRESS**

Friday, 22<sup>nd</sup> July 2022, 10:30-12:00

Salón de Actos, Faculty of Psychology and Speech Therapy

*Chair: César Venero*

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Social isolation and loneliness (the subjective feeling of being isolated) are becoming major concerns as they are strongly linked to poor physical and mental health outcomes. Both social isolation and loneliness are considered potent stressors, that disrupt the normal functioning of the neuroendocrine systems. In this regard, dysregulation of the Hypothalamic-Pituitary-Adrenal (HPA) axis is a potential pathway through which stress, loneliness, and social isolation can exert a negative impact on the brain and behavior.

This symposium brings together recent experimental and clinical advances on the psychobiological effects of social isolation, loneliness, and stress. Recent research will be presented indicating how stress and social isolation during early life in rodents can alter both, inhibitory circuits in the adult brain as well as behavior, resembling what was observed in psychiatric patients. In addition, new findings will be discussed concerning how chronic social isolation induces cognitive decline and impairs hippocampal LTP in aged rats, an effect that can be restored by resocialization. In middle-aged and older adults, new knowledge on the sex-specific associations between loneliness, subjective health, and cortisol indexes will be presented. In addition, recent evidence of how repetitive transcranial magnetic stimulation of the dorsolateral prefrontal cortex can improve the regulation of the physiological stress response in young adults will be discussed.



## LONG-TERM CONSEQUENCES OF STRESS AND ISOLATION DURING EARLY LIFE

**Marta Perez-Rando<sup>1,2,3</sup>, Patrycja Klimczak<sup>1,2</sup>, Yaiza Gramuntell<sup>1</sup>, Julia Alcaide<sup>1,2</sup>, Xavier David<sup>1,2</sup>, Marc Beltran<sup>1</sup>, Juan Nacher<sup>1,2,3</sup>**

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Stress and social isolation have an important impact on the physiology and structure of the nervous system and are predisposing factors for the development of psychiatric disorders, particularly major depression. The consequences of these adverse experiences are worsened when they occur during infancy or adolescence, when the brain is still in its last stages of development. Stress and isolation affect the construction of neural circuits and render altered networks in the adult brain. In this presentation we will review recent work from our laboratory on animal models, focused particularly on the impact of stress and isolation during early life on inhibitory circuits. We will present evidence of long-term alterations in the structure, connectivity and plasticity of inhibitory neurons, both in cortical and extracortical regions. These persistent changes are frequently accompanied by anomalies in behavior. Interestingly, we have found similar alterations of inhibitory circuits in the brain of psychiatric patients.

This research was supported by RTI2018-098269-B-I00 (Spanish Ministry of Science and Innovation) /AEI/10.13039/501100011033/ (“FEDER Una manera de hacer Europa”), the Generalitat Valenciana (PROMETEU/2020/024).

**Keywords:** Social isolation, inhibitory neuron, early life stress, plasticity, major depression.





## **RESOCIALIZATION RESCUES THE COGNITIVE DEFICIT AND LTP IMPAIRMENT IN AGED SOCIALLY ISOLATED FEMALE RATS**

**Shishir Baliyan<sup>1,2</sup>, Ana Belén Sanz-Martos<sup>1</sup>, Nuria del Olmo<sup>1</sup>, César Venero<sup>1,2</sup>**

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Social isolation is a psychological stressor with a high prevalence in older adults and that is associated with mood alterations such as anxiety and depression, and cognitive decline. While most animal research studies have been focused on the behavioral effects of social isolation in the post-weaning, juvenile or young adulthood in male rodents, few studies have investigated the effects of chronic social isolation in aged female rats. In addition, there is scarce evidence of the effectiveness of resocialization to revert isolation-induced cognitive decline. In the present study, we studied the cognitive effects of long-term social isolation and subsequent resocialization in 16-month-old female Fisher rats. We observed that chronically isolated animals showed impaired spatial reference memory in the Morris water maze that was rescued in re-socialized animals. In addition, reversal spatial learning was not significantly affected by social isolation whereas spatial working memory was impaired in socially isolated rats but not in re-socialized animals. Subsequently, we analyzed synaptic plasticity on CA1 pyramidal neurons in dorsal hippocampal slices through long-term potentiation (LTP) experiments. We found that socially isolated aged rats showed an impaired hippocampal LTP that was restored in re-socialized animals. We have also analyzed gene and protein expression related to hippocampal neurotransmission underlying the rescuing effect of resocialization on memory impairment induced by chronic social isolation.

This research was supported by PSI2018-094627-R (Spanish Ministry of Science and Innovation).

**Keywords:** Aging, social isolation, stress, memory, LTP.



## LONELINESS AND HEALTH INDICATORS IN LATE-MIDDLE-AGED AND OLDER PEOPLE

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Loneliness is the complex and uncomfortable feeling that results from the perception of a lack of desired personal and social ties. Loneliness has been related to numerous organic and psychological diseases, increasing the morbidity and mortality, thus it has been understood as a psychosocial stress. One of the mechanisms through loneliness affects health could be via the dysregulation of Hypothalamic-Pituitary-Adrenal (HPA) axis. In middle-aged and older people has been studied the relationship between loneliness and HPA axis functioning showing a wide heterogeneity of results. Therefore, the aims of this study were to investigate the relationships between loneliness, subjective health, and cortisol indexes, taking the sex into account, and investigate whether the HPA axis mediates the relationship between loneliness and subjective health. To do this, 79 participants between 55-75 years older were assessed psychologically (loneliness, subjective health, depression, perceived stress) and provided cortisol samples during two consecutive days. Regression analyses showed that loneliness was related to psychological health in men but not in women. However, loneliness was not associated with physical health, and cortisol indexes. Moderation analyses showed that cortisol indexes employed did not mediate the relationship between loneliness and subjective health. Overall, these results highlight that the expected negative outcomes of loneliness associated with aging can be countered by an active life that can compensate for the natural losses experienced with age or at least delay these negative outcomes, considering the different pattern of association in men than in women.

This research was supported by the Spanish Science, Innovation and Universities Ministry (PID2020-119406GB-I00/AEI/10.13039/501100011033, the FPU 17/03428), and Grant BES-2017-082148 funded by MCIN/AEI/10.13039/501100011033 and by “ESF Investing in your future.” The contribution of VH has been supported by the Government of Aragón (S31\_20D) and the Universities Ministry and European Union (European Union-NextGenerationEU, grant for the requalification of the Spanish University System).

**Keywords:** loneliness, subjective health, stress, HPA axis functioning, cortisol, aging.



## THE ROLE OF THE PREFRONTAL CORTEX IN STRESS-INDUCED COGNITIVE AND PHYSIOLOGICAL PROCESSES: A STUDY WITH REPETITIVE TRANSCRANIAL MAGNETIC STIMULATION

**Matias M. Pulopulos<sup>1</sup>, Stefanie De Smet<sup>2</sup>, Jozefien Tilleman<sup>2</sup>, Shishir Baliyan<sup>3</sup>, Maximilian Schmausser<sup>4</sup>, Marie-Anne Vanderhasselt<sup>2</sup>, César Venero<sup>3</sup>, Chris Baeken<sup>2,5,6</sup>, Rudi De Raedt<sup>1</sup>**

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Disrupted inhibitory control of the prefrontal cortex over stress-induced physiological and cognitive processes has been proposed as one of the underlying mechanisms behind the development of stress-related disorders and reduced stress resilience. However, experimental evidence is scarce, and the causal role of the prefrontal cortex on the stress regulatory process in humans is still not well understood. In a single-blind, between-subject experiment with 80 healthy participants (mean age=21.05, SD=2.60), we investigated the effects of a single excitatory high-frequency repetitive transcranial magnetic stimulation (HF-rTMS) protocol (versus sham) over the left dorsolateral prefrontal cortex (DLPFC) on the stress-induced cortisol and heart rate variability response and changes in momentary rumination. At the physiological level, participants in the active HF-rTMS group showed a lower cortisol response to stress than the sham group, but no differences were observed in heart rate variability. At the cognitive level, the stress task increased momentary rumination, but no direct influence of DLPFC stimulation was observed. Importantly, individuals with a higher tendency to engage in brooding, a maladaptive ruminative thinking trait, showed a larger increase in momentary rumination after stress in the active HF-rTMS but not in the sham group. Our results provide important evidence for the inhibitory role of the DLPFC in the regulation of the Hypothalamic-Pituitary-Adrenal axis under stressful situations. However, our findings also suggest that the activation of prefrontal areas might increase maladaptive cognitive processes in individuals at risk of developing stress-related disorders.

This research was supported by Grant BOF16/GOA/017 for a Concerted Research Action of Ghent University, Grant RTI2018-094627-B-I00 from the Spanish Ministry of Science and Innovation, Grant BOFSTA2017002501 for research at Ghent University, and by the Research Foundation Flanders (Grant GOF4619N, and Grant FWO18/PDO/174).

**Keywords:** Stress, Cortisol, Rumination, Dorsolateral Prefrontal Cortex, High-Frequency Repetitive Transcranial Magnetic Stimulation.

# IV PSYCHO BIOLOGY

International Congress





## **SYMPOSIUM 12**

### **ETHOLOGY AND COMPARATIVE PSYCHOLOGY**

Friday, 22<sup>nd</sup> July 2022, 10:30-12:00

Aula A6, Faculty of Psychology and Speech Therapy

*Chair: José Francisco Zamorano-Abramson*

*Centro de Investigación en Complejidad Social, Facultad de Gobierno, Universidad del Desarrollo, Santiago, Chile. Grupo UCM de Psicobiología Social, Evolutiva y Comparada, Universidad Complutense de Madrid. España, [zabramson@psi.ucm.es](mailto:zabramson@psi.ucm.es)*

In the study of the origins of human cognition, two approaches are fundamental: (1) comparison between hominids and (2) comparison with other non-primate or more distant primate species. The goal of hominin comparison (human and non-human apes) is to identify which cognitive traits or abilities have evolved since humans diverged from other apes from a common ancestor. Comparison with other non-primate species or primates further along the evolutionary scale, on the other hand, allows us to identify cases of evolutionary convergence (evolutionarily distant species that share similar psychological traits). In these cases, these abilities must have appeared independently due to similar selective pressures, which would allow us to explore how these abilities could have arisen. In this “Ethology and Comparative Psychology” symposium we will present a series of studies addressing both the study of aggressive behavior and pair bonding in humans and the study of cognition (theory of mind, memory, imitation) in other non-human animal species, including macaques, parrots and marine mammals such as pinnipeds, dolphins and orcas. In summary, from this variety of talks, this symposium will provide an overview of essential information in the study of the evolution and origin of animal and human behavior and their underpinnings cognitive abilities.



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**JAPANESE MACAQUES (*Macaca fuscata*) ADAPT FLEXIBLY TO HUMAN'SGAZE BUT DO NOT SHOW SIGNS OF PERSPECTIVE TAKING**

**Anna Albiach-Serrano<sup>1</sup>, Alba Castellano-Navarro<sup>1</sup>, Emilio Macanás-Martínez<sup>1</sup>, Zhihong Xu<sup>2</sup>, Federico Guillén-Salazar<sup>1</sup>, Andrew J. J. MacIntosh<sup>2</sup>, Federica Amici<sup>3,4</sup>**

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<sup>3</sup>*Research Group Primate Behavioral Ecology, Department of Human Behavior, Ecology and Culture, Max-Planck Institute for Evolutionary Anthropology, Germany* <sup>4</sup>*Behavioral Ecology Research Group, Institute of Biology, Faculty of Life Science, University of Leipzig, Germany*

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Gaze is a valuable source of information since it signals attentional states and allows inferring others' intentions and visual perspective. Being sensitive to others' gaze can be advantageous in situations as varied as prey-predator interactions and cooperative and competitive interactions, usually between conspecifics but also with members of different species. Here, we present a study done with free-ranging Japanese macaques that investigated the macaques' response to human gaze in three contexts: threat (Experiment 1), cooperation (Experiment 2), and competition (Experiment 3). When a human approached them in straight line, subjects perceived his direct gaze as threatening, shown by a greater flight initiation distance and more threats towards the human in that condition compared to another where the human approached while looking in another direction. When a human provisioned them with food, subjects were sensitive to his eyes being open or closed, and when he was not oriented in their direction, they moved to enter his visual field. In contrast, the macaques did not show evidence of taking the visual perspective of a human who competed with them over food, since they did not prefer taking food hidden from the human behind an opaque barrier over food placed behind a transparent barrier. Our results show that Japanese macaques are sensitive to human's gaze and that they respond to it flexibly depending on the context. They also suggest that visual perspective-taking may be beyond the species' cognitive capacities, although further research will be needed before reaching any conclusions on this respect.

**Keywords:** Japanese macaques, gaze sensitivity, visual perspective, Theory.



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**INTERGROUP CONFLICT MODULATES COOPERATION AND  
AGGRESSION IN HUMAN BEINGS. A FUNCTIONAL APPROACH**

**José Antonio Muñoz-Reyes<sup>1</sup>, Pablo Polo<sup>1</sup>, Nohelia Valenzuela<sup>1</sup>, Oriana Figueroa<sup>1</sup>,  
Miguel Pita<sup>2</sup>, Daniel Torrico<sup>1</sup>, Gabriela Fajardo<sup>1</sup>, Montserrat Belinchón<sup>1</sup>, Eugenio  
Guzmán<sup>1</sup>, Carlos Rodríguez-Sickert<sup>1</sup>**

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The aggressive conflict between groups of humans has a ubiquitous presence in societies dating back to the dawn of our species. In this sense, different authors have proposed competition between groups as one of the primary selective forces that made our lineage's evolution possible. This intergroup competition for limited resources would favor intergroup aggression and intragroup cooperation. In addition, it would have a dimorphic component at the sexual level, with men being the ones who would be more sensitive to the threat of a conflict, especially considering differences in parental investment, which made men more prone to risky behavior to maximize reproductive opportunities. The line of research that we have developed in recent years aims to corroborate the assumptions of this theoretical model, commonly called "The Male Warrior Hypothesis." We conduct behavioral experiments under controlled laboratory conditions to measure aggression and cooperation from virtual games (Public Goods Games and the Point Subtraction Aggression Paradigm) in a universe of 600 people. We generate both intra and intergroup competition scenarios of competition where aggression and cooperation are needed to increase monetary payments. The results of the line of study have corroborated the main predictions in men. Still, they have also raised relevant doubts about the neutral position that the functional models give to women within the intergroup conflict since they would have a much more active role than assumed. Therefore, we proposed a new model of strategic intergroup conflict with different functions for each sex in intergroup conflict.

**Keywords:** Aggression, cooperation, intergroup conflict, sex differences.



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**TRAITS RELATED TO SHORT AND LONG-TERM MATING  
STRATEGIES IN MEN**

**Pablo Polo<sup>1</sup>, José Antonio Muñoz-Reyes<sup>1</sup>, Gabriela Fajardo<sup>1</sup>, Nohelia Valenzuela<sup>1</sup>,  
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Humans show a wide variety of mating strategies, from the establishment and maintenance of long-lasting pair-bonds (long-term strategies)—with different degrees of parental investment—to promiscuous mating (short-term strategies). The strategic pluralism hypothesis proposes that short and long-term mating strategies are conditional reproductive strategies contingent on the expression of certain morphological, physiological, and psychological traits and social environment. Our line of research developed to date aims to test several assumptions derived from the strategic pluralism concerning the role of testosterone in mating strategies and to shed light on the traits that may be relevant for the expression of a long-term mating strategy. Our studies performed on Chilean men suggest that high levels of androgenity, measured through muscularity and facial width-to-height ratio, are important for the expression of a short-term mating orientation and affect the number of sexual partners. In addition, we have found that socioeconomic status, a trait related to access to resources, is relevant for long-term mating orientation but strength, related to protection skills, was only relevant for short-term mating orientation. Our results partially support predictions derived from the strategic pluralism suggesting that men showing traits important in an intrasexual competition like musculature or strength may benefit from investing in mating, whereas men showing access to resources may benefit from investing in parenting, and emphasize the importance of considering short-and long-term mating strategies as two different dimensions to better understand human mating. Finally, we pretend to focus on traits relevant to women's mating strategies in future studies.

**Keywords:** strategic pluralism hypothesis, reproductive trade-off, sociosexuality, testosterone, human mating.





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## WHAT DID YOU DO? MEMORY FOR OWN BEHAVIOUR IN PARROTS, DOLPHINS AND PINNIPEDS

**Sara Torres Ortiz<sup>1</sup>, Simeon Quirinus Smeele<sup>2,3</sup>, Auguste Von Bayern<sup>1</sup>**

<sup>1</sup>*Max Planck Institute for Biological Intelligence, in foundation, Seewiesen Eberhard-Gwinner-Strasse, 82319 Starnberg, Germany*

<sup>2</sup>*Max Planck Institute of Animal Behaviour, Am Obstberg 1, 78315, Radolfzell Am Bodensee, Germany*

<sup>3</sup>*Max Planck Institute for Evolutionary Anthropology, Deutscher Platz 6, 04103, Leipzig, Germany*

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Awareness of one's own behaviour is necessary to consciously revive past events. Memory in animals has been studied extensively using different methods, but the animal's ability to consciously retrieve those memories is not clearly understood. In our study, dolphins and parrots were trained to understand the abstract rule of repeating their previous behaviour using the same trainer and training plan and following the same experimental protocol as in Smeele et al (2019) to allow comparison between the five different species. They were tested for single repeats and double repeat where all animals successfully performed above chance. After, we tested their memory on a delayed task, where parrots, dolphins and pinnipeds remembered the last thing they did for a maximum delay of 15 seconds. Even their evolutionary distance and their remarkably difference in brain size, all three species did not show significant differences in performance for all experiments. Also, our results in dolphins are radically different than those reported by Hermann in 1984. Kastak and Schusterman 1994, speculated that drastic species-specific differences in cognitive capacities may be due to differences in training rather than their abilities. Our study will be the first one to compare the ability to form an abstract concept and their use by five different species with similar training procedures supporting that some abilities previously found in dolphins, might be a cause of their extensive training and learning process rather than unique capabilities.

**Keywords:** self-awareness, consciousness, glaucogularis, tursiops, episodic memory.



## **ORCAS (*ORCINUS ORCA*) DISPLAY DEFERRED AND INTERFERENCE-RESISTANT RESPONSE FACILITATION**

**José Zamorano-Abramson<sup>1,2</sup>, M<sup>a</sup> Victoria Hernández-Lloreda<sup>2,3</sup>, Fernando Colmenares<sup>2,3</sup>, Josep Call<sup>4</sup>**

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<sup>2</sup>*Grupo UCM de Psicobiología Social, Evolutiva y Comparada, Universidad Complutense de Madrid, 28223, Madrid, Spain*

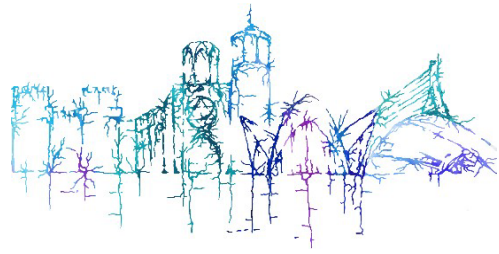
<sup>3</sup>*Departamento de Psicobiología y Metodología de las Ciencias del Comportamiento, Facultad de Psicología, Campus de Somosaguas, Universidad Complutense de Madrid, 28223, Madrid, Spain*

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Orcas are known to be highly social and learn from their group's members via various forms of social learning. Response facilitation is often portrayed as a "simple" social learning mechanism because the demonstrator's action automatically triggers that same action (e.g., yawning), which is already in the observer's repertoire, rather than induces the learning of a new action. However, learning a new action, as opposed to reproducing a familiar one, is only one indicator of cognitive sophistication. We investigated whether orcas reproducing familiar actions displayed cognitive control regarding their production by 1) introducing a delay between observing and producing the actions and 2) interspersing distractor actions during the delay period. These two manipulations were aimed at assessing whether response facilitation in orcas is triggered automatically after preventing the mental rehearsal of the observed actions during the delay period. We used a do-as-the-other-did paradigm to study deferred response facilitation of intransitive actions (not directed towards an object or body part) in two orcas. Subjects observed a demonstrator's target actions and then were instructed to reproduce them after a delay interval ranging from 60 to 150 sec. Some trials included interspersed distractor actions performed by the demonstrator and by the subjects during the delay interval. Both orcas copied the model's target actions on command over various delay periods, and crucially, despite the presence of distractor actions. Our findings imply either that orcas possess a form of voluntary response facilitation not documented to date, or that response facilitation is not as automatic as previously thought.

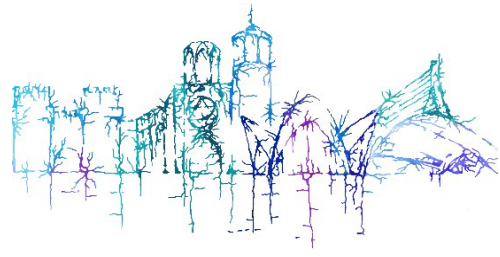
**Keywords:** Response facilitation, delayed imitation, social learning mechanisms, cetaceanculture, orca.



***ORAL COMMUNICATIONS***

# IV PSYCHO BIOLOGY

International Congress





## **ORAL COMMUNICATIONS 1**

### **COGNITION AND EMOTION**

### **NEUROPLASTICITY AND COGNITIVE ENHANCEMENT**

Wednesday, 20<sup>th</sup> July 2022, 9:00-10:15

Salón de Actos, Faculty of Psychology and Speech Therapy

*Chair: Fernando Rodríguez Fernández (Universidad de Sevilla)*

# IV PSYCHO BIOLOGY

International Congress





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**DIFFERENTIAL OUTCOMES PROCEDURE AND DYNAMIC  
EMOTIONAL EXPRESSIONS: INSIGHTS FROM A BAYESIAN  
GENERALIZED LINEAR MODEL**

Cognition and emotion

**Antonio González-Rodríguez**, Marta Godoy-Giménez, Ángel García-Pérez, Pablo Sayans-Jiménez, Fernando Cañadas, Ángeles F. Estévez

University of Almeria, Almeria, Spain

Keywords: Emotional Facial Expressions, Emotion Recognition, Differential Outcomes Procedure, GLM, Bayesian

**Objetivos / Objectives**

The current study aims to explore whether the Differential Outcomes Procedure (DOP), which involves the association of a specific outcome to each stimulus to-be- recognised, may be useful to improve the recognition of dynamic emotional facial expressions, a fundamental ability for adaptative social functioning.

**Metodología / Methodology**

183 undergraduate students performed a two-phased computerized task in which they should recognise the emotion expressed in a face that morphed from a neutral expression to one of the basic emotions at full intensity over a period of 10 seconds. Once the participant recognised the emotion, he/she should press the spacebar and choose the emotion they considered correct. In the first phase, participants did not receive feedback after their responses, while, in the second phase, after their correct responses, 88 participants received differential outcomes and 95 participants received non-differential outcomes. Using Generalized Linear Models (GLMs) and Bayesian inference we estimated, for each phase, the accuracy, reaction times, the penalization caused by not seeing the emotion at full intensity, and the effect of trial in accuracy so we could compare learning curves.

**Resultados y Conclusiones / Results & Conclusions**

Participants showed similar accuracy and reaction times in both feedback conditions for the same emotions. The only emotion in which feedback generated a learning curve was Fear. Notably, Fear and Surprise showed less penalization under the DOP condition. This may suggest that the DOP could reduce the negative impact caused by not seeing some emotions at full intensity, which could be related to a more efficient recognition of the key aspects that differentiate each emotion.



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## **ACUTE PSYCHOSOCIAL STRESS LEADS TO A DYSFUNCTIONAL DECISION-MAKING**

Cognition and emotion

**Nour Ben Hassen Jemni**, Mónica Paz Echeverry, Francisco Molins , Miguel Ángel Serrano Rosa

Departamento de Psicobiología, Facultad de Psicología, Valencia, España

Keywords: Psychosocial Stress, Decision-Making, Learning, Iowa Gambling Task, Trier Social Stress Test

### **Objetivos / Objectives**

The aim of this research is to study the decision-making processes under acute stress. It has been seen that stress activates neurobiological dynamics, including catecholaminergic systems and corticosteroids activation that significantly affect the prefrontal cortex functioning, leading to dysfunctional decision-making. In this research, we expected that higher levels of electrodermal activity (EDA) and heart rate (HR) will be seen in stress group, as well as higher perceived stress. Hypothesizing that this group will show an inconsistent and a non-strategic decision-making.

### **Metodología / Methodology**

95 participants have been randomly distributed into two groups, experimental (N = 46) and control (N = 49). A virtual version of The Trier Social Stress Test (TSST) was used as a laboratory stressor, then, decision-making was assessed by using the Iowa Gambling Task (IGT) in its computerized version. Furthermore, Value-Plus- Preservation (VPP) RL computational model based on Bayesian logic has been used for an in-depth analysis of decision-making processes.

### **Resultados y Conclusiones / Results & Conclusions**

As we expected, the experimental group showed higher physiological activation (EDA and HR) and psychological stress. Compared to the control group, the stressed participants showed lower learning and altered feedback sensitivity, manifesting both lower loss aversion and lower weight for gains, and more tendency to switch rather than persevere on succeeding trials and lower consistency during decision-making. These results support the idea that decision-making after acute stress could be based on disadvantageous strategies related to impairments in the prefrontal cortex functioning and its cognitive correlate.





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**THE EFFECT OF PERSUASIVE STRATEGIES ON NUTRITION  
EDUCATION MESSAGES: AN EVENT-RELATED POTENTIAL STUDY**

Cognition and emotion

**Valerie N Rodríguez Hernández**<sup>1</sup>, Ruth Garrido-Chaves<sup>1</sup>, Vanesa Hidalgo<sup>1,2</sup>, Alicia Salvador<sup>1,3</sup>,

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2. University of Zaragoza, Teruel, Spain
3. Spanish National Network for Research in Mental Health CIBERSAM, Madrid, Spain

Keywords: Persuasion, Information Processing, ERPs, Attention

**Objetivos / Objectives**

A fundamental aspect of health education is how it is communicated and its effectiveness in producing an attitude or behavior change in people. For that, is common to use persuasive strategies to increase the attention of an individual or group. The three major persuasive strategies chosen to study are: Ethos, Pathos, Logos; each with a particular perspective on how to address information. Ethos appeals to the authority or power of the source, Pathos appeals to emotions, and Logos appeals to the logic of the argument.

**Metodología / Methodology**

The present study investigates the efficacy of the three different persuasive strategies mentioned above to produce an attitude change regarding nutrition education messages, considering individual differences and neuronal correlates, among a student sample (N= 29). The amount of attentive processing of the persuasive information was measured by recording the N100 and P300 event-related potentials (ERPs).

**Resultados y Conclusiones / Results & Conclusions**

The results of the P300 amplitude for the Fp1, Fp2, F3 electrodes showed that Ethos presented a larger amplitude than Logos in these electrodes. In addition, Ethos presented a larger amplitude than Pathos in Fp1 and Fp2, and Pathos had a greater amplitude than Logos in Fz. As for the N100, no significant main effect was found. These results revealed a frontally distributed P300 effect which is related to reasoning and novelty processing. Results also suggest the use of an authority source as an effective strategy to capture more attentional resources toward health messages.

This research is supported by the Spanish Science, Innovation and Universities Ministry (PID2020-119406GB-I00/AEI/10.13039/501100011033; FPU2018/03422).



## **ALTERED NEUROANATOMICAL MECHANISMS OF A COMPULSIVE PHENOTYPE SELECTED BY SCHEDULE- INDUCED POLYDIPSIA**

Neuroplasticity and cognitive enhancement

**Elena Martín-González**<sup>1</sup>, Manuela Olmedo-Córdoba<sup>1</sup>, Ángeles Prados-Pardo<sup>1</sup>, Steve Sawiak<sup>2</sup>, Jeffrey Dalley<sup>2</sup>, Pedro Ramos-Cabrer<sup>3</sup>, Daniel Padro<sup>3</sup>, Santiago Mora<sup>4</sup>, Margarita Moreno<sup>1</sup>

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2. University of Cambridge, Cambridge, United Kingdom
3. Center for Cooperative Research in Biomaterials, San Sebastián, Spain
4. University of Copenhagen, Copenhagen, Denmark

Keywords: Compulsive Behavior; Schedule-Induced Polydipsia; Magnetic Resonance Imaging; Voxel-Based Morphometry

### **Objetivos / Objectives**

The present study investigated the morphology of brain differences in white and gray matter structures in a compulsive phenotype of rats selected by Schedule-Induced Polydipsia (SIP).

### **Metodología / Methodology**

Wistar rats were selected as either High (HD) or Low (LD) drinkers according to their drinking behavior on SIP. Subsequently, we assessed structural brain alterations using high-resolution magnetic resonance imaging (MRI).

### **Resultados y Conclusiones / Results & Conclusions**

Voxel-based morphometry of segmented MRI images revealed that HD animals presented higher volume in white matter structures, such as Anterior Commissure and Corpus Callosum compared to LD. Moreover, there were significant differences between compulsive HD rats and LD rats in the volume of brain structures related to inhibitory control deficit system, such as: decreased mPFC and increased dlOFC, Striatum, Amygdala, Hippocampus, Midbrain, Subthalamic Nucleus and Cerebellum. Finally, no significant differences were found in the whole brain, ventricles, and CSF volume between groups. These findings suggest alterations in cortico-striatal systems and their modulators such as brain structures of the thalamic-cortical, limbic areas and Cerebellum related to the compulsive phenotype of HD rats. The research in mapping different structural brain patterns might enhance the knowledge about the vulnerability to develop a compulsive spectrum disorder.

Funded by Gobierno de España MCIN/ AEI /10.13039/501100011033/ grant number PGC2018-099117-B-C21 and UAL2020-CTSD2068 FEDER I+D+i “Una manera de hacer Europa”.



## **ORAL COMMUNICATIONS 2**

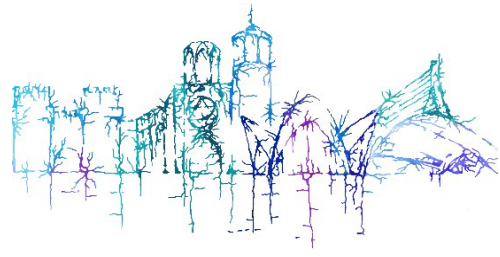
### **PSYCHOPHARMACOLOGY & ADDICTION**

Wednesday, 20<sup>th</sup> July 2022, 9:00-10:15

Aula A6, Faculty of Psychology and Speech Therapy

*Chair: Marta Miquel Salgado-Araujo (Universitat Jaume I)*

**IV** PSYCHO  
BIOLOGY  
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## EVALUATION OF ALCOHOL SELF-ADMINISTRATION THROUGH A PARADIGM BASED ON THE RELATIONSHIP BETWEEN BINGE-EATING AND BINGE-DRINKING: A STUDY IN MALE AND FEMALE RATS.

Psychopharmacology & addiction

**Alejandro Martín Valverde**<sup>1</sup>, Sergio Cuesta Martínez<sup>2,3</sup>, Leandro Ruiz Leyva<sup>2,3</sup>, Teresa Aparicio Mescua<sup>4</sup>, Ignacio Morón Henche<sup>1</sup>, Cruz Miguel Cendán Martínez<sup>2,3</sup>

1. Department of Psychobiology and Centre of Investigation of Mind, Brain, and Behavior (CIMCYC), Faculty of Psychology, University of Granada, Granada, España
2. Department of Pharmacology, Institute of Neuroscience, Biomedical Research Centre (CIBM), Faculty of Medicine, University of Granada, Granada, España
3. Instituto de Investigación Biosanitaria (IBS), Granada, España
4. Department of Psychobiology, Faculty of Psychology, University of Granada, Granada, España

Keywords: Binge Drinking, Binge Eating, Female Rats, Environmental Enrichment.

### **Objetivos / Objectives**

Binge-like behaviors (e.g. binge-drinking [BD] or binge-eating [BE]) constitute a major health issue. Although it is prevalent in both sexes, few studies in animal models have addressed it including the female sex. Recent works demonstrated with male rats that BD is linked to BE, showing that a previous BE can be the trigger for BD. The objective of the study was to replicate these results in females, as well as to see if the BD phenomenon is sensitive to the presence of environmental enrichment in the animals' cages, since it is hypothesized that this may function as a protective factor against consumption.

### **Metodología / Methodology**

First Experiment: Over 10 days, 20 adults female and male Wistar rats without environmental enrichment were exposed to binge or control eating (e.g., the ingestion of 11.66 vs. 0.97 kcal/3 min) immediately followed by two-bottle choice tests (10% w/w ethanol vs. water). Second Experiment: This one was similar, but using 20 female rats with environmental enrichment.

### **Resultados y Conclusiones / Results & Conclusions**

Animals exposed to BE consumed more ethanol than the control diet groups, with a lower and later consumption in the female group, and both groups also showed a preference for ethanol. We also saw, in BE females, a higher water consumption.

Finally, the effect in females appeared when they did not have environmental enrichment. Our results suggest that female rats are more resistant to the proposed model, as well as that environmental enrichment works as a protective factor against BD.



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## **BINGE DRINKING PATTERN: SHORT VERSUS LONG TERM EFFECTS ON MEMORY**

Psychopharmacology & addiction

**Concepción Vinader-Caerols**, Milton Ramírez-Piña, Santiago Monleón Verdú

Universitat de València, Valencia, España

Keywords: Binge Drinking, Immediate Visual Memory, Working Memory, Longitudinal Study

### **Objetivos / Objectives**

Binge Drinking (BD) pattern, characterized by intermittent consumption of large quantities of alcohol in short periods, has differential effects on several types of memory. It is important to clarify if a stable BD pattern maintained over time (12 months or 4 years, in our studies) or acute alcohol consumption affect memory performance. Longitudinal studies are necessary in order to explore this issue. Thus, the main objective of this research was to compare short versus long term effects of BD pattern on several types of memory.

### **Metodología / Methodology**

The experimental subjects were male and female adolescent university students (18–19 years old at the beginning of this longitudinal study) recruited based on strict inclusion and exclusion criteria. They were classified as refrainers (or very occasional alcohol consumers) or binge drinkers. Those subjects who maintained their consumption pattern were evaluated in two sessions with a 3-year interval, performing Immediate Visual Memory (IVM) and Working Memory (WM) tests.

### **Resultados y Conclusiones / Results & Conclusions**

Acute alcohol consumption impaired IVM performance in men and women. The BD pattern maintained over time significantly affected IVM in men but not in women at the second session. WM was not affected. In conclusion, alcohol exposure during adolescence triggers different cognitive effects in men and women. The long term effects of BD persist and expand over time.



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**IS INFLAMMATION PAIN A SEX-DEPENDENT RISK FACTOR TO ALCOHOL USE DISORDER? AN OVERVIEW OF DIFFERENT RODENT MODELS**

Psychopharmacology & addiction

Jesús Lorente-Erenas, Javier Cuitavi, Yolanda Campos-Jurado, Paula Andrés-Herrera, Natalia Landsberg, David Meseguer, Jose Luís González-Romero, **Lucía Hipólito**

Department of Pharmacy and Pharmaceutical Technology and Parasitology, University of Valencia, Burjassot, Spain

Keywords: Alcohol Use Disorder Pain Rodent Models

**Objetivos / Objectives**

The aim of the present research is to disentangle how inflammatory pain can impact alcohol drinking behaviour in different alcohol access models and rodent species.

**Metodología / Methodology**

To do that, we performed a series of different long-term alcohol access models (alcohol deprivation effect, intermittent access, continuous access, drinking in the dark) combined with the Complete Freund's Adjuvant (CFA) model of inflammatory pain.

**Resultados y Conclusiones / Results & Conclusions**

Opposite to what has been observed in mice, the development of an inflammatory pain condition did not alter acquisition of the non-operant continuous alcohol drinking behaviour both in male and female rats. Nonetheless, differences in alcohol drinking behaviour were observed depending on the age of the rats. Young adult rats (8 weeks) drink significantly more alcohol than old adult rats (12 weeks) independently of the pain condition. Very interestingly, when pain was developed during abstinence only female CFA rats significantly increased their alcohol consumption over the baseline in an intermittent access model but not in a continuous access model. These differences were not observed in mice. Finally, alterations in the expression of mu and kappa opioid receptors and ligands were specifically observed in the CFA female rats that showed a relapse-like behaviour.

In conclusion, alcohol access, sex, rodent species and time course of the inflammatory pain induction has led to different impact of pain in alcohol drinking behaviours.

Future research is warranted in order to clarify the specific role of how pain alters alcohol drinking behaviour and its underlying neural mechanism in different rodent models.



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## **EFFECTS OF BINGE DRINKING ON EMOTIONAL MEMORY, SPATIAL MEMORY AND RECOGNITION MEMORY IN MICE**

Psychopharmacology & addiction

**Santiago Monleón Verdú**, Milton Ramírez-Piña, Concepción Vinader-Caerols

Universitat de València, Valencia, Spain

Keywords: Binge Drinking, Emotional Memory, Spatial Memory, Recognition Memory, Mice

### **Objetivos / Objectives**

The main objective of this work was to evaluate the effects of chronic-intermittent ethanol administration, model of binge drinking (BD) alcohol consumption pattern, on emotional memory, spatial memory and recognition memory in adolescent mice of both sexes. Additionally we evaluated if the anti-inflammatory indomethacin counteracts the memory deficits caused by BD alcohol.

### **Metodología / Methodology**

Animals were randomly assigned to four groups in each sex: SS (saline+saline), SA (saline+alcohol), SI (saline+indomethacin), and AI (alcohol+indomethacin). They were injected (i.p.) with saline, ethanol (3 g/kg) and indomethacin (10 mg/kg) in chronic-intermittent administration (the first three days of each week, throughout three weeks). After treatment, emotional memory was assessed in an inhibitory avoidance task; spatial memory was assessed in a Morris Water Maze (MWM); and recognition memory was assessed by the Novel Object Recognition (NOR) test.

### **Resultados y Conclusiones / Results & Conclusions**

Emotional memory impairment was observed in the SA group, while the AI group showed similar inhibitory avoidance to controls. No significant differences between groups of treatment were observed in the MWM, either in the acquisition phase or in the probe trial. In the NOR test, the SA group spent less exploration time for the novel object than the SS and the SI groups. In conclusion, BD alcohol impairs emotional memory and recognition memory, but not spatial memory, in mice. Also, this memory impairment can be counteracted by the anti-inflammatory indomethacin. This work represents new evidence which supports the contribution of neuroinflammation in the cognitive consequences of BD alcohol.





## **FROM BINGE EATING TO BINGE DRINKING: ASSESSING BINGE ETHANOL SELF-ADMINISTRATION IN ADULT MALE WISTAR RATS LACKING THE SIGMA-1 RECEPTOR**

Psychopharmacology & addiction

**Sergio Cuesta Martínez**<sup>1,2</sup>, Ignacio Morón Henche<sup>3,4</sup>, Leandro Ruiz Leyva<sup>1,2</sup>, Teresa Aparicio Mescua<sup>3</sup>, Alejandro Martín Valverde<sup>3,4</sup>, Cruz Miguel Cendán Martínez<sup>1,2</sup>

1. Department of Pharmacology, Institute of Neuroscience, Biomedical Research Centre (CIBM), Faculty of Medicine, University of Granada, Granada, Spain
2. Instituto de Investigación Biosanitaria (IBS), Granada, Spain
3. Department of Psychobiology, Faculty of Psychology, University of Granada, Granada, Spain
4. Centre of Investigation Mind, Brain, and Behavior (CIMCYC), Granada, Spain

Keywords: Binge Drinking, Binge Eating, Polyconsumption, Sigma-1, Knockout

### **Objetivos / Objectives**

Binge drinking (BD) and binge eating (BE) behaviors represent a major public health problem and their interaction in polyconsumption contexts needs to be studied.

Preclinical evidence suggests that sigma-1 receptor (Sig-1R) modulates both excessive consumption and the motivation to obtain alcohol and palatable food. In addition, it has been shown that mice lacking this receptor (knockout or KO) excessively consume high concentrations of ethanol and appear to be less sensitive to its rewarding effects.

The aim of the present study was to assess the voluntary ethanol consumption of KO Sig-1R rats using a robust binge-like polyconsumption model, in which ethanol access follows a BE episode.

### **Metodología / Methodology**

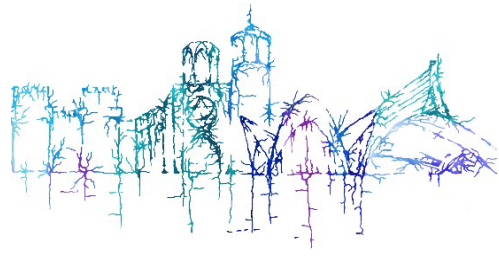
Over 10 days, 70 adult male KO Sig-1R Wistar rats and 10 wild-type (WT) counterparts were exposed to binge or control eating (i.e., the ingestion of 11.66 vs.

0.97 kcal/3 min, respectively, derived from a sugary palatable food), immediately followed by two-bottle choice tests (6–20% w/w ethanol vs. water).

### **Resultados y Conclusiones / Results & Conclusions**

KO Sig-1R rats exposed to BE exhibited a binge-like polyconsumption pattern and their ethanol intake was similar to that of their WT counterparts at the 10% concentration. Moreover, KO Sig-1R rats reached peak consumption values at the highest ethanol concentrations (14% and 20%). Water intake remained unaffected and the influence of BE was specific to ethanol consumption. Our results suggest that Sig-1R deletion increases the consumption of high concentrations of ethanol, likely by decreasing its rewarding effects, a fact that strengthens the involvement of this receptor in the modulation of the reinforcing effects of alcohol.

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## **ORAL COMMUNICATIONS 3**

### **BRAIN ELECTRICAL CORRELATES AND NEUROMODULATION**

Wednesday, 20<sup>th</sup> July 2022, 18:15-19:30 h

Salón de Actos, Faculty of Psychology and Speech Therapy

*Chair: Matías M. Pulópulos (Ghent University)*

**IV** PSYCHO  
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## PHOTOBIMODULATION ON THE YOUNG BRAIN

Brain electrical correlates and neuromodulation

**Alba Gutiérrez-Menéndez**<sup>1,2,3</sup>, Juan A. Martínez<sup>4,5,6</sup>, Miguel J. Prieto<sup>4,2,3</sup>, Marta Méndez<sup>1,5,6</sup>, Jorge L. Arias<sup>1,2,3</sup>

1. Laboratory of Neuroscience, Department of Psychology, University of Oviedo, Plaza Feijóo, s/n, E 33003, Oviedo, Asturias, Spain
2. Instituto de Neurociencias del Principado de Asturias (INEUROPA), Oviedo, Spain
3. Instituto de Investigación Sanitaria del Principado de Asturias (ISPA), Oviedo, Spain
4. Electronic Technology Area, University of Oviedo, 33204, Gijón, Asturias, Spain
5. Instituto de Neurociencias del Principado de Asturias (INEUROPA), Asturias, Spain
6. Instituto de Investigación Sanitaria del Principado de Asturias (ISPA), Asturias, Spain

Keywords: Photobiomodulation, Nervous System, Development, BrainNeuromodulation, Light Therapy.

### Objetivos / Objectives

Photobiomodulation (PBM) or the use of red to near-infrared light, is a non-invasive intervention that produces neurostimulatory effects and reaches benefits in several pathologies as well as in healthy subjects. Several studies in adult samples have documented a large number of positive brain effects when using this therapy suggesting PBM to be a new modality of neural activity stimulation that improves brain functions. The main proposed mechanism of action is the stimulation of the cytochrome c oxidase (CCO), the terminal enzyme in the mitochondrial electron transport chain. The main objective of this study was to evaluate and compare the effects of PBM on the prefrontal cortex and hippocampus of 23 day-old healthy male (n=31) and female (n=30) Wistar rats.

### Metodología / Methodology

Three groups of each sex were employed: a PBM group that received five days of light therapy, a device group submitted to the same conditions but without light radiation, and a control basal group. Brain metabolic activity and immediate early gene activation were analyzed using CCO histochemistry and c-Fos immunostaining, respectively.

### Resultados y Conclusiones / Results & Conclusions

Results displayed no differences between groups of each sex in CCO and c-Fos expression. In contrast to the consequences reported in healthy adult subjects after PBM, our study showed a lack of PBM effects in young healthy rat brains. At this stage, mitochondrial function is not disturbed so the action of PBM may not be detectable using our analysis. Further studies are needed to examine in depth the effects of PBM on brain development. MINECO PID2020-117259RB-I00, FICYT- AYUD/2021/51378 and MCIU-19-PRE2018-086220-A.G.M.



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## **RELAXIN3 PROJECTIONS FROM THE NUCLEUS INCERTUS TO THE MEDIAL SEPTUM AND ENTORRHINAL CORTEX**

Brain electrical correlates and neuromodulation

**Isis Gil-Miravet** , Mónica Navarro-Sánchez , Aroa Mañas-Ojeda , Mohamed Zahran, Francisco E Olucha Bordonau

Universitat Jaume I, Castelló, España

Keywords: Nucleus Incertus, Relaxin3, Medial Septum, Entorhinal Cortex

### **Objetivos / Objectives**

The nucleus incertus (NI) which is a small group of neurons in the midline of the floor of the IV ventricle in the pontine tegmentum, produce and release in its projected areasthe neuropeptide Relaxin3 which has been found to modulate emotional and cognitive learning processes. A portion of the projections between the NI and the medial septum,hippocampus, and entorhinal cortex are mediated by Relaxin3 and its receptor RXFP3.The objective of this study is analyse the collateralization of the projections from the NI to the medial septum and/or the medial entorhinal cortex.

### **Metodología / Methodology**

Combinations of two retrograde tracers, FluoroGold (FG) and cholera toxin subunit B (CTB), are injected in the medial septum (MS) and medial entorhinal cortex (MEnt) orlateral entorhinal cortex (LEnt). After surgery, immunofluorescence with Relaxin3, FGand CTB was performed, and the number of Relaxin3 positive neurons projecting fromthe NI to each of these nuclei was recorded.

### **Resultados y Conclusiones / Results & Conclusions**

Retrograde tracer injections placed in the medial and lateral entorhinal cortex produced prominent retrograde labelling in the ipsilateral NI and some labelling in the contralateral NI. Moreover, the projections from the NI to the MS were twice as numerous as to the entorhinal. Most of NI neurons projects independently to the mediallyseptum or entorhinal cortex. In addition, we observed that approximately a 21% of the NI-MS, 28% of NI-MEnt and 37% of NI-LEnt projections were Relaxin3 positive. These results show the importance of the Relaxin3-NI projections over the mediallyseptum and entorhinal cortex.



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## **ARE SUBJECTIVE MEMORY COMPLAINTS ASSOCIATED WITH ALTERATIONS IN THE EEG SPECTRAL ANALYSIS?**

Brain electrical correlates and neuromodulation

**Vanesa Perez**<sup>1,2</sup>, Ruth Garrido-Chaves<sup>1</sup>, Mariola Zapater-Fajari<sup>1</sup>, Vanesa Hidalgo<sup>1,3</sup>, Alicia Salvador<sup>1</sup>

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**Keywords:** Subjective Memory Complaints, Resting State, Electroencephalography, Spectral Power

### **Objetivos / Objectives**

Subjective memory complaints (SMCs) have been related to subtle cognitive deficits and some neural changes. In this study, we investigated whether electroencephalogram (EEG) rhythms, usually altered in mild cognitive impairment and Alzheimer's disease, are also affected in SMCs compared to people without SMCs.

### **Metodología / Methodology**

Seventy-one older adults (55-74 years old) underwent three minutes of EEG recording in a resting-state condition with their eyes closed (EC) and eyes open (EO) and a comprehensive neuropsychological evaluation. The EEG measures included were power spectral delta (0.5–4 Hz), theta (4–8 Hz), alpha (8–12 Hz), and beta (13–30 Hz).

### **Resultados y Conclusiones / Results & Conclusions**

Compared to controls, older people with SMCs showed increased theta rhythm. Furthermore, in this group, the power spectral were related to several deficits in verbal memory, executive functions, and attention. These findings suggest that certain changes in the neurophysiological markers of brain function may identify cognitive changes even before they are observed on objective neuropsychological tests.

Spanish Science and Innovation Ministry (PID2020-119406GB-I00/ AEI / 10.13039/501100011033)



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**ANALYSIS OF BRAIN RESPONSES IN AN AUDITORY STIMULATION  
PARADIGM: EVENT-RELATED POTENTIALS AND FNIRS  
HEMODYNAMICS**

Brain electrical correlates and neuromodulation

**Vanesa Muñoz**, Carlos M. Gómez

Universidad de Sevilla, Sevilla, Spain

Keywords: Auditory Stimulation, FNIRS, Auditory Cortex, EEG, ERP

**Objetivos / Objectives**

The brain response in auditory paradigms is a widely studied topic, however in a new technique such as functional near infrared spectroscopy (fNIRS), there are still many doubts about its scope and limitations. The present study analyzed the brain response to three different sound intensities (77.9dB, 84.5dB, and 89.5dB), recording electroencephalography in order to obtain event-related potentials and fNIRS to study hemodynamic activity linked to activation of the auditory cortex.

**Metodología / Methodology**

Thirty-three subjects participated in the study. The stimulation period consisted of a random presentation of a tone with different intensity, with a duration of 500ms, each type of tone was presented 54 times, while EEG and fNIRS were recorded.

**Resultados y Conclusiones / Results & Conclusions**

The results on event-related potentials showed an expected and already studied effect of amplitude increase in P2 and decrease in N1, related to intensity. However, in the hemodynamic response analyzed with fNIRS in the auditory cortex, although a clear hemodynamic response was obtained for the three intensities, no amplitude difference was found between them. Together these results could suggest that at the brain level there is a response to the effect of the intensity change, but fNIRS is not able to detect it, possibly because of its spatial limitations or the source of this effect is external to the auditory cortex.





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## **HD-TDCS OVER THE LEFT DLPFC AND TASK DEMANDS DISSOCIATE VIGILANCE DECREMENT FROM PROPENSITY TO MIND-WANDER IN SUSTAIN ATTENTION TASKS**

Brain electrical correlates and neuromodulation

**Víctor Martínez-Pérez**, Almudena Andreu, Alejandro Sandoval-Lentisco, Miriam Tortajada, Lucía B. Palmero, Alejandro Castillo, Guillermo Campoy, Luis J. Fuentes

Universidad de Murcia, Murcia, Spain

Keywords: TDCS, Vigilance Decrement, Mind-Wandering, Sustain Attention

### **Objetivos / Objectives**

Whether or not decrement in vigilance and mind wandering (MW) are independent phenomena remains an open question that underlies most explanatory theories of sustained attention. In the present study, we addressed this question by introducing two critical manipulations: varying task demands, which has been thought to affect vigilance decrement, and applying anodal High Definition transcranial Direct Current Stimulation (HD-tDCS) over left Dorsolateral Prefrontal Cortex (DLPFC), which has been thought to affect the MW rate.

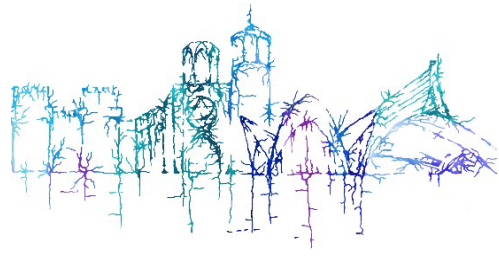
### **Metodología / Methodology**

Two versions of the Sustain Attention to Response Task (SART) were used that varied in task demands and included thought probes of intentional and unintentional mind wandering during task performance. Seventy-eight participants were assigned to one of the four groups resulting from the factorial combination of task demands (low, high) and stimulation (anodal, sham). Using pre-post resting EEG we explored the after-effects on alpha power due to our manipulations and asked whether baseline alpha band at resting predicted performance gains related to HD-tDCS and/or task demands.

### **Resultados y Conclusiones / Results & Conclusions**

Our results showed that task demands exclusively affected vigilance decrement, whereas anodal tDCS exclusively affected the MW rate. Thus, the double dissociation suggests that vigilance decrement and MW in sustained attention tasks are two independent phenomena. Critically, alpha band at resting predicted tDCS-related gains in MW but not task-related performance. Here we provide the first evidence of how individual differences in baseline alpha power may be of key importance in predicting the effects of HD-tDCS on mind-wandering propensity.

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## **ORAL COMMUNICATIONS 4**

### **PSYCHOENDOCRINOLOGY & PSYCHOIMMUNOLOGY SOCIAL ISOLATION, LONELINESS AND STRESS**

Wednesday, 20<sup>th</sup> July 2022, 18:15-19:30 h

Aula A6, Faculty of Psychology and Speech Therapy

*Chair: Javier Mahía Rodríguez (Universidad de Granada)*

**IV** PSYCHO  
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**CHRONOTYPE AND TIME OF DAY AS MODULATORS OF  
AUTOMATIC AND CONTROLLED COGNITIVE PROCESSES: INSIGHTS  
FROM A SEMANTIC PRIMING PARADIGM**

Psychoendocrinology and Psychoimmunology

**Lucía Beatriz Palmero**, Miriam Tortajada, Víctor Martínez-Pérez, Alejandro Sandoval-Lentisco, Guillermo Campoy, Luis José Fuentes

University of Murcia, Murcia, Spain

Keywords: Chronotype, Morning-Types, Evening-Types, Automatic Processing, Controlled Processing

**Objetivos / Objectives**

Chronotype and time of day modulate human cognition. In relation to the degree of task demands to which we are exposed, it has been proposed that both circadian factors modulate processes that require control and are linked to the prefrontal cortex, whereas automatic processes are invariant. However, the time course of both processes in relation to these factors has not been studied. In the present study we delved into this aspect using a semantic priming paradigm and evaluated two extreme chronotypes to analyze possible dissociations in the time course of both types of processing.

**Metodología / Methodology**

Forty participants (20 Evening- and 20 Morning-types) were tested at 8 am and 8:30 pm, in a 40-min semantic priming task. We informed the participants about the low relatedness proportion between the prime and the target (20%) to expect an unrelated target in the majority of trials. Facilitatory priming was expected at 100 ms Stimulus Onset Asynchrony (SOA) as an index of automatic processing, whereas inhibitory priming was expected at longer SOAs as an index of controlled processing. We controlled for caffeine intake and sleep hours.

**Resultados y Conclusiones / Results & Conclusions**

Our results replicated previous findings regarding the modulation of controlled processing. However, regarding automatic processing, we observed a dissociation of the circadian influence as a function of chronotype. In relation to the time course of automatic processing, Evening-types are influenced by the time of day, whereas morning individuals keep the process invariant. Our pattern of results is in line with theories that explain the greater flexibility and adaptation of Morning-types.



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## **EARLY LIFE STRESS AFFECTS AMYGDALA MICROCIRCUITRY AND SOCIO-AFFECTIVE BEHAVIOR: SEX AND AGE DIFFERENCES**

Social isolation, loneliness and stress

**Aroa Mañas-Ojeda** , Clara García-Mompó, Jose Francisco Hidalgo-Cortés, Mónica Navarro-Sánchez, Isis Gil-Miravet, Esther Castillo-Gómez

Universitat Jaume I, Castelló De La Plana, Spain

Keywords: Stress Perinatal, Amygdala, E/I Balance, Aggression, Depression

### **Objetivos / Objectives**

We hypothesize that early life stress in mice will affect socio-affective behavior and the balance between excitatory and inhibitory (E/I) synapses in MeA, BLA and/or CeA. These effects might be observed in the short and long term and also be dependent on sex. Therefore, our main objective will be to demonstrate our hypothesis in an animal model of child social neglect (maternal separation with early weaning, MSEW).

### **Metodología / Methodology**

Pups from the MSEW group were daily separated from their mothers for 4-8h from P2-P16 and were definitely weaned at P17. Socio-affective behavior was evaluated by the Open Field Test, Forced Swimming Test, Three Chamber (sociability and novelty), and Tube Dominance test. Then, E/I balance was measured by immunofluorescence of VGLUT1, VGLUT2 and VGAT markers.

### **Resultados y Conclusiones / Results & Conclusions**

The long-term consequences of early life stress on socio-affective behavior are sex-dependent and are correlated with imbalances between excitatory and inhibitory synapses in different nuclei of the amygdala. However, in the short term, only behavioral alterations were observed in both males and females.



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**SOCIAL ISOLATION STRESS MODULATES AFFECTIVE BEHAVIOR  
AND INHIBITORY CIRCUITS IN AGED MICE**

Social isolation, loneliness and stress

**Clara García-Mompó**, José Francisco Hidalgo-Cortés, Aroa Mañas-Ojeda , Daniel Fortea-Muñoz, Jorge Lucerón-Morales, Francisco Ros-Bernal, Esther Castillo-Gómez

Universitat Jaume I, Castelló De La Plana, Spain

Keywords: Chronic Isolation Stress, Aging, Anxiety, Parvalbumin, Perineuronal Nets

**Objetivos / Objectives**

The aim of our study is to investigate the impact of chronic isolation stress (CIS) and a subsequent resocialization period in aged (18-24 months) male and female mice, and to know how it affects emotional response and modulates basolateral amygdala (BLA) inhibitory circuits.

**Metodología / Methodology**

Aged mice from the chronic isolation stress (CIS) group were isolated for 21 days and after that they were resocialized (groups of 2-3 animals) for 21 days. Depressive-like behaviour was evaluated by the Forced Swimming Test (FST). Then, parvalbumin expressing cells surrounded by perineuronal nets were studied.

**Resultados y Conclusiones / Results & Conclusions**

Interestingly CIS demonstrated sex-dependent effects in both behavior and inhibitory circuitry (parvalbumin expressing cells surrounded by perineuronal nets). At the behavioral level, CIS induced depressive-like behavior only in females that was effectively rescued by resocialization. Remarkably, these changes were correlated with modulatory effects on inhibitory circuitry. Therefore, the present study suggests that social isolation stress in aging induces high emotional response and modulates BLA inhibitory circuits.



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## **SENSE OF BELONGING: STRUCTURE AND NETWORK ANALYSES WITHIN CROSS-CULTURAL CONTEXTS**

Social isolation, loneliness and stress

**Sara Valdes**<sup>1</sup>, Dustin Burkey<sup>1</sup>, Jenny Huen<sup>2</sup>, Bob Lew<sup>3</sup>, Augustine Osman<sup>1</sup>

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3. Griffith University, Brisbane, Australia

Keywords: Belongingness, Loneliness, Motivation, Isolation, And Distress

### **Objetivos / Objectives**

Recent trends in the prevalence of the pandemic and other world events have challenged our well-being and the desire to connect with others. The sense of belonging construct has been proposed as a transdiagnostic construct for overcoming negative and stressful life experiences. The few existing self-report instruments developed for assessing this construct are limited conceptually and psychometrically. Because sense of belonging can have far-reaching consequences for both individuals and society at large, developed and validated scores on a 21-item measure, the Multidimensional Sense of Belonging Inventory-21 (MSBI-21). We report on the construction and performance of scores on three dimensions of the instrument: Negative Emotions, Social Reassurance, and Intrinsic Motivation.

### **Metodología / Methodology**

Scores on concurrent self-report measures of suicidal thoughts, behaviors, and social anxiety (anger distress, alcohol reliance, and social avoidance) were collected online from nonclinical US (N = 513) and Chinese (N = 536) young adults aged 18-47 years (M = 20.55, SD = 2.32).

### **Resultados y Conclusiones / Results & Conclusions**

Exploratory structural equation modeling provided evidence for invariance of three-factor structure across groups. Estimates of internal consistency reliability were acceptable. Network modeling analyses provided information about the links between the MSBI-21 dimensions and those of life function-related dimensions. The MSBI-21 offers a viable tool for examining the dimensions and life experiences related to the sense of belonging construct.





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## **AUTOBIOGRAPHICAL MEMORY AND HYPOTHALAMIC- PITUITARY- ADRENAL AXIS IN HEALTHY OLDER ADULTS**

Learning and memory

**Pablo Rivas Diaz**<sup>1</sup>, Teresa Montoliu<sup>1</sup>, Vanesa Hidalgo<sup>2</sup>, Alicia Salvador<sup>1</sup>

1. Universidad de Valencia, Valencia, España
2. Universidad de Zaragoza, Zaragoza, España

Keywords: Autobiographical Memory, Stress, CAR, Cortisol, Aging

### **Objetivos / Objectives**

Autobiographical Memory (AM) is the ability to recall a memory from one's past. This ability has been studied in relation to some cognitive and emotional conditions as anxiety disorders or depression. It has been hypothesized that AM is related to stress exposure. Stress is mediated by the hormone cortisol, which is the final product of Hypothalamic-Pituitary-Adrenal (HPA) axis. In aging population, a dysregulated HPA-axis has been associated with poor cognitive functioning. In this study, we aimed to explore the relationship between AM and HPA-axis functioning taken into account to some cortisol Indexes (Cortisol Awakening Response, CAR, Diurnal Cortisol Slope, DCS, and the Overall Cortisol Levels, AUCg). Also, we studied age and sex differences in AM performance and HPA-axis indexes.

### **Metodología / Methodology**

To do so, 150 older men and women completed the Autobiographical Memory Test (AMT) and provided 8 morning saliva samples collected on two consecutive weekdays.

### **Resultados y Conclusiones / Results & Conclusions**

Our results showed that, when AUCg was higher, men presented more negative memories, while women recalled less negative memories. In terms of the specificity of the recalls, we did not find significant correlation between AM and HPA-axis in none of the analyzed indexes in both all participants together and separating by sexes or age. To conclude, men recalled more negative memories than women when both had higher overall morning cortisol levels regardless their group of age.



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## **COVID-19 PANDEMIC AND HEALTH WORKER STRESS: THE MEDIATING EFFECT OF EMOTIONAL REGULATION**

Cognition and emotion

**Zoilo Emilio Garcia-Batista**

Pontificia Universidad Catolica Madre y Maestra, Santiago De Los Caballeros, Dominican Republic

Keywords: Emotional Regulation, Health Worker, COVID-19, Stress

### **Objetivos / Objectives**

Psychological and physical well-being of health personnel has been significantly affected by COVID-19. Work overload and continuous exposure to positive COVID-19 cases have caused them fatigue, stress, anxiety, insomnia and other detriments. This research aims: 1) to analyze whether the use of cognitive reevaluation and emotional suppression strategies decreases and increases, respectively, stress levels of health personnel; 2) to quantify the impact of contact with patients with COVID-19 on stress levels of medical staff.

### **Metodología / Methodology**

Emotion regulation strategies (cognitive reevaluation and emotional expression) and stress levels were evaluated in 155 Dominican physicians who were treating people infected with COVID-19 at the moment of the study (67.9% women and 32.1% men; mean age = 34.89; SD = 9.26). In addition, a questionnaire created by the researchers quantified the impact that contact with those infected had on their stress levels.

### **Resultados y Conclusiones / Results & Conclusions**

Contact with patients with COVID-19 predicts increased use of emotion suppression strategies, although is not associated with the use of cognitive reevaluation. These findings lead to an even greater increase in stress on health care providers.

Contextual contingencies demand immediate responses and may not allow health personnel to use cognitive re-evaluation strategies, leaning more towards emotion suppression. However, findings regarding high levels of stress require the implementation of intervention programs focused on the promotion of more functional emotion regulation strategies. Such programs may reduce current stress and prevent post-traumatic symptoms.



## **ORAL COMMUNICATIONS 5**

### **NEUROPSYCHOLOGY**

Wednesday, 20<sup>th</sup> July 2022, 18:15-19:30 h

Aula A8, Faculty of Psychology and Speech Therapy

*Chair: Magdalena Méndez-López (Universidad de Zaragoza)*

**IV** PSYCHO  
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## SEX DIFFERENCES IN SPATIAL LEARNING AND BRAIN OXIDATIVE METABOLISM: INFLUENCE OF WESTERN DIET AND EARLY-LIFE STRESS

Sex/gender in the psychobiological research

Isabel López Taboada<sup>1,2,3</sup>, Saúl Sal Sarría<sup>1,2</sup>, Héctor González Pardo<sup>1,2,3</sup>, Nélida Conejo Jiménez<sup>1,2,3</sup>

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Keywords: Sex Differences, High-Fat And High-Sugar Diet, Maternal Separation, Brain Energy Metabolism, Oxidative Stress

### Objetivos / Objectives

Environmental factors can modulate neurodevelopment and behavior differentially as related to age and biological sex. Early consumption of a Western diet (WD) rich in saturated fats and sugars or early exposure to stressful events during childhood have been linked to increased risk for cognitive impairment and several mental disorders during adulthood. However, the interaction between both environmental factors on brain development could be sex-specific. Accordingly, this study aimed to evaluate the impact of lifelong consumption of a high-fat and high-sugar (HFS) diet together with exposure to early-life stress (ELS) by maternal separation (MS) on spatial learning and brain metabolism in male and female Wistar rats.

### Metodología / Methodology

Spatial learning and memory were evaluated in 60-day-old rats using the Morris water maze. Next, regional brain oxidative metabolism (cytochrome c oxidase activity) and oxidative stress (total antioxidant capacity and lipoperoxidation levels) were measured in the medial prefrontal cortex and the hippocampus.

### Resultados y Conclusiones / Results & Conclusions

Results showed that males fed the HFS diet performed better in the spatial learning task than females. In addition, brain oxidative metabolism in the selected brain regions was higher in males than females, and each environmental factor (diet or stress) increased brain oxidative metabolism. WD and ELS impaired brain oxidative stress differentially between sexes, although both factors interacted together and ameliorated their negative effects. This study suggests a sex-specific compensatory effect resulting from the interaction between diet and early stress.

Supported by grant PSI 2017-83038-P (MINECO, Spain).



**SEX DIFFERENCES IN THE ROLE OF THE DYNORPHINERGIC SYSTEM ON NEGATIVE AFFECT INDUCED BY INFLAMMATORY PAIN: UNCOVERING THE DYNORPHINERGIC PROJECTION OF CENTRAL AMYGDALA TO NUCLEUS ACCUMBENS**

Sex/gender in the psychobiological research

**Jesus David Lorente**<sup>1</sup>, Yolanda Campos Jurado<sup>2</sup>, Khairunisa Ibrahim<sup>2</sup>, Laura Rullo<sup>3</sup>, Javier Lorente Cuitavi<sup>1</sup>, Nicolas Massaly<sup>2</sup>, S Candelletti<sup>3</sup>, Patrizia Romualdi<sup>3</sup>, Jose A Moron<sup>2</sup>, Lucía Hipólito<sup>1</sup>

1. University of Valencia, Valencia, Spain
2. Washington University in St. Louis, Saint Louis, United States
3. Alma Mater Studiorum-University of Bologna, Bologna, Italy

Keywords: Pain, Keywords: Sex, Dynorphin, Central Amygdala, Nucleus Accumbens

**Objetivos / Objectives**

Our objective is to assess the role of central amygdala (CeA) to Nucleus accumbens(NAc) dynorphin projections in driving pain induced negative affect.

**Metodología / Methodology**

To reach this goal we used a combination of cell-specific optogenetic, behavioural approaches, and in-vivo physiology in both male and female mice and rats using the complete Freund adjuvant (CFA) model of inflammatory pain.

**Resultados y Conclusiones / Results & Conclusions**

First, we observed that pain impaired stress coping strategies in female mice and rats as shown by a decrease in time spent in the light compartment in the light/dark box test. This adaptation was correlated with a significant increase in FosB marking in the CeA of CFA female mice, and with a reduction in the dynorphin and kappa opioid receptors expression in the NAc. To further investigate the involvement of the dynorphinergic system in the NAc and the CeA in pain-induced negative affect, we performed a series of tracing, optogenetics combined with electrophysiology and behavioural techniques. We revealed an unknown dynorphinergic input from CeA to NAc, that was altered in the presence of pain. Indeed, stimulation of CeA-to-NAc dynorphin projection was sufficient to drive real time place aversion in a sex and time-dependent manner. Interestingly, only in CFA-female mice, a significant increase in the amplitude of evoked local field potentials in the NAc upon photo-stimulation of CeA dynorphin neurons was recorded. In conclusion, we demonstrate that inflammatory pain alters the CeA to NAc dynorphin projections representing an important candidate in driving pain-induced negative affective states in a sex and time-dependent fashion.



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## RELATIONSHIP BETWEEN ACADEMIC ENGAGEMENT AND PERSONALITY FACTORS IN NURSING STUDENTS

Others

**Ana Isabel Villafaña Alonso**<sup>1</sup>, Laura Espín López<sup>2</sup>, María Del Pino Sánchez López<sup>2</sup>

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2. Departamento de Anatomía Humana y Psicobiología. Facultad de Psicología. Universidad de Murcia, Murcia, Spain

**Keywords:** Academic Engagement, University Students, Personality, Nursing, Educational Psychology

### **Objetivos / Objectives**

Academic Engagement is defined as a psychological state of accomplishment and commitment to the task performed. Personality factors can help to understand why, some students show a positive mental state related to their studies and others show a lack of engagement. The aim of this study was to determine the personality characteristics of a sample of nursing students based on the Big Five model and to analyze the differences in engagement.

### **Metodología / Methodology**

The sample consisted of 90 nursing students.

For the personality analysis, we used the third revised and expanded Spanish edition of the NEO-PI-R Inventory, while for measure engagement, the instrument used was the Student Utrecht Work Engagement Scale (UWES-S), validated in Spanish university students. Pearson's correlation coefficients were calculated and a multivariate analysis of variance was performed.

### **Resultados y Conclusiones / Results & Conclusions**

The results showed that the existence of engagement is positively associated with Extraversion, Agreeableness, Conscientiousness, and Openness, and negatively associated with the Neuroticism personality trait. The students classified in the first cluster, which was defined by a profile with high neuroticism and low scores on the rest of the personality traits, had a lower presence of engagement. In the second cluster, defined by low Neuroticism and high Extraversion, Agreeableness, Openness and Conscientiousness, the presence of engagement was higher. In conclusion, assessments of personality and engagement can be useful measurement tools to find out about students' academic performance and be able to carry out strategies aimed at preventing the consequences of academic stress in the most vulnerable students.



## GENETIC INFLUENCES AND ENVIRONMENTAL TRIGGERS FOR DEPRESSION: THE COVID CASE

Others

**Francisca Gonzalez-Javier**<sup>1</sup>, Juan José Madrid-Valero<sup>2</sup>, Federico Jose Blanco<sup>1</sup>, Eduvigis Carrillo<sup>1</sup>, Juan Francisco Sánchez-Romera<sup>1</sup>, Juan Ramón Ordoñana<sup>1</sup>

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2. Universidad de Alicante, Alicante, Spain

Keywords: Behavior Genetics, Depression, GxE Interaction

### Objetivos / Objectives

Genetic and environmental influences interact to produce complex phenotypes. Genetic influences on depression and anxiety are consistently found in the moderate range (approximately 0.4), but their effects depend on the presence and distribution of environmental conditions. The COVID pandemic has been regarded as an environmental circumstance with negative consequences for mental health. Our aim is to examine how a strongly negative environmental factor modulates the impact of genetic factors on the development of depressive and anxiety symptoms.

### Metodología / Methodology

The study uses a population-based sample of monozygotic and dizygotic (same-sex and opposite sex) twin pairs, born between 1940 and 1966. The initial sample comprised 1219 individuals (63.4% female; mean age: 46.2) who participated in a previous study during 2018. This cohort was contacted again between September and December 2020 and 1034 participants agreed for a follow-up interview (79.8%). Information on depression (PHQ-8) and anxiety (GAD-7), as well as use of psychotropic medication was collected at both times. Bivariate longitudinal Cholesky decompositions are used to analyze the distributions of variance between both moments.

### Resultados y Conclusiones / Results & Conclusions

Heritability was in a similar range in the pre-pandemic baseline and the mid-pandemic moment [Depression: .42 (.31, .52) and .45 (.33, .56), respectively; Anxiety: .34 (.21, .45) and .40 (.27, .51), respectively]. About 28% of the genetic and 91% of the environmental influences in depression in 2020 were specific for that moment. We conclude that the relative magnitude of genetic and environmental factors does not change but their composition does.





## **ORAL COMMUNICATIONS 6**

### **LEARNING AND MEMORY**

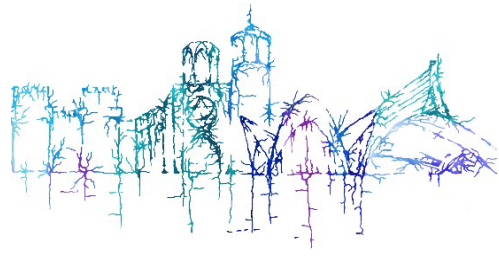
### **NEUROPSYCHOLOGY**

Thursday, 21<sup>st</sup> July 2022, 13:00-14:15 h

Salón de Actos, Faculty of Psychology and Speech Therapy

*Chair: Milagros Gallo Torre (Universidad de Granada)*

**IV** PSYCHO  
BIOLOGY  
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## VISUALIZATION OF A REMOTE SPATIAL MEMORY IN THE HIPPOCAMPUS

Learning and memory

**Alejandro Borja Grau Perales**<sup>1</sup>, Clàudia Jou<sup>1</sup>, Rayna M. Harris<sup>2</sup>, Kao Hsin-Yi<sup>1</sup>, Juan Marcos Alarcon<sup>3</sup>, Hans A. Hofmann<sup>2</sup>, Andre A Fenton<sup>4</sup>

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2. Department of Integrative Biology, Center for Computational Biology and Bioinformatics, Institute for Cellular and Molecular Biology, The University of Texas, Austin, United States
3. Department of Pathology, State University of New York, Downstate Health Sciences University, New York, United States
4. Center for Neural Science, New York University, New York, United States

Keywords: Long Term Memory, PKMzeta, Transcriptomics, Hippocampus

### **Objetivos / Objectives**

The synaptic plasticity and memory hypothesis asserts that synapses undergo physical changes to store memory and realize experience-dependent modifications of neuronal information processing. Which hippocampal circuit-defining synaptic populations change with experience is unknown.

### **Metodología / Methodology**

We used immunohistochemical labeling of PKM $\zeta$  and transcriptional profiling of hippocampal subregions to identify input-specific synaptic populations that change in long-term memory storage as PKM $\zeta$  is both necessary and sufficient for maintaining hippocampal late-LTP and crucial for long-term active place avoidance memory. We used a transient recombination in active populations strategy with ArcCreERT2xChR2-EYFP mice trained to acquire active place avoidance memory and injected with 4-OH tamoxifen to tag memory-related cells with EYFP-ChR2.

### **Resultados y Conclusiones / Results & Conclusions**

Training established a 1-month-old remote memory and increased EYFP-expression in the principal cell populations of CA1, CA3 and dentate gyrus (DG), and input-specific increases in expression of PKM $\zeta$  at the synaptic compartments of the tri-synaptic pathway of the memory-tagged EYFP<sup>+</sup> cells compared to EYFP<sup>+</sup> cells of unconditioned controls. Transcriptional profiling of hippocampal subregions 24-h after memory formation identified differentially expressed genes in DG and CA1 related to metabolism, and related to synaptic plasticity in DG. However, neither significant changes in LTP-associated gene expression nor their covariation with memory expression were found, ruling out strong



transcriptional but not translational regulation of these molecules in memory persistence. These findings identify input-specific hippocampal synaptic pathways that express a marker of LTP maintenance at least a month after memory training, indicating that beyond the selective upregulation of synaptic plasticity proteins, long-term memory also mobilizes persistent changes in cellular metabolism.



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## **ANOMALOUS EATING BEHAVIOUR: A NEW ANIMAL LEARNING MODEL**

Learning and memory

**Marta Valero**, Ana Vázquez-Agredos, Milagros Gallo, David García-Burgos

University of Granada, Granada, Spain

Keywords: Cognition, Taste Learning, Second-Order Conditioning, Preference, Rat.

### **Objetivos / Objectives**

Dysfunctional cognitions seem to play an important role in the development and maintenance of restrictive eating patterns. However, to our knowledge there are not animal models experimentally addressing how our thoughts can promote a decrease in high-calorie food intake. The present experiment tries to fill this gap by exploring changes in the acceptance and preference for sweet solutions induced by aversive mental representations in both male and female rats.

### **Metodología / Methodology**

We used a second order conditioning protocol (n=48) in which drinking a sucrose solution (10%) was paired with an aversive context previously associated with body rotation. Two control groups were added. The sucrose solution was presented either in a neutral context in absence of body rotation or was unpaired with body rotation.

### **Resultados y Conclusiones / Results & Conclusions**

Results showed lower consumption of the sweet solution in the experimental group in comparison with control groups while there were no significant differences between both control groups. Sucrose acceptance was significantly reduced by the second order conditioning protocol, although this did not overcome the sucrose preference versus water as demonstrated in a two-bottle choice test applied in the home cage. The sucrose preference ratio was significantly higher than .50 in all three groups. These results support the role of unpleasant cognitions in modulating intake of sweet substances. The potential translational value of this protocol for developing animal models of disordered eating mediated by dysfunctional mental representations is discussed.

Funded by PID2020-114269GB-I00 (MICIU); Marie Skłodowska-Curie N° 754446 - Athenea3i; and the CTS-1003 research group (University of Granada, Spain).



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**EFFECTS OF CALORIC RESTRICTION AND SODIUM BUTYRATE ADMINISTRATION ON MONOAMINERGIC NEUROTRANSMISSION AND HIPPOCAMPAL MEMORY, IN FEMALE AND MALE AGED RATS**

Learning and memory

**Neus Galofré-López**, Gisela Masó-Pérez, Soraya Gómez-Mohamed, Marta Portero-Tresserra, Margarita Martí-Nicolovius, Anna Vale-Martínez, Gemma Guillazo-Blanch

Departament de Psicobiologia i Metodologia de les Ciències de la Salut, Institut de Neurociències, Universitat Autònoma de Barcelona, Barcelona, Spain

Keywords: Caloric Restriction, Sodium Butyrate, Hippocampal Memory, Rats

**Objetivos / Objectives**

Progressive aging leads to memory impairments that have been suggested to be modulated by variance of gene expression resulting from chromatin remodeling through histone acetylation in the hippocampus (HPC). Female and male Wistar rats have been used for this study to assess the effect of systematic intraperitoneally administration of sodium butyrate (NaBu), a histone deacetylation inhibitor (HDACi), together with a long-term caloric restriction (CR) diet on HPC-dependent memories. The beneficial effects of CR on health and life expectancy are well documented, although its ability to slow down age-dependent cognitive decline and the underlying biochemical changes remains unclear. Therefore, the aim of this study was to investigate the effects of CR and NaBu on spatial memory in aged Wistar rats, as well as on monoaminergic neurotransmission in brain areas related to cognitive processes, such as the hippocampus (HPC), prefrontal cortex (PFC) and striatum (ST).

**Metodología / Methodology**

Animals maintained on different dietary regimes were trained in the Morris Water Maze (MWM): old rats maintained on a 30% CR diet from four months of age, old rats with unrestricted access to food; and adult rats with Ad Libitum access to food. Also, brain monoamine levels were quantified by high performance liquid chromatography (HPLC-ED).

**Resultados y Conclusiones / Results & Conclusions**

Life-long CR diet and/or NaBu administration can attenuate age-related deterioration in spatial memory, probably by attenuating age-related dysfunctions in brain monoamines levels. In conclusion, our findings suggest that modulation of epigenetic factors may be a suitable strategy for the study of the mechanisms responsible for age-related cognitive decline.



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## ANALYSIS OF ORGANIZATIONAL STRATEGIES IN VERBAL FLUENCY TASKS IN STROKE PATIENTS

Neuropsychology

**Francisco Javier Pérez Comino**<sup>1</sup>, María Del Pino Sánchez López<sup>1,2</sup>, Ana Gallego Martínez<sup>1,3</sup>, Laura Espín López<sup>3</sup>

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2. Departamento de Anatomía Humana y Psicobiología. Facultad de Psicología. Universidad de Murcia, Murcia, Spain
3. Departamento de Anatomía Humana y Psicobiología. Facultad de Psicología. Universidad de Murcia, Murcia, Spain

**Keywords:** Verbal fluency, Phonological fluency, Semantic fluency, Stroke, Organizational strategies, Clustering, Switchings

### **Objetivos / Objectives**

Verbal Fluency (VF) is considered a measure of cognitive flexibility and strategic search within the lexical and semantic content. To this day, the organizational strategies of clustering and switching in VF have received little analysis in stroke patients although they normally perform more poorly on fluency measures compared to controls. The aim of this study was to analyse the organizational strategies (clustering and switching).

### **Metodología / Methodology**

The sample consisted of 28 subjects distributed in three groups according to the location of brain damage by stroke (Anterior Stroke, Posterior Stroke and Lacunar Stroke), through the observation of the responses to phonological fluency task (words beginning with P, M and R) and semantic fluency task (animals).

### **Resultados y Conclusiones / Results & Conclusions**

The results indicate that, in phonological verbal fluency, there is a trend towards significance for the total number of words evoked that begin with M, as well as for the variable “number of switching” in phonological fluency, being the anterior stroke group the one with the worst execution. In the rest of the variables studied, no significant differences were found (letter P, R, animals, phonological clustering; switching and clustering in semantic). In conclusion, our results point to an impairment in verbal fluency after stroke, although we have not been able to demonstrate that the location of the injury affects the qualitative or quantitative aspects of verbal fluency performance in a significant way. Other intervening variables are noted (hemispheric location).



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**DETECTION OF COGNITIVE IMPAIRMENT IN PARKINSON'S DISEASE  
THROUGH SUBTEST WEIGHTING OF THE MONTREAL COGNITIVE  
ASSESSMENT (MOCA)**

Neuropsychology

**Laura Alonso-Recio**<sup>1</sup>, María Belén Castelli<sup>2</sup>, Juan Manuel Serrano<sup>2</sup>

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2. Universidad Autónoma de Madrid, Madrid, Spain

Keywords: Parkinson'S Disease; Cognitive Impairment; MoCA; Screening

**Objetivos / Objectives**

The Montreal Cognitive Assessment (MoCA) is the screening tool most recommended to assess cognitive impairment in patients with Parkinson's Disease (PD) given that it covers the common deficits found in this disease, such as those in executive functions, working memory and visuospatial skills. However, recent research indicates that its scoring system does not give a balanced weight to the different cognitive domains, and a new system has been proposed that places greater relevance on the domains most affected in PD.

The objective of the present study was to establish the differences between the original MoCA and the weighted MoCA to detect cognitive impairment in PD.

**Metodología / Methodology**

A total of 73 patients with PD were evaluated by MoCA and a battery of neuropsychological tests to assess attention/working memory, visuospatial skills, language and executive functions. To determine cognitive impairment, the Movement Disorders Society Task Force criterion was applied.

**Resultados y Conclusiones / Results & Conclusions**

According to the ROC curve analysis, both the original and the weighted scores were able to detect cognitive impairment ( $p < .05$ ). Nonetheless, the weighted MoCA had a higher accuracy (82.7% versus 69.7%) and sensitivity (93.8% versus 68.8%) than the original. In sum, the new weighted scoring system for MoCA appears to be better than the usual MoCA to detect cognitive impairment, which may lead to an earlier detection of this disease. It is worth considering for the future the possible advantage of this novel subtests weighting of the MoCA, to detect deficits in specific cognitive processes.





## **ORAL COMMUNICATIONS 7**

### **PSYCHOPHYSIOLOGY**

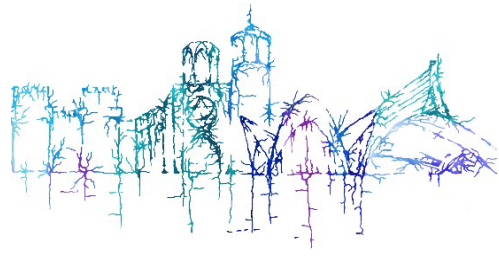
### **DEVELOPMENTAL PSYCHOBIOLOGY**

Thursday, 21<sup>st</sup> July 2022, 13:00-14:15 h

Aula A6, Faculty of Psychology and Speech Therapy

*Chair: M<sup>a</sup> Teresa Colomina Fosch (Universitat Rovira i Virgili)*

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## MULTISCALE ENTROPY OF ADHD CHILDREN DURING RESTING STATE CONDITION

Developmental Psychobiology

**Brenda Y. Angulo Ruiz**, Vanesa Muñoz Burbano, Elena I. Rodríguez Martínez, Celia Cabello Navarro, Carlos M. Gómez Gonzalez

Experimental Psychology Department, University of Seville, Seville, España

Keywords: ADHD, Complexity Metrics, Multiscale Entropy, Power Spectral Density, Variability

### **Objetivos / Objectives**

The present study applied multiscale entropy (MSE), EEG signal standard deviation (SDs), in addition, to the mean, standard deviation (SDp) and coefficient of variation (CV) of absolute spectral power (PSD) and mean of relative PSD to analyze the complexity and variability of the EEG brain signal, to study the neural mechanisms underlying ADHD compared to healthy children.

### **Metodología / Methodology**

For this purpose, a sample of children diagnosed with attention-deficit/hyperactivity disorder (ADHD) aged 6-17 years were selected, 32 for the open-eyes (OE) experimental condition and 25 children for the close-eyes (CE) experimental condition. Healthy control subjects were age and gender matched with the ADHD group. The MSE and SDs of resting state EEG activity were calculated on 34 time scales using a coarse-grained procedure, in addition, the PSD was averaged in delta, theta, alpha, and beta frequency bands, and its mean, SDp, and CV were calculated.

### **Resultados y Conclusiones / Results & Conclusions**

The results obtained show, first, that the MSE changes with age during development and increases as the number of scales increases and presented a higher amplitude in controls than in ADHD. The absolute PSD results show CV differences between subjects in low and beta frequency bands, with higher variability values in the ADHD group. All these results suggest an increased EEG variability and reduced complexity in ADHD compared to controls.



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**EFFECTS OF PRENATAL PARTICULATE MATTER <10NM EXPOSURE  
ON RATS: ANALYSIS OF PRE- AND POST-WEANING  
DEVELOPMENTAL MILESTONES**

Developmental Psychobiology

**Diego Ruiz Sobremazas<sup>1</sup>**, Mario Ruiz-Coca<sup>1</sup>, Miguel Morales-Navas<sup>1</sup>, Cristian Perez-Fernandez<sup>1</sup>, Maria Teresa Colomina-Fosch<sup>2,3</sup>, Fernando Sanchez-Santed<sup>1</sup>

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3. University Rovira I Virgili, Research Center for Behavior Assessment(CRAMC), Tarragona, Spain

Keywords: Neurodevelopmental Toxicology, Environmental Health, Air Pollution, ASD

**Objetivos / Objectives**

Particulate matter (PM), or also known as particle pollution, is a complex mixture of particles with a specific diameter (commonly classified as <10 nm, 2.5 nm and 0.1 nm). Gestational and postnatal exposures to PM have been associated with different neurodevelopmental disorders in children, such as attention-deficit/hyperactivity and autism spectrum disorders (ASD). The later is characterized by a decreased social interaction and delayed development, amongst other clinical features. However, the influence of PM<10 exposure on specific developmental variables have been sparsely studied in preclinical research. The present work wanted to clarify the effects of PM<10 on developmental milestones (weight, neurofunctional battery, eyes opening, ect.). Also, sexual differences were analyzed. Furthermore, social variables were screened for any dysfunctional social behavior related with PM<10 exposure.

**Metodología / Methodology**

In order to clarify the effects of prenatal exposure to PM<10 over developmental milestones, pregnant Wistar rats were randomly exposed to PM<10 (at a dosage of 200µg/Kg/Day) or its vehicle (PBS) during gestation. Behavioral and developmental profile of their pups (both sexes) were tested for body weight, eyes opening, neuromotor development, anxiety and locomotor activity at both neonatal and adolescence periods.

**Resultados y Conclusiones / Results & Conclusions**

PM<10 exposure influenced both developmental and behavioral outcomes, where exposed animals were heavier, showed delayed development and altered behavior during adolescence. Future research should focus on the effects of PM<10 on other developmental milestones and behavioral task as well as the biological basis of the behavioral results found here.



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**HIGH TESTOSTERONE AS A SUSCEPTIBILITY MARKER IN GIRLS:  
THE INTERACTION BETWEEN REACTIVE AGGRESSION AND  
MOTHERS' PARENTING STYLE**

Developmental Psychobiology

**Nora Del Puerto-Golzarri**<sup>1</sup>, Eider Pascual-Sagastizabal<sup>1</sup>, José Manuel Muñoz<sup>2</sup>, María Rosario Carreras<sup>2</sup>, Paloma Braza<sup>2</sup>, Aitziber Azurmendi<sup>1</sup>

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2. University of Cadiz (UCA), Puerto Real, Spain

Keywords: Aggressive Behavior, Differential Susceptibility, Testosterone, Children, Parenting Styles

**Objetivos / Objectives**

The objective of the study was to explore whether cortisol and testosterone moderated the effect of parenting style on children's aggressive behavior, in accordance with the diathesis-stress or differential susceptibility theory; i.e., whether children are vulnerable to negative parenting styles (diathesis-stress) or, in addition to this vulnerability, also benefit more from positive parenting (differential susceptibility).

**Metodología / Methodology**

The sample group comprised 279 eight-year-old children (154 boys and 125 girls) from Spain. Aggressive behavior was assessed using the "Reactive and Proactive Questionnaire" (RPQ) and parenting styles were measured using the "Parenting Styles and Dimensions Questionnaire" (PSDQ). Finally, to measure testosterone and cortisol levels, three saliva samples were collected and analyzed by ELISA.

**Resultados y Conclusiones / Results & Conclusions**

The results revealed that girls' high testosterone levels moderated the association between mothers' authoritarian parenting style and reactive aggression. This result can be explained by the differential susceptibility model. None of the interactions were statistically significant in boys' proactive aggression. The study points out the importance of studying biological and social characteristics that may influence aggressive behavior.



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**ATTENTIONAL FILTER AND HIS PSYCHOPHYSIOLOGICAL  
CORRELATE WITH PHASE AND NONPHASE ACTIVITY IN ALPHA  
AND GAMMA BANDS**

Psychophysiology

**Esteban Sarrias Arrabal<sup>1</sup>**, Rocío Caballero Díaz<sup>2</sup>, Manuel Vázquez Marrufo<sup>2</sup>

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2. Universidad de Sevilla, Sevilla, Spain

**Keywords:** Electroencephalography (EEG), Phase Activity, Nonphase Activity, Alpha, Gamma

**Objetivos / Objectives**

Recent studies have revealed sensory and/or cognitive processes by investigating nonphase activity. These processes are not observable in phase activity, the more traditionally studied. In previous work we have described a decrease (desynchronization) of nonphase alpha activity that occurs simultaneously with an alpha synchronization in phase activity when the stimulus is being processed. This desynchronization could represent a reduction of background activity in the visual cortex to facilitate stimulus processing. On the other hand, nonphase gamma activity has been suggested as an index of shifts in attentional focus. In this work, the aim is to confirm the roles of alpha and gamma non phase activity.

**Metodología / Methodology**

The cognitive task used was a “lateralized Go/NoGo” task. To obtain EEG data, a scalp recorder with 58 electrodes (Ag/AgCl) in standard locations of a 10-10 system was used.

**Resultados y Conclusiones / Results & Conclusions**

The results showed that the desynchronization of nonphase alpha activity was bilateral compared to the contralateral distribution of phase alpha activity. This suggests that the decrease in background activity is not limited to the neural areas responsible for visual processing of the stimulus. In addition, gamma activity showed more desynchronization of nonphase activity in the ipsilateral hemisphere while phase activity reached its maximum activity in the contralateral hemisphere. These findings suggest that the possible functions of nonphase gamma activity extend beyond shifts in attentional focus, representing also a reduction in attentional filter activity in the task- irrelevant area.



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**FEMALE MICE SUBMITTED TO CHRONIC SOCIAL INSTABILITY  
STRESS DISPLAYED MORE SOCIAL EXPLORATION AND SHOWED  
CHANGES IN THE IMMUNE SYSTEM**

Psychoendocrinology and Psychoimmunology

**Alina Díez-Solinska**, Andrea Lebeña, Olatz Goñi-Balentziaga, Garikoitz Beitia, Eneritz Gómez-Lázaro, Mainer Muñoz-Culla, Garikoitz Azkona, Oscar Vegas

University of the Basque Country, San Sebastian, Spain

Keywords: Social Stress, Social Interaction, Cytokines, Female, Mice

**Objetivos / Objectives**

The aim of this study was to assess the behavioral and neurochemical changes in OF1 female mice submitted to Chronic Social Instability Stress (CSIS).

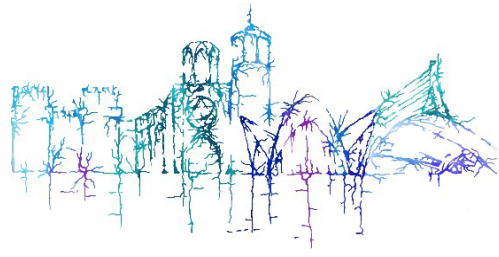
**Metodología / Methodology**

To this end, subjects (n=91) were divided into 2 groups: the stressed (n=52) and the non-stressed (n=39) ones. The stressed group was submitted to CSIS model for 28 days and, after it, mice were brought together in cages (3/4 mice per cage). Social interaction was then recorded and analyzed through a video tracking system. In addition, the hippocampus dissection took place after the experimental procedure and biological parameters were analyzed through Real-Time RT-PCR.

**Resultados y Conclusiones / Results & Conclusions**

Both, the social interaction offered ( $F[1,77] = 105.385$ ;  $p = 0.000$ ;  $\eta^2 = 0.585$ ) and received ( $F[1,77] = 61.474$ ;  $p = 0.000$ ;  $\eta^2 = 0.444$ ) was higher in the stressed mice as compared to the non-stressed mice. This seems totally consistent with the results observed in non-social exploration since the stressed mice displayed much less such behavior ( $F[1,75] = 113.099$ ;  $p = 0.000$ ;  $\eta^2 = 0.601$ ) in comparison with the non-stressed mice. Regarding the inflammatory response, the stressed mice presented lower IL-6 ( $F[1,83] = 5.027$ ;  $p = 0.028$ ;  $\eta^2 = 0.057$ ), IL-1 $\beta$  ( $F[1,83] = 34.648$ ;  $p = 0.000$ ;  $\eta^2 = 0.295$ ), TNF- $\alpha$  ( $F[1,83] = 5.701$ ;  $p = 0.019$ ;  $\eta^2 = 0.064$ ) and IL-10 ( $F[1,83] = 8.575$ ;  $p = 0.004$ ;  $\eta^2 = 0.094$ ) mRNA gene expression levels. These findings demonstrate that experiencing an unpleasant event as CSIS induces changes at the neuroendocrine level and could increase the need of social support. This suggests that the changes at the neuroendocrine level could be involved with the regulation of behavioral response to stress in female mice.

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## **ORAL COMMUNICATIONS 8**

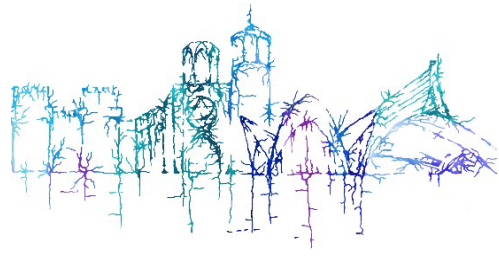
### **SEX/GENDER IN PSYCHOBIOLOGICAL RESEARCH OTHERS**

Thursday, 21<sup>st</sup> July 2022, 13:00-14:15 h

Aula A8, Faculty of Psychology and Speech Therapy

*Chair: Nélida Conejo Jiménez (Universidad de Oviedo)*

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## LIFE SATISFACTION IN ADULTS WITH NEUROLOGICAL DISORDERS

Neuropsychology

**Gimena García Fernández**, Noelia Ruiz Herrera

International University of La Rioja, Logroño, España

Keywords: Life Satisfaction, Neurological Disorder, Adult

### **Objetivos / Objectives**

Neurological disorders (ND) represent the leading cause of mortality and disability in the world. Scientific literature suggests that people with ND suffer a negative impact on their quality of life and mental health. Objective: To explore the levels of life satisfaction in people with neurological disorders.

### **Metodología / Methodology**

20 adults (8 women) aged 18-65 years diagnosed with spina bifida (3 women), cerebralpalsy (9; 3 women), and acquired brain injury (8; 2 women) were recruited. Users with a score  $\geq 24$  on the MINI-MENTAL Cognitive Test Spanish Adaptation were evaluated and the Satisfaction with Life Scale was used.

### **Resultados y Conclusiones / Results & Conclusions**

The results obtained for the life satisfaction variable of the evaluated sample will be discussed. No statistically significant results were observed in the variable satisfaction with life between genders, ages, degree of dependence, years since diagnosis and having received or not psychotherapeutic treatment (all  $p > 0,05$ ). Conclusion: The implications of these findings, the limitations of the study, and suggestions for future research will be discussed.



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**MAPPING IN AWAKE SURGERY: APPROACH TO DELIMITING CONNECTIONS AND FUNCTIONS IN FRONTO-OPERCULAR AND SUPERIOR INSULAR GLIOMA**

Neuropsychology

**Isabel Trujillo-Pozo<sup>1</sup>**, Ignacio Martín Schrader<sup>2</sup>, José Luis Narros<sup>2</sup>

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2. Neurosurgery Department, University Hospital Virgen del Rocío, Seville, Spain

**Keywords:** Neuropsychology, Awake Surgery, Eloquent Brain Area Connectivity, Cortico-Subcortical Mapping, Cognition

**Objetivos / Objectives**

Low-grade gliomas in eloquent areas of the cortex require surgical resection. Improvements in microsurgical technique, the cortical and subcortical brain mapping besides neuroimage techniques and neuropsychological evaluation permit awake surgery. The goal of this study is to present improvements in awake surgery results by using a complex case. Cortical and subcortical electrical stimulation mapping and neuropsychological intraoperative protocols during fronto-opercular insular glioma could improve the quality of life and minimize morbidity following surgery.

**Metodología / Methodology**

Structural and functional MRI and diffusion tensor imaging (DTI) tractography identify structural and functional cortical language areas. Neuropsychological cognitive, emotional and behavioural assessment permit programming intraoperative protocol. The glioma margins were delimited using intraoperative ultrasonography

**Resultados y Conclusiones / Results & Conclusions**

Intraoperatorially, with bipolar cortical electrical stimulation, four points on the superior and posterior margins of the lesion presented language functions. Subcortically, neuropsychological and monopolar electrical stimulation exhibited patient alterations in language, emotion and memory. The arcuate and fronto-occipital inferior fasciculus and the cortico-spinal tract were identified. During subcortical resection, at the level of superior and posterior lesion margins, the patient showed altered nomination, limited verbal comprehension, confabulation, alexia, emotional disturbance, aphasic signs, and verbosity. Following these alterations, the glioma resection was finalized. Up to 95% of glioma was resected to preserve cognitive and neurological functions. This study presents results to consider awake surgery an appropriate technique to improve post-surgery glioma resection in eloquent and complex brain areas. Moreover, it permits a better understanding of the functional anatomy of this complex brain region, combined with an improved knowledge of its connectivity.



## **EXECUTIVE FUNCTIONS AND FUNCTIONAL CONNECTIVITY IN FRONTOSTRIATAL STROKE PATIENTS**

Neuropsychology

**José García Pinteño**<sup>1</sup>, Rocío Rodríguez-Herrera<sup>1</sup>, Pilar Fernández-Martín<sup>1</sup>, José Juan León-Domene<sup>1</sup>, Laura Amaya-Pascasio<sup>2</sup>, Miguel Soto-Ontoso<sup>2</sup>, Cristina Uceda-Sánchez<sup>1</sup>, Patricia Martínez-Sánchez<sup>2</sup>, Ana Sánchez-Kuhn<sup>1</sup>, Pilar Flores<sup>1</sup>

1. Department of Psychology, University of Almería & Health Research Centre (CEINSA-UAL), Almería, Spain, Almería, Spain
2. Mental Health and Neurology Units, Torrecárdenas University Hospital, Almería, Spain, Almería, Spain, Almería, Spain

Keywords: Frontostriatal Stroke, Prefrontal Cortex, Executive Functions, Resting-State Functional Connectivity, Executive Network

### **Objetivos / Objectives**

Stroke is the second cause of cognitive alterations worldwide. Much of the cognitive processes depend on a correct executive functioning involving frontostriatal circuits. However, traditionally motor affections have been more studied. This work is focused on evaluating the executive functioning and resting-state functional connectivity frontostriatal stroke patients to increase the neurophysiological knowledge of this disease.

### **Metodología / Methodology**

We measured impulsive decision making, cognitive flexibility, working memory and motor inhibition with neurobehavioral tasks and resting-state connectivity changes in prefrontal and motor regions with Functional Near-Infrared Spectroscopy (fNIRS) (16x16) in frontostriatal stroke patients (n=18) compared to healthy controls (n=15) (age range 37-57). Correlation analysis were used to determine the relationship between the functional connectivity and the behavioral outcomes for each group.

### **Resultados y Conclusiones / Results & Conclusions**

Compared to controls, frontostriatal stroke patients showed more impulsive decision making and greater inflexibility. Functional resting-state connectivity was lower in patients between the orbitofrontal cortex (OFC) and the parietal posterior cortex (pPC) (IOFC-lpPC, IOFC-rpPC, rOFC-rpPC and lpPC-rpPC). A lower connectivity between these two regions (IOFC-rpPC and rOFC-rpPC) was associated with more impulsive decision making within the healthy control group. This study aimed at advancing in the neurobehavioral and neurofunctional knowledge of frontostriatal patients to develop more precise diagnosis and rehabilitation treatments.



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## SELF-CONCEPT IN ADULTS WITH NEUROLOGICAL DISORDER

Neuropsychology

**Noelia Ruiz Herrera**, Gimena García Fernández

International University of La Rioja, La Rioja, Spain

Keywords: Neurological Disorders, Self-Concept, Adults

### **Objetivos / Objectives**

Neurological disorders (ND) represent the leading cause of mortality and disability in the world. Scientific literature suggests that people with NT suffer a negative impact on their quality of life and mental health. While the scientific literature has identified a direct association between self-concept, mental health, well-being, happiness, and satisfaction with life, the relationship between self-concept and ND has not been sufficiently and consistently studied in the scientific literature. Thus, the objective of this work was to explore the self-concept of Spanish adults with neurological disorders.

### **Metodología / Methodology**

Twenty adults (8 women) aged 18-65 years with a diagnosis of spina bifida (3 women), cerebral palsy (9, 3 women), and acquired brain injury (8, 2 women) were recruited. Only users with a score  $\geq 24$  on the MINI-MENTAL Cognitive Test Spanish Adaptation were assessed to ensure understanding of the assessment process. The self-concept scale Form 5, was administered to assess this construct through the five dimensions: Academic-work, social, emotional, family, and physical.

### **Resultados y Conclusiones / Results & Conclusions**

The results obtained for the self-concept variable of the evaluated sample will be presented. The results obtained from the analysis of the differences between genders, ages, degree of dependence, years since diagnosis, and having received or not psychotherapeutic treatment will be presented. Conclusion: The implications of these findings, the limitations of the study, and suggestions for future research will be discussed.



## EXECUTIVE FUNCTIONS AND FUNCTIONAL CONNECTIVITY IN OBSESSIVE-COMPULSIVE DISORDER

Neuropsychology

**Rocío Rodríguez-Herrera**<sup>1</sup>, José García-Pinteño<sup>1</sup>, Pilar Fernández-Martín<sup>1</sup>, José Juan León-Domene<sup>1</sup>, Miguel Soto-Ontoso<sup>2</sup>, Laura Amaya-Pascasio<sup>2</sup>, Carmen Galindo-Ibañez<sup>1</sup>, Patricia Martínez-Sánchez<sup>2</sup>, Ana Sánchez-Kuhn<sup>1</sup>, Pilar Flores<sup>1</sup>

1. Department of Psychology, University of Almería & Health Research Centre (CEINSA-UAL), Almería, Spain
2. Mental Health and Neurology Units, Torrecárdenas University Hospital, Almería, Spain

**Keywords:** Obsessive-Compulsive Disorder, Executive Functions, Decision Making, Resting-State Functional Connectivity, Executive Network

### **Objetivos / Objectives**

Obsessive-compulsive disorder (OCD) is one of the most prevalent mental health disorders in adulthood. Its complex symptomatology has raised the necessity to study more deeply the behavioral and functional processes involved in this disease to develop more accurate treatments. Thus, this study aims to explore executive functioning and resting-state functional connectivity in the executive network.

### **Metodología / Methodology**

For that aim, we compared a sample of adults with OCD diagnosis (n=25) with a healthy population (n=32) (18-55 years old). Executive functions and decision-making were measured with neurobehavioural tasks: Stop-Signal Reaction Time (SSRT), Probabilistic Reversal Learning (PRLT), ICE CREAM Nesplora and Delay Discounting Task (DDT). Functional Near-Infrared Spectroscopy (fNIRS) (16x16) was used to record the resting-state functional connectivity of the executive network. We performed a correlation analysis to determine whether there is any relationship between the behavioural variables and the resting-state functional connectivity.

### **Resultados y Conclusiones / Results & Conclusions**

We found that OCD patients performed significantly worse than the control group in motor inhibition, cognitive flexibility, working memory and decision-making.

We found no differences in resting-state functional connectivity between the groups. In the total sample, there was a significant negative correlation between cognitive flexibility (number of hits) with the functional connectivity between the left dorsolateral prefrontal cortex and the left orbitofrontal cortex. We also found a negative correlation between the motor inhibition variable (omissions) and the functional connectivity between the right dorsolateral prefrontal cortex and the right posterior parietal cortex.

The present work was funded by the projects: PID2019-108423RB-I00 (Spanish Ministry of Science and Innovation) and P20\_00308 (Junta de Andalucía).



## **EFFECTIVENESS OF A PILOT ONE-TO-ONE PEER SUPPORT INTERVENTION FOR NEWLY DIAGNOSED BREAST CANCER PATIENTS**

Psychoendocrinology and Psychoimmunology

**Ibane Aizpurua Perez**<sup>1</sup>, Amaia Arregi Agirre<sup>1</sup>, David Gonzalez Familiar<sup>2</sup>, Gurutze Ugartemendia Ibarbia<sup>2</sup>, Oscar Vegas Moreno<sup>1</sup>, Joana Perez Tejada<sup>2</sup>

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2. Oncologic Center (Onkologikoa), San Sebastian, España

Keywords: Breast Cancer, Peer Support, Resilience, TNF- $\alpha$ , Positive/Negative Affect

### **Objetivos / Objectives**

In cancer patients, peer support programs have emerged in recent years with the purpose of meeting the psychosocial support needs not covered by the patients' immediate environment. This research is framed within a longitudinal clinical trial and aimed to analyse the biopsychosocial effects of a peer support program in breast cancer patients, based on the support offered by women who have gone through similar experiences.

### **Metodología / Methodology**

Patients with recently diagnosed breast cancer at the Onkologikoa Hospital were randomly allocated to intervention (n = 39) or control (n = 40) groups. The intervention group received 6 or 8 biweekly social support sessions involving a patient and a volunteer. The control group received usual care only. Participants completed the Positive and Negative Affect Schedule (PANAS), the Resilience Scale (RS-14) and the Medical Outcomes Study-Social Support Survey (MOS-SSS) and provided blood samples for determination of TNF- $\alpha$  levels at baseline and at 4-month follow-up point. Repeated measures analyses of variance (ANOVA) were performed to study the influence of the intervention on biopsychosocial variables.

### **Resultados y Conclusiones / Results & Conclusions**

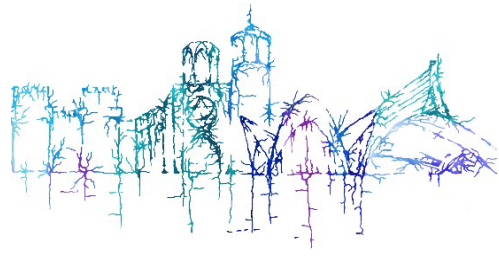
The results showed a significant effect of group for TNF- $\alpha$  ( $F(1,61)=4,492$ ,  $p=0.038$ ,  $\eta^2=0,069$ ), a significant time-by-group interaction for resilience ( $F(1,71)=5,269$ ,  $p=0.025$ ,  $\eta^2=0,069$ ) and a trend effect of time-by-group interaction for positive ( $F(1,71)=3,548$ ,  $p=0.064$ ,  $\eta^2=0,048$ ) and negative ( $F(1,71)=5,770$ ,  $p=0.056$ ,  $\eta^2=0,050$ ) affect, signifying participants who received the intervention had more positive health outcomes compared to those who did not. A 3- to 4-month one-to-one peer support intervention was feasible and effective in improving the health status of women newly diagnosed with breast cancer.





***SHORT COMMUNICATIONS***

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## **SHORT COMMUNICATIONS 1**

Thursday, 21<sup>st</sup> July 2022, 18:15-19:30 h

Aula A6, Faculty of Psychology and Speech Therapy

*Chair: Noemí San Miguel Segura (Universitat de València)*

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## **TRIBUTYRIN REVERTS SPATIAL MEMORY DEFICITS AND MODULATES HIPPOCAMPAL SYNAPTIC PLASTICITY THROUGH PPAR $\gamma$ SIGNALLING**

Learning and memory

**Ana Belén Sanz Martos**<sup>1</sup>, Jesús Fernández Felipe<sup>1</sup>, Beatriz Merino Palacios<sup>1</sup>, María Victoria Cano Iglesias<sup>1</sup>, Mariano Ruiz Gayo<sup>1</sup>, Nuria Del Olmo Izquierdo<sup>1,2</sup>

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Keywords: Tributyrin, Spatial Memory, LTP, Hippocampus, Synaptic Transmission

### **Objetivos / Objectives**

Butyric acid (BA), a short-chain fatty acid (SCFA), has been proposed as a potential tool to mitigate memory impairments related to neurodegenerative diseases although the mechanisms involved are still not understood. In order to further elucidate the role of this fatty acid on the spatial memory process and synaptic plasticity, we have investigated the effect of tributyrin (TB), a prodrug of BA, on hippocampus-dependent spatial memory and hippocampal synaptic transmission and plasticity.

### **Metodología / Methodology**

Adolescent male C57BL/6J mice were fed with diets containing different concentrations of TB (0.5%, 1%, and 3%) both acutely (48 h) and chronically (20 weeks). Hippocampus-dependent spatial memory was assessed using the Y-Maze. Moreover, hippocampal synaptic transmission and the expression of genes and proteins relevant to hippocampal glutamatergic transmission has been investigated.

### **Resultados y Conclusiones / Results & Conclusions**

Our results showed that TB transformed early-LTP (e-LTP) into late-LTP (l-LTP) through PPAR $\gamma$  receptor signalling in hippocampal slices. Moreover, TB reverted the LTP-inhibition induced by scopolamine (SCOP). In vivo assays showed that free-feeding intake during 48 h of a diet containing 1% TB prevented SCOP-induced impairment of hippocampus-dependent spatial memory in adolescents, but not in adult mice. On the other hand, we observed that TB up-regulated hippocampal gene expression of Pparg, leptin, and adiponectin receptors as well as that of the glutamate receptor subunits, AMPA-2, NMDA-1, and NMDA-2B. In conclusion, our study suggests that TB has a positive influence on hippocampal transmission and synaptic plasticity suggesting the involvement of both PPAR $\gamma$  and AMPK in TB-mediated effects.



**ABSTINENCE FROM COMBINED COCAINE AND ETHANOL SELF-ADMINISTRATION DECREASED PHENYLALANINE AND TYROSINE PLASMA LEVELS IN YOUNG RATS**

Psychopharmacology & addiction

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Keywords: Poly-Consumption, Cocaine, Alcohol, Self-Administration, Aromatic Amino Acids

**Objetivos / Objectives**

The poly-consumption of cocaine and alcohol is very prevalent in western countries, moreover, the risk of relapse is very high in recovering addicts. In this study we have explored the effects of abstinence from this polydrug use on plasma amino acid pattern.

**Metodología / Methodology**

Young male and female Wistar rats intravenously self-administered during 10 sessions(6h): cocaine and alcohol (C+A; 1mg/kg injection cocaine + 0,133 mg/kg injection alcohol); cocaine (Coc; 1mg/kg injection) and Saline (Sal; 0,9% NaCl). After a withdrawal period (2 days: Wd2 or 30 days: Wd30), animals (N=8-12 per group) were subjected to a relapse test to measure their seeking behavior. Plasma samples were collected and analysed by CE-LIF, quantifying the concentrations of: Gly, L-Ala, L- Gln, L-Glu, L-Iso, L-Leu, L-Orn, L-Pro, L-Thr, L-Ser, L-Tyr, L-Phe, L-Val, L-Asp and Tau. A 3x2 factorial analysis of variance (Treatment\*Withdrawal period) was performed.

**Resultados y Conclusiones / Results & Conclusions**

We measured the molar ratio of branched-chain amino acids (BCAAs: leucine, valine, isoleucine) to aromatic AAs (phenylalanine, tyrosine) or Fischer's ratio, that is an indicator of liver metabolism. A main effect of treatment on Fischer's ratio [F (5,57) = 4.99; p =0.01] and post hoc analysis revealed significant differences between C+A and Sal groups (p=0.035) at Wd30.

This study shows a reduction of L-Phenylalanine and L-Tyrosine which may indicate an altered synthesis of catecholamines, given that both amino acids are precursor of these neurotransmitters. Also, Fischer's ratio could be a potential biomarker informing about metabolic alterations caused by the combined consumption of cocaine and alcohol.



## **TEMPORAL LOBE EPILEPSY IMPAIRS PERFORMANCE ON A SPATIAL RECOGNITION TASK**

Learning and memory

**María Del Mar Salvador Viñas<sup>1</sup>**, Isabel María Carmona Lorente<sup>1</sup>, Joaquín Castillo Escamilla<sup>1</sup>, José Manuel Cimadevilla Redondo<sup>2</sup>, Pablo Quiroga<sup>3</sup>

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Keywords: Epilepsy, Spatial Memory

### **Objetivos / Objectives**

The hippocampal formation, in addition to participating in memory and spatial orientation, is one of the most epileptogenic regions of the brain. Thus, people with epilepsy present different alterations in the functions that depend on the integrity of this brain structure. In this study we evaluate how spatial memory can be affected in people with epilepsy with hippocampal focus (N=21), being compared with a group of normotypical people (N=21).

### **Metodología / Methodology**

To do this, a battery of tasks was used, which includes the Almeria Spatial Memory Recognition Test (ASMRT). The task consists of a virtual room containing 9 boxes. The participant's task is to remember the position of the boxes marked in green (sample session). In a later recognition session, the room is presented from different perspectives, and the participants must decide if the position of the green boxes corresponds to the image previously presented in the sample session.

### **Resultados y Conclusiones / Results & Conclusions**

The results showed the absence of significant differences in the performance of the participants, although there were in the response times, with the epileptic patients having a higher TR than the control group. This may indicate that, although they have apparently similar performance, epileptics need more than one minute, compared to controls, to recognize whether or not the green box is the same as in the sample image. This is an advance to learn more about this pathology in the area of spatial memory and offers us some preliminary data as the basis for an electroencephalogram (EEG) study.



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## **CARDIOVASCULAR RESPONSES CAUSED BY DIFFERENT BLOOD ALCOHOL CONCENTRATIONS IN ADOLESCENTS**

Psychopharmacology & addiction

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Keywords: Binge Drinking, Cardiovascular System, Blood Pressure, Heart Rate, Adolescents

### **Objetivos / Objectives**

Alcohol and the illegal drug cannabis are the psychoactive substances most consumed by the general population of all ages in Spain. Adolescents and young adults are the population most affected by binge drinking (BD) alcohol consumption pattern and BD+cannabis poly-drug use. The aim of this study was to clarify the effects of different blood alcohol concentrations (BAC) on the cardiovascular system: systolic and diastolic blood pressure (SBP and DBP) and heart rate (HR) in male and female adolescents with BD or poly-drug use history.

### **Metodología / Methodology**

Subjects were 265 (147 females and 118 males) adolescents (18-19 years old) with BD or BD+cannabis poly-drug use history. SBP, DBP and HR were evaluated in participants with different BACs: BAC-0 (0.00 g/L), BAC-R ( $0.49 \pm 0.15$  g/L) and BAC-BD ( $0.76 \pm 0.14$  g/L).

### **Resultados y Conclusiones / Results & Conclusions**

The blood pressure results showed gender differences, with higher SBP in men. The HR results also showed gender differences, with higher HR in females. Besides, significant differences were observed among the BAC groups, showing an increased HR depending on BAC levels. In conclusion, gender differences were observed in SBP and HR. These findings are in agreement with previously reported results in adolescent population. In addition, an activation of the cardiovascular system was reflected in the HR, with increases in a BAC's dependent manner.





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**PRENATAL EXPOSURE TO ALCOHOL ATTENUATES ITS  
UNCONDITIONED AVERSIVE EFFECTS IN INFANT RATS**

Developmental Psychobiology

**Mirari Gaztañaga Echeverría**, Asier Angulo Alcalde, Estibaliz Muñoz, M. Gabriela Chotro Lerda

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Keywords: Prenatal Exposure, US Preexposure Effect, Infant Rat, Alcohol

**Objetivos / Objectives**

The general objective of this study was to learn whether alcohol exposure during the last gestational days of the rat (17-20) would affect the capacity of alcohol to act as an appetitive or aversive US during infancy. More specifically, our aim was also to study the role of acetaldehyde (the first metabolite on the oxidation chain of alcohol) as the unconditioned stimulus.

**Metodología / Methodology**

Pregnant rat dams were administered alcohol on gestational days 17 to 20. To test the role of acetaldehyde a group of pregnant dams also received an acetaldehyde sequestering agent on the same days. On postnatal days 14 to 17 infant rats were trained on a conditioned taste aversion paradigm: saccharin (conditioned stimulus) was followed by an intraperitoneal injection of 1 or 3 g/kg of alcohol (unconditioned stimulus). On day 18 infant rats were tested on saccharin consumption.

**Resultados y Conclusiones / Results & Conclusions**

Results of this study show that the prenatal exposure to alcohol, in the presence of acetaldehyde, interferes with the acquisition of a postnatal conditioned aversion generated by alcohol intoxication on postnatal days 14-18. This result suggests that alcohol intoxication may induce a US-preexposure effect even during prenatal stages.



## **THE USE OF FEMALE COPULATION CALLS IN HAMADRYAS BABOONS (PAPIO HAMADRYAS)**

Ethology and Comparative Psychology

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2. Universidad Complutense de Madrid, Madrid, Spain

**Keywords:** Copulation Calls, Papio Hamadryas, Sexual Selection, Female Reproductive Strategies, Female Transfer

### **Objetivos / Objectives**

Among primates, females of species organized in promiscuous multi-male/multi-female groups have been shown to utter so-called copulation calls, CCs. By contrast, female hamadryas baboons are attached to one-male units (OMUs) with a polygynous mating system. Interestingly, they also display CCs. It has been hypothesised that these calls are part of a postcopulatory sexual selection strategy which promote male competition for the sexual access to females via sperm competition and mate guarding, favouring females' reproductive success. However, neither of these mechanisms are likely to apply in hamadryas baboons. Considering their reproductive strategies, we propose that CCs may function to indicate females' interest to desert and join another OMU. We predicted that females attached to low-ranking males should call at higher rates to induce male-male competition and increase their chances of becoming to OMUs of higher-ranked males.

### **Metodología / Methodology**

We explore this hypothesis by analyzing 331 copulations from 47 sexually mature females, recorded via behavioural sampling, from July through October 1999, in the colony of hamadryas baboons of the Madrid zoo. For each recorded copulation, we assessed the social status and age of the mating pair, the female's stage of her oestrous cycle, the presence/absence of CC, and whether ejaculation took place.

### **Resultados y Conclusiones / Results & Conclusions**

Of 47 sexually mature females, five produced 85% of these vocalizations. These females belonged to harems led by the lowest-ranking males. Ongoing analysis will provide information on how copulation context may influence the use of this vocalization and whether they function to promote takeovers to test our predictions.



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## **INFLAMMATORY PAIN IMPACTS MOTIVATED BEHAVIOUR AND NEUROINFLAMMATION IN A SEX AND TIME-DEPENDENT MANNER**

Motivation: mechanisms of deficit and reward

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Keywords: Motivated Behaviour, Neuroinflammation, Inflammatory Pain, Mesocorticolimbic System.

### **Objetivos / Objectives**

The aim of this work is to study sex-dependent alterations induced by the development of inflammatory pain in motivated behaviour together with pain-induced local neuroinflammatory events in the mesocorticolimbic system (MCLS).

### **Metodología / Methodology**

We selected male and female SD rats (8 weeks) that were injected with the Complete Freund's Adjuvant (CFA) in the hind paw, to induce inflammatory pain, or saline as control. We performed 2 different studies. In the first one, we tested rats under progressive ratio schedule of sucrose self-administration to study how inflammatory pain affects motivation after 2, 4 and 7 post- CFA/Saline injection. In addition, to investigate pain-induced neuroinflammatory events in the MSCL, a different cohort of rats were injected with CFA or saline and brains were obtained to analyse neuroinflammatory markers in MCLS areas.

### **Resultados y Conclusiones / Results & Conclusions**

The development of inflammatory pain impacted motivated behaviour in a sex- dependent and time-dependent way. At early onset (2 days), both male and female rats showed a reduction of the number of rewards obtained under progressive ratio schedule of self-administration. This altered motivated behaviour was recovered in female but not in male rats since only females showed a similar number of rewards than controls obtained during the sessions performed 4 and 7 days after the CFA injection. In addition, the immunohistochemistry and western blot analysis of the selected neuroinflammatory markers, showed sex-dependent alterations that might underlie the behavioural observed adaptations under inflammatory pain condition. Further investigations will help to unravel the mechanisms through which peripheral inflammation impacts motivated behaviour.



## DECREASING CONSUMPTION OF SUGAR-SWEETENED BEVERAGES BY INHIBITION OF THE SWEET TASTE RECEPTOR IN WISTAR RATS

Models, methods and techniques in Psychobiology

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3. Centre des Sciences du Goût et de l'Alimentation, Université de Bourgogne, Dijon, Francia
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5. Departamento de Psicobiología, Universidad de Granada, Granada, España

Keywords: Anti-Sweet, Biocompound, Gurmarin, *Gymnema Sylvestre*, Sweet Taste Receptor

### **Objetivos / Objectives**

Excessive added sugar consumption is a nutritional determinant that influences high chronic disease rates: specifically, increased consumption of substances with added sugar is related to a higher risk for cardiovascular disease, obesity or type-2 diabetes. In consequence, strategies to reduce consumption of sugar-sweetened beverages are a key component of public health promotion and obesity prevention. Among new strategies, the use of bioactive compounds extracted from plants such as *Gymnema sylvestre* is a tool with great potential due to their sweet-taste receptor inhibitory properties. The main objective of the study was to examine if oral administration of a *Gymnema sylvestre* derivative, gurmarin, was able to reduce consumption and preference for sweet beverages in an animal model.

### **Metodología / Methodology**

24 Wistar rats (50% females) were divided into three groups: experimental (with Q-1 recombinant gurmarin) and two control groups (with gymnemic acids that have no effect in rats and phosphate buffer). After anaesthesia with isoflurane, the lingual application of 20 µl of the experimental or control solutions were carried out. Finally, one-bottle acceptance tests (sweet beverages, sucrose 10% v/v), and two-bottle preference tests (water versus sucrose 10% v/v) were performed within a session and between sessions.

### **Resultados y Conclusiones / Results & Conclusions**

Results showed a significant reduction of sucrose consumption in experimental group both after 5 and 10 minutes of inhibitor administration within session ( $p < .05$ ) and along four experimental sessions ( $p < .05$ ), with no preference differences. Hence, preclinical studies show the effectiveness of the use of sweet taste inhibitors to reduce sugar consumption.



## THE ROLE OF SIGMA-1 RECEPTORS IN CONSUMMATORY SUCCESSIVE NEGATIVE CONTRAST

Psychopharmacology & addiction

Ana María Jiménez-García<sup>1</sup>, Leandro Ruiz-Leyva<sup>2,3</sup>, Sergio Cuesta Martínez<sup>2,3</sup>, Ignacio Morón Henche<sup>4</sup>, Cruz Miguel Cendán Martínez<sup>2</sup>

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3. Instituto de Investigación Biosanitaria, Granada, Spain
4. Department of Psychobiology and Centre of Investigation of Mind, Brain, and Behavior (CIMCYC), Faculty of Psychology, University of Granada, Granada, Spain

Keywords: Frustration, Consummatory Successive Negative Contrast, Sigma-1 Receptor, Rats

### Objetivos / Objectives

The goal was to evaluate the effects of Sig1R ligands on frustration. The Sig1R antagonists could be expected to act reducing the pain derived from the frustration process whereas the Sig1R agonists might mitigate the frustration-induced anxiety. Previous pharmacological evidence pointed out Sig1R as a modulator of processes associated with frustration. The Sig1R antagonism has shown to be effective reducing pain, whereas the Sig1R agonists have demonstrated an anxiolytic effect and an improvement in learning and memory. That is the reason why it is hypothesized that Sig1R could modulate processes associated with frustration.

### Metodología / Methodology

202 male rats were tested for frustration by the Consummatory Successive Negative Contrast (cSNC) test. Twenty-six groups (n=7-9 approximately per group) have been defined depending on the SNC group, the drug and the dose administered. The Sig1R receptor antagonists used were BD-1063 and S1RA, while the Sig1R agonists used were PRE-084 and Igmesine.

### Resultados y Conclusiones / Results & Conclusions

The systemic administration of Sig1R ligands differentially modulate the frustration induced by the cSNC. The subcutaneous administration of the selective Sig1R agonists (PRE-084 and igmesine) reduces or eliminates the frustration both on the first and on the second post-shift days. On the other hand, the subcutaneous administration of the selective Sig1R antagonists produce controversial results. While BD1063 seems to reduce the frustration, S1RA do not modify the frustration response at any of the tested doses. The results obtained suggest that Sig1R seems to play a role on the frustration induced by the cSNC.

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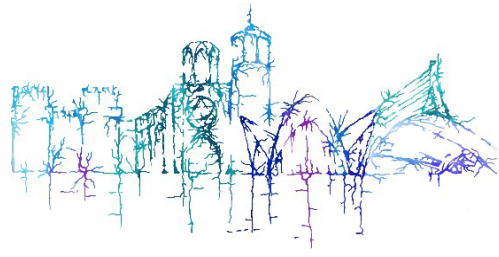
## **SHORT COMMUNICATIONS 2**

Thursday, 21<sup>st</sup> July 2022, 18:15-19:30 h

Aula A8, Faculty of Psychology and Speech Therapy

*Chair: Irene Cano-López (Universidad Internacional de Valencia)*

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## **DIFFERENCES BETWEEN THE LOGOPENIC VARIANT OF PRIMARY PROGRESSIVE APHASIA AND OF ALZHEIMER'S DISEASE. A SYSTEMATIC REVIEW**

Ageing and dementia

**Africa Yolanda Gómez-Pérez<sup>1</sup>**, Ana Melgar-Mota<sup>1</sup>, Ariane Hohl<sup>1</sup>, Jorge Romero-Castillo<sup>1</sup>, Lisa Marie Edelkraut<sup>1</sup>, Fernando Cuetos<sup>2</sup>

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**Keywords:** Alzheimer, Dementia, Frontotemporal Lobar Degeneration, Logopenic Progressive Aphasia, Logopenic Variant, Primary Progressive Aphasia

### **Objetivos / Objectives**

To determine whether clinical, neuropsychological, or neuroanatomical differences have been found between the logopenic variant (lv) with Primary Progressive Aphasia (PPA) as underlying pathology (lvPPA) and the one with Alzheimer disease (AD) as underlying pathology (lvAD).

### **Metodología / Methodology**

A systematic review of the latest literature was implemented. Inclusion criteria were: a) study includes a lvPPA experimental group; b) comparison between lvPPA and lvAD subgroups; c) underlying pathology confirmed via autopsy or biomarkers; c) methodologic and statistical analysis quality. From the initial 736 papers found, 22 were revised.

### **Resultados y Conclusiones / Results & Conclusions**

From these 22 revised studies, only 13 made a direct comparison between lvPPA and lvAD. Four studies found neuropsychological/linguistic differences, one found neuroanatomical differences, and seven studies found both neuropsychological/linguistic and neuroanatomical differences. One study didn't find any differences between subgroups. The most consistent differences between the groups were the ones found at the neuroanatomical level, as lvAD shows more extended patterns of atrophy, as well as greater involvement of the right hemisphere. The linguistic and neuropsychological differences found were mild, distinguishing greater impairment of naming and global cognitive measures in the lvAD group, and greater impairment of phonological fluency and syntax in the lvPPA group. Despite the observed differences, there are very few studies on this subject, and more investigation on this syndrome is needed to fully understand it, to improve the diagnosis and to better adapt the treatment for each patient.



## **SELF-REPORTED COGNITIVE STATE OF HEMODIALYSIS PATIENTS AND ITS RELATIONSHIP WITH CLINICAL VARIABLES**

Cognition and emotion

**Alexandra Elena Marin**<sup>1</sup>, Rosa Redolat<sup>1</sup>, Inés Moragrega Vergara<sup>1</sup>, Lorena González-García<sup>2</sup>, Alicia García-Testal<sup>3</sup>, Eva Segura-Ortí<sup>4</sup>, Patricia Mesa-Gresa<sup>1</sup>

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Keywords: Chronic Kidney Disease, Cognition, Creatinine, Phosphorus, Cognitive Decline

### **Objetivos / Objectives**

Chronic kidney disease (CKD) is a global burden that occurs when patients present abnormalities in their kidneys function or structure for more than three months, with consequences for the individual's health. Patients with CKD have a 10%-40% higher risk of cognitive impairment (CI) compared to the general population. According to previous studies, some of the cognitive decline risk factors can be cardiovascular factors, uremic metabolites, dialysis factors, and depression.

Our main aim was to measure the subjective perception of patients of their cognitive state and to evaluate if those findings are related with any of the patients' clinical or demographic data.

### **Metodología / Methodology**

Exploratory questionnaires regarding patients' perception of their cognitive state were answered by 78 patients with CKD from Hospital de Manises (Spain) (M=68.3 years; 50% women). The exploratory questionnaires were developed ad hoc and present a reliability of .72 (Cronbach's Alpha).

### **Resultados y Conclusiones / Results & Conclusions**

Negative correlations were found between perceived cognitive state and three different biochemical data: creatinine ( $r=-.250$ ,  $p<0.05$ ), phosphorus ( $r=-.276$ ,  $p<0.05$ ) and uric acid ( $r=-.206$ ,  $p<0.05$ ) levels. No significant differences were found regarding other demographic variables as age, sex, or months that patients have been on dialysis.

Higher levels of creatinine, phosphorus and uric acid were associated with lower levels of self-perceived cognitive state in patients. In the next phase of the project, validated questionnaires will be used in order to evaluate different aspects of the patient's cognition, such as memory, attention, and executive functioning in order to compare the results with the present findings.

Acknowledgements: GoodRENAL project (European Community. SRIC\_UE\_2020-1-ES01-KA204-083141).



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## **DIFFERENTIAL PERFORMANCE IN FLEXIBILITY AND RESPONSE INHIBITION IN OCD PATIENTS ACCORDING TO AGE**

Neuropsychology

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Keywords: Obsessive-Compulsive Disorder, Age, Cognitive Flexibility, Response Inhibition

### **Objetivos / Objectives**

Cognitive flexibility and response inhibition have been highly studied executive functions, concluding that patients with OCD have lower performance than healthy patients. The main was to compare whether there were differences in performance inflexibility and response inhibition in a group of patients with OCD based on age.

### **Metodología / Methodology**

Participants: The sample was 64 participants aged between 8-50 years (Mean = 32.2) diagnosed with OCD. The instruments used for the evaluation were Wisconsin Card Sorting Test (WCST), Stroop Test and Go/NoGo tasks. Two groups were formed according to age: Group 1: patients from 8 to 19 years old, Group 2: patients from 25to 50 years old.

### **Resultados y Conclusiones / Results & Conclusions**

Results: The means of performance in the different executive functions were compared, observing that there were significant differences between the groups ( $p < .05$ ). The youngest group was the one that achieved the best results.

Conclusions: Younger OCD patients achieved higher cognitive flexibility and response inhibition performance than older participants. However, the small sample size prevented generalization of the results.

This communication was supported by Project 20902/PI /18 financed by the Autonomous Community of Murcia (Spain) through the Grants for projects for the development of scientific and technical research by competitive groups, included in theRegional Program for the Promotion of Scientific and Technical Research (Action Plan2018) of the Seneca Foundation-Science and Technology Agency of Murcia Region (Spain).



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**A SERIOUS GAME (NEUROAPP) TO IMPROVE ACADEMIC PERFORMANCE IN PSYCHOBIOLOGY STUDENTS: RELATIONSHIP WITH COGNITIVE PERFORMANCE AND PSYCHOPHYSIOLOGY**

Psychophysiology

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Keywords: Psychophysiology, Cognition, Visual Working Memory, HRV, SeriousGames

**Objetivos / Objectives**

The use of Serious Games (SG) with specific objectives focused on teaching and learning in higher education can be very useful to stimulate attention and integration of knowledge through practice and interaction. Our main aim was to develop a SG (NeuroApp) to improve academic performance in Psychobiology subjects evaluating how cognitive and psychophysiological variables may influence both its use by the participants and effectiveness of learning.

**Metodología / Methodology**

NeuroApp has been developed according to prior studies of academic SG and is currently being used by 38 undergraduate Psychology students (M= 19.1 years, SD=2). Physiological responses of a subsample (n=17) were assessed in the laboratory using a Polar Vantage M2 to capture cardiovascular activity. Subjects also completed the Stroop Test and the Memory Visual Index (IMVT) of the Weschler Memory Scale IV (WMS-IV). Blood pressure (BP) and heart rate variability (Mean RR) were taken pre- and post-performance of cognitive tests.

**Resultados y Conclusiones / Results & Conclusions**

NeuroApp will be presented in the poster through a QR code. In the laboratory, BP (systolic pre-, and diastolic pre- and post-test) correlated negatively with IMVT ( $p < 0.05$ ). Heart rate variability (Mean RR) correlated positively with the Stroop interference ( $p < 0.01$ ). NeuroApp usage data will be correlated with these measures at the end of the academic course. NeuroApp is aimed to complement traditional teaching, focusing on interaction during learning and including challenges to overcome SG successfully. Focusing on improving attention, visual working memory, cognitive interference and sympathovagal tone may be useful to increase academic performance and gaming experience.



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**ANXIETY AND DEPRESSION, INFLUENTIAL VARIABLES IN  
FLEXIBILITY AND RESPONSE INHIBITION IN  
CHILDREN/ADOLESCENTS WITH OCD**

Neuropsychology

**Jose Luis Parada-Navas**, Ana Isabel Rosa-Alcázar, Angel Rosa-Alcázar, M. Dolores García-Hernández, Cristina Bernal-Ruiz

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Keywords: Obsessive-Compulsive Disorder, Cognitive Flexibility, Response Inhibition, Anxiety, Depression

**Objetivos / Objectives**

Objective: Obsessive-compulsive disorder (OCD) presents a high comorbidity with anxiety and depressive disorders. Few studies have analyzed the impact of depression and anxiety levels on flexibility performance and response inhibition in children and adolescents with OCD. Cognitive flexibility is the ability to change the representation based on incoming information and keep it intact when the changes are irrelevant.

Inhibition refers to the mental processes responsible for intentional and voluntary control or the ability to prevent the interference of irrelevant information against ongoing responses or response patterns and to suppress previously relevant information that is currently not useful. The aim of this study was to analyze whether performance in flexibility and inhibition was moderated by levels of anxiety and depression in a group of children/adolescents with OCD.

**Metodología / Methodology**

The participants were 39 children/adolescents with a mean age of 16.8 years (SD = 3.9), diagnosed with OCD. The sample was recruited from different private and public clinical centers. The instruments used were Wisconsin Card Sorting Test (WCST), Stroop Test and Go/NoGo tasks.

**Resultados y Conclusiones / Results & Conclusions**

Results: The depression variable influenced the performance of the neuropsychological variables ( $p = .04$ ).

Conclusions: The levels of depression could be relevant in the performance of executive functions, more than the disorder itself. The main limitation of the study is the small sample size.

This communication was supported by Project 20902/PI /18 financed by the Autonomous Community of Murcia (Spain) through the Grants for projects for the development of scientific and technical research by competitive groups, included in the Regional Program for the Promotion of Scientific and Technical Research (Action Plan 2018) of the Seneca Foundation-Science and Technology Agency of Murcia Region (Spain).



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**PRE-EXPOSURE PROPHYLAXIS (PREP) IMPACT ON ANXIETY,  
DEPRESSION AND SEXUAL SATISFACTION: THE GAME CHANGER**

Neuropsychology

**Manuel Reiriz**<sup>1</sup>, Benjamin Expósito<sup>2</sup>, Ana María Jiménez-García<sup>3</sup>, Sara Uceda<sup>3</sup>, Natalia Arias<sup>3</sup>

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Keywords: HIV; Pre-Exposure Profilaxis (PrEP); Sexual Satisfaction; Depression; Anxiety

**Objetivos / Objectives**

Numerous health-related issues continue to undermine the life and sexual satisfaction, depression and anxiety of people living with HIV. Pre-exposure prophylaxis (PrEP) has been implemented as a prevention against HIV; however, its impact on mental health and sexual and life satisfaction has not been addressed.

**Metodología / Methodology**

We compared the degree of life satisfaction (SWLS), sexual satisfaction (NSSS and PROMIS V2.0), depression (PHQ-9) and anxiety (GAD-7) in two experimental groups, PrEP users and non-users.

**Resultados y Conclusiones / Results & Conclusions**

PrEP use was correlated to better sexual satisfaction, which was related to greater life satisfaction. Also, PrEP users showed a negative correlation with depression and anxiety which was not found in PrEP non-users. Moreover, we have observed that younger PrEP users showed higher scores in anxiety and lower in depression compared to the older. The indirect correlation between sexual satisfaction, depression, and anxiety symptoms in PrEP users could be underlying the benefits PrEP can provide for patient's sex lives such as increase in sexual liberties, enhance pleasure due to decreased anxiety and provide mental comfort when experiencing chemsex.



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**ANDROGEN RECEPTOR GENE AND SOCIOSEXUALITY. DOES FIGHTING ABILITY MODERATE THE EFFECT OF GENETICS IN REPRODUCTIVE STRATEGIES?**

Others

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Keywords: Sociosexuality, CAG Polymorphism, Self-Perceived Fighting Ability, Human Reproductive Strategy

**Objetivos / Objectives**

Sociosexuality is a reliable proxy to evaluate the trade-off between short-term and long-term human reproductive strategies. The androgen receptor gene CAG-repeats polymorphism regulates the effect of testosterone and the expression of testosterone-related traits which are commonly associated to short-term oriented strategies. In the current study we propose the effect of the androgen receptor gene polymorphism in sociosexuality to be moderated by the self-perceived fighting ability, a psychological attribute relevant in intrasexual competition. Our objective is to reveal if the CAG polymorphism is associated with a short-term strategy as expected from the strategic pluralism hypothesis, or conversely with long-term investments.

**Metodología / Methodology**

The total sample included 438 men of ages between 18 and 36 ( $M \pm SD = 22.15 \pm 3.03$ ). Participants fulfilled Spanish-adapted versions of the Multidimensional model of sociosexuality and of the Self-perceived fighting ability questionnaire (SPFA) and provided a saliva sample for DNA isolation of the androgen receptor gene CAG- repeats polymorphism. General linear models were fitted to test our predictions.

**Resultados y Conclusiones / Results & Conclusions**

We fail to find any effect of the CAG polymorphism over mating strategies. However, self-perceived fighting ability is related to short-term mating orientation but not to the number of past sexual partners. Under our approach we find no clear evidence about the potential role of CAG polymorphism of the androgen receptor gene over sociosexual attitudes and behavior. However, other results suggest that there is evidence that genetic factors influence sociosexuality, but it is necessary to consider simultaneously more than a single genetic polymorphism and other psychological and physiological variables.



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**RESULTS OF THE CULTURE AND HEALTH PROJECT IN THE  
STIMULATION OF SMELL IN PEOPLE SUFFERING FROM  
ALZHEIMER'S DISEASE TO ENHANCE COGNITIVE CAPACITIES**

Neuroplasticity and cognitive enhancement

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Keywords: Stimulation, Sense Of Smell, Memory

**Objetivos / Objectives**

Smell is a communication system, which makes our brain have stored the sensations that we have perceived. As for memory, smells are more powerful and secure, stronger than images or sounds. In people with Alzheimer's disease (AD) one of the symptoms is the loss of the sense of smell. This sense has the ability to take us to moments of our lives, to evoke memories. The relationship of the variables studied has focused on being able to study the stimulation of the different cognitive abilities through smell and art. Memory stimulation has been enhanced through the olfactory system in the areas: evocation of memories, association and abstract thought.

**Metodología / Methodology**

In the formation of the groups, the criterion of the degree of cognitive deterioration was established. Twenty-three participants with GDS (from 1 to 5) were included. The study was carried out through experimentation and observation using an empirical-analytical method. Specific record sheets were prepared to be able to analyze and quantify the responses to stimulation.

**Resultados y Conclusiones / Results & Conclusions**

It was observed that olfactory stimulation helps the evocation of memories, association with images and abstract thought. Memory is preserved at the level of conscious and unconscious association. Reasoning, judgment and the ability to isolate details are activated. Qualitative studies may offer some useful markers for further studies with people with AD. The importance of being able to work in the early stages of the disease.





**SEX AND SURGERY TYPE: MODULATING FACTORS OF THE  
RELATIONSHIP BETWEEN EXECUTIVE FUNCTION AND MEMORY  
CHANGES IN EPILEPSY**

Neuropsychology

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Keywords: Sex, Type Of Surgery, Executive Function, Memory, Epileps

**Objetivos / Objectives**

To explore the possible modulating factors of the relationship between presurgical executive function and changes in memory function after epilepsy surgery.

**Metodología / Methodology**

Seventy-seven patients with drug-resistant epilepsy underwent a neuropsychological assessment before and after surgery, where executive function performance was assessed using the Epitrack screening tool before surgery, and memory function was assessed using the discriminability index of the Spanish Complutense Verbal Learning Test before and after surgery.

**Resultados y Conclusiones / Results & Conclusions**

Higher Epitrack total score was associated with significant improvements in discriminability after surgery ( $p = 0.02$ ). The interaction between Epitrack total score and sex also predicted post-surgical discriminability changes ( $p = 0.03$ ). Additionally, the interaction between Epitrack total score, sex, and type of surgery tended to predict post-surgical discriminability changes ( $p = 0.07$ ). Johnson-Neyman analyses revealed that Epitrack total score was significantly associated with post-surgical discriminability improvements only for women who did not undergo amygdalohippocampectomy ( $p = 0.003$ ), but not for women who underwent amygdalohippocampectomy neither men ( $p > 0.06$ ). Our results suggest that sex and surgery type are relevant modulation factors in the relationship between presurgical executive function and postsurgical memory changes. Epitrack is a reliable predictor of verbal memory evolution, especially for women and patients who underwent resective surgery without amygdalohippocampectomy. These factors should be taken into account in clinical decision-making processes.

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**THE SIDE OF SEIZURE FOCUS MODULATES THE RELATIONSHIP  
BETWEEN EPILEPSY DURATION AND EXECUTIVE FUNCTION IN  
EPILEPSY**

Neuropsychology

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Keywords: Temporal Lobe Epilepsy, Epilepsy Duration, Executive Function, Side of Seizure Focus.

**Objetivos / Objectives**

This work aims to study the effect of the side of seizure focus as a moderator in the relationship between epilepsy duration and executive function.

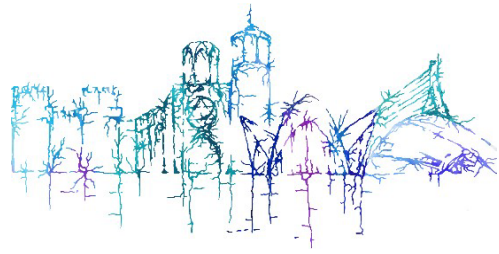
**Metodología / Methodology**

One hundred and ten patients with drug-resistant temporal lobe epilepsy (TLE) (54 with left TLE and 56 with right TLE, mean age = 38.75 years, SD = 12.11) underwent a neuropsychological evaluation, in which attention (Trail Making Test A), processing speed (Stroop test), cognitive flexibility (Wisconsin Card Sorting Test) and verbal fluency (FAS and animals) were assessed. In addition, the Epitrack screening tool, which is focused on attention and executive function, was administered.

**Resultados y Conclusiones / Results & Conclusions**

The side of seizure focus moderated the relationship of epilepsy duration with attention performance, processing speed, cognitive flexibility, and verbal fluency. Jonhson- Neyman analyses showed that longer epilepsy duration was associated with poorer cognitive performance in these variables in patients with left TLE, but not in those with right TLE. Furthermore, the side of seizure focus tended to moderate the relationship between epilepsy duration and Epitrack total score, being the moderation significant for 3 of the 6 subscales. In these cases, the relationship between epilepsy duration and poorer cognitive functioning was also significant for left TLE patients, but not for right TLE patients. Conclusions. These results show the relevance of the side of seizure focus as a modulating variable of the influence of the duration of epilepsy on cognitive functioning, emphasizing the importance of taking into account this variable in clinical decision-making and preventive action.

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## **EFFICACY OF INTENSIVE TELE-REHABILITATION COMBINED WITH DONEPEZIL COMPARED TO FACE-TO-FACE ADMINISTRATION**

Neuropsychology

**África Gómez-Pérez**, María José Torres-Prioris, Ana Melgar-Mota, Ariane Hohl, Ismael Gutierrez-Cordero, María José Ariza, Ricardo Ortega-Palacios, Francisco M Alfaro-Rubio, Lisa Marie Edelkraut, Marcelo Berthier, Guadalupe Dávila

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Keywords: Post-Stroke Aphasia; Intensive Language Rehabilitation; Tele-Rehabilitation; Donepezil

### **Objetivos / Objectives**

- (a) To evaluate the benefits promoted by two modalities of intensive language-action therapy, telerehabilitation (Tele-ILAT) and face-to-face (ILAT), applied alone and in combination with Donepezil to persons with chronic post-stroke aphasia (PSA) (phase 1).
- (b) To examine the best remote or hybrid strategy to maintain the gains in language and language-affiliated behaviours (communication, psychological adjustment, and quality of life) promoted by both modalities of ILAT, and to determine the efficacy of these interventions in reducing the therapist burden (phase 2).
- (c) To identify potential predictors of treatment response, including gene markers, and to detect changes in language, cognition, emotional functions, and neural plasticity using multimodal MRI.

### **Metodología / Methodology**

Estimated sample size: 48 participants with chronic PSA are required to obtain a power of 80% (increment of 5 points  $\pm$  4) relative to baseline scores on the Western Aphasia Battery-Revised.

Methods and design: a randomised control trial involving four groups comparing the effectiveness of ILAT applied online, and face-to-face administered alone and with Donepezil (phase 1); three quasi-randomised parallel groups (asynchronous, hybrid and control) (phase 2).

### **Resultados y Conclusiones / Results & Conclusions**

Primary outcome measures: aphasia severity, communication, behaviour, and quality of life. Likewise, evaluations will determine potential predictive variables of response and brain and language changes associated with the treatments at different timepoints. This trial will determine: (a) whether Tele-ILAT administered alone and combined with Donepezil reduces aphasia severity and language-affiliated deficits in the same manner as face-to-face ILAT and the contribution of adding Donepezil to these interventions; (b) the best long-term remote maintenance-therapy.



## **PAIN-RELATED EVOKED POTENTIALS ARE DIFFERENTIALLY AFFECTED BY CHRONIC PAIN AND AGING**

Neuropsychology

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Keywords: Aging, Chronic Pain, Pain Perception Electroencephalography

### **Objetivos / Objectives**

The prevalence of chronic pain is known to increase with advancing age. Moreover, aging seems to be associated with altered pain perception (increased pain thresholds and reduced amplitudes in pain-related evoked potentials (PREPs), but reduced pain tolerance). However, few studies have investigated how aging and chronic pain combine to produce enhanced pain perception.

### **Metodología / Methodology**

We present preliminary results comparing PREPs of 27 pain-free older participants and 9 older adults with chronic pain (>60 years old), as well as 23 healthy younger adults (<25). Participants received 30 trains of painful stimulation (3 stimuli of 1ms duration separated by 5ms) to the thenar eminence of the non-dominant hand, individually adjusted to elicit a rating of four on a 0-10 rating scale. In addition, 30 non-painful stimulus trains were presented.

### **Resultados y Conclusiones / Results & Conclusions**

We found no group difference in pain intensity and unpleasantness ratings. Younger adults showed larger evoked potentials than all older participants, except in P3 amplitudes to painful stimulation where no differences between younger and older adults with pain were found. Moreover, chronic pain older participants showed similar PREPs to older participants without pain in early latencies (flattened N1-P1 in comparison to younger adults), but increased P300 amplitudes just in the painful condition. These increased amplitudes in late evoked potentials in the chronic pain group might reflect an augmented alarm/orienting response to the pain stimulation.

Altogether suggests that plastic changes driven by suffering from long-lasting pain outweigh those resulting from the normal aging process, when both coexist.





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**CAN PRESURGICAL EPITRACK PERFORMANCE DIFFERENTIATE  
POSTSURGICAL AFFECTIVITY AND QUALITY OF LIFE PROFILES IN  
EPILEPSY?**

Neuropsychology

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Keywords: Epitrack, Affectivity, Quality Of Life, Surgery, Temporal Lobe Epilepsy

**Objetivos / Objectives**

To examine possible differences between groups of patients with drug-resistant temporal lobe epilepsy depending on presurgical cognitive performance measured with Epitrack screening tool on postsurgical anxiety, depression, and quality of life.

**Metodología / Methodology**

Fifty-seven patients with drug-resistant temporal lobe epilepsy underwent a neuropsychological assessment before and after surgery, where cognitive performance was assessed with the Epitrack screening tool before surgery, and affectivity and quality of life were assessed after surgery using the State-Trait Anxiety Inventory, the Beck Depression Inventory-II, and the Quality of Life in Epilepsy Inventory-31.

**Resultados y Conclusiones / Results & Conclusions**

The sample was divided into two groups depending on whether participants had intact (n=33) or impaired (n=24) performance in the Epitrack screening tool. Patients with impaired Epitrack performance had significantly higher anxiety ( $p = 0.03$ ) and depression scores ( $p = 0.04$ ), and poorer quality of life ( $p = 0.02$ ) than those with intact Epitrack performance.

These results suggest that Epitrack is a sensitive tool for detecting cognitive profiles before surgery in patients with temporal lobe epilepsy, and emphasize that this instrument also could be useful for the prediction of possible postsurgical affectivity and quality of life impairments in this population.

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## **POSITIVE IMPACT OF SOCIAL SUPPORT ON COGNITIVE DEFICITS IN FIBROMYALGIA SYNDROME**

Neuropsychology

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Keywords: Fibromyalgia Syndrome, Social Support, Emotional Support, Socializing, Cognitive Deficits

### **Objetivos / Objectives**

Despite the attempts to elucidate the influence of the clinical symptoms on the cognitive decline reported by FMS patients, no studies have explored the specific role of social support. Social support has been shown to be an essential modulator factor on cognitive performance in other diseases.

### **Metodología / Methodology**

Sixty-four women with FMS and 32 healthy women (HW) participated in the study and completed questionnaires pertaining to anxiety, depression, fatigue, insomnia, clinical pain and social support; along with a neuropsychological battery assessing verbal memory, organization, strategic and planning abilities, self-regulation, processing speed, attention and cognitive flexibility.

### **Resultados y Conclusiones / Results & Conclusions**

Results showed that FMS patients exhibited lower values in all social support dimensions in comparison with HW; especially in the socializing dimension. Despite the lower social support observed in FMS, all social support dimensions showed a positive impact on the different cognitive domains evaluated in these patients. In fact, social support was generally associated with greater correct responses and processing speed and minor number of errors. Socializing was the main predictor of organization and planning abilities, strategic planning and self-regulation. In sum, results suggest that social support may be a key factor in buffering the cognitive decline observed in FMS. Designing psychoeducation programs and intervention programs directed not only to FMS patients but also relatives, health care workers and the general population, might be essential to improve the social support of FMS patients and positively impact on patient's cognitive status.



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**COGNITIVE DECLINE IN FIBROMYALGIA SYNDROME PATIENTS.  
EXPLORING THE ROLE OF BODY MASS INDEX AND CLINICAL  
SYMPTOMS OF THE DISORDER**

Neuropsychology

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Keywords: Body Mass Index, Clinical Symptoms, Cognitive Decline, Basic Cognitive Domains, Fibromyalgia Syndrome

**Objetivos / Objectives**

The high prevalence of obesity and overweight in Fibromyalgia Syndrome (FMS) maybe an important factor in the well-known cognitive deficits observed in the disorder.

Few studies have been conducted to this regard, and those have been limited to complex cognitive processes such as executive function. This study analyzed the influence of body mass index (BMI), primary clinical symptoms of FMS (pain, fatigue, insomnia, anxiety and depression) and medication intake on attention, memory and processing speed in FMS.

**Metodología / Methodology**

Fifty-two FMS patients and thirty-two healthy participants completed cognitive tasks assessing selective, sustained and divided attention, visuospatial and verbal memory and information processing speed. Furthermore, they were evaluated in terms of the main clinical symptoms of the disorder.

**Resultados y Conclusiones / Results & Conclusions**

FMS patients showed a marked reduction of cognitive performance in terms of selective, sustained and divided attention, visuospatial memory and processing speed, but no group differences were observed in verbal memory. BMI negatively affected sustained and selective attention, verbal memory and processing speed, and was the main predictor of performance in these basic cognitive domains. Our findings confirm the presence of cognitive deficits with respect to attention and visual memory, as well as slower processing speed, in FMS. Moreover, the results support a role of BMI in the observed cognitive deficits. Interventions increasing physical activity (directly, as well as indirectly via the associated reduction in body weight) and promoting cognitive stimulation could be useful for strengthening cognitive function and consequently quality of life of FMS patients.



## NEUROPSYCHOLOGICAL ASSESSMENT IN CHILDREN WITH HYDROCEPHALUS: A SYSTEMATIC REVIEW

Neuropsychology

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Keywords: Hydrocephalus; Neuropsychology; Neuropsychological Assessment; Children.

### Objetivos / Objectives

Hydrocephalus is a condition that is defined as the increase of volume of cerebrospinal fluid in the ventricular system of the brain. Different causes are related to this problem. The most common form of congenital hydrocephalus is due to both spina bifida, and myelomeningocele although it could also be caused by hemorrhage and other alterations. Children affected by hydrocephalus show different patterns of cognitive performance. Nowadays, the assessment protocol for these dysfunctions is not well established. This review aims to analyze neuropsychological assessment instruments used by different professionals in this population and synthesize these results to design a standard protocol.

### Metodología / Methodology

This review was based on the PRISMA 2020 Declaration. A systematic search was carried out in Web of Science, Pubmed, and Scopus databases in May 2022. The keywords selected were: hydrocephalus, children, neuropsychology, and assessment. Eligibility criteria included were: studies that used standardized instruments, which include children with a primary diagnosis of hydrocephalus, and that were written in English/Spanish.

### Resultados y Conclusiones / Results & Conclusions

The initial review yielded a total of 74 papers, of which 18 remained after eliminating duplicates and applying the eligibility criteria. The selected studies showed that the neuropsychological assessment protocol in this population is heterogeneous, being the most common instruments used the following: WISC (different versions) as a measure of general intelligence, and WRAML to assess learning and memory. Other cognitive domains such as executive function and perceptual processing were assessed using different instruments. This evidence the need to validate a standard neuropsychological evaluation protocol in this specific sample.



## COMPARISON OF THE PERFORMANCE OF YOUNG PEOPLE IN THE COMPLEX FIGURE OF REY-OSTERRIETH AND IN THE COMPLEX FIGURE OF TAYLOR

Neuropsychology

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Keywords: Complex Figure Of Rey, Complex Figure Of Taylor, Neuropsychological Evaluation, Parallel Tests.

### **Objetivos / Objectives**

The Taylor Complex Figure (TCF) was developed as an alternate form for the Rey-Osterrieth Complex Figure (ROCF) to assess visuospatial abilities, as well as memory and learning functions. There are a number of situations in neuropsychology in which is interesting and convenient administer parallel tests to assess the same cognitive function. For example, to assess before and after surgery, effectiveness of a cognitive and/or pharmacological treatment. The present study examines the comparability of the figures TCF and ROCF by comparing total scores, type construction and completion times on copy and recall trials.

### **Metodología / Methodology**

It was used a sample of 40 volunteer subjects, university students aged between 18 and 27 years. For the administration, both figures were given on a counterbalanced order to the entire sample, being separated for a week between both administrations. To estimate the intellectual level of the participants several tests were administrated: vocabulary and matrix reasoning (WAIS-III).

### **Resultados y Conclusiones / Results & Conclusions**

A repeated-measures Anova for the variable "copy accuracy" only showed significant effects for the version of the test (ROCF > TCF). Regarding the copy time and immediate recall, significant interactions were found between the order of administration and the version of the test. A predominance of type 2 is observed in the execution of both tests (60% ROCF, 70% TCF). Overall, the study supports the use of the TCF as a comparable measure of visuospatial, learning and memory functions to the ROCF, but taking into account a number of considerations.



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## **SELF-CONCEPT AND LIFE SATISFACTION IN ACQUIRED BRAIN INJURY: A CASE STUDY (I)**

Neuropsychology

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Keywords: Self-Concept, Life Satisfaccion, Acquired Brain Injury

### **Objetivos / Objectives**

Scientific literature suggests that people with ND suffer a negative impact on their quality of life and mental health. Stroke, migraine and Alzheimer's disease are the most disabling among neurological diseases. Objectives: To analyze the different cognitive processes affected and to explore the levels of self-concept and life satisfaction in a patient with hemorrhagic stroke.

### **Metodología / Methodology**

Case: A 34-year-old man suffered a hemorrhagic stroke in the left middle cerebellum on March 2021. The main sequelae are residual motor symptoms, diplopia and mild dysjective syndrome. He has been receiving outpatient neurorehabilitation for one year with occupational therapy, physiotherapy, neuropsychology and psychotherapy. The neuropsychological assessment was extracted from his clinical history, self-concept was measured using the Self-Concept Form 5, and life satisfaction was measured using the Satisfaction with Life Scale.

### **Resultados y Conclusiones / Results & Conclusions**

Case: A 34-year-old man suffered a hemorrhagic stroke in the left middle cerebellum on March 2021. The main sequelae are residual motor symptoms, diplopia and mild dysjective syndrome. He has been receiving outpatient neurorehabilitation for one year with occupational therapy, physiotherapy, neuropsychology and psychotherapy. The neuropsychological assessment was extracted from his clinical history, self-concept was measured using the Self-Concept Form 5, and life satisfaction was measured using the Satisfaction with Life Scale.



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**PERFORMANCE DIFFERENCES BETWEEN ALLOCENTRIC AND EGOCENTRIC SPATIAL STRATEGIES MEDIATED BY WORKING MEMORY AND TEMPORAL CAPACITY**

Neuropsychology

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Keywords: Spatial Recognition, Temporal Perception, Spatial Orientation, Hippocampus, Memory Load

**Objetivos / Objectives**

Locating ourselves in space in an optimal way is essential for daily life. To do so, we can use two orientation strategies: egocentric (uses the position of one's own body as a reference) and allocentric (uses cues from the environment, dependent on the hippocampus). These are modulated by working memory, but the influence of temporal perception capacity and its relationship with them still requires further investigation.

Therefore, the objective of this work is to verify the differences in performance according to spatial strategy (allocentric/egocentric), mediated by working memory and temporal perception simultaneously.

**Metodología / Methodology**

A total of 20 men and 21 women, all of them students at Sapienza University, were evaluated using two virtual spatial recognition tasks (3D allocentric and 2D egocentric). Both tasks had two different display times for the sample image (3000/1000ms) to verify their influence on performance. A couple of additional tasks focused on working memory and temporal perception were also used.

**Resultados y Conclusiones / Results & Conclusions**

Considering working memory and temporal perception as covariates, men performed better than women in the allocentric 3D Task, modulated by the type of trial (correct answers, false alarms...). In contrast, in the egocentric task, there were no differences in performance between men and women, but there were differences between each type of trial. In general, a differential modulation of working memory and temporal perception is reflected for each spatial strategy. Specifically, a sexually dimorphic behavioral pattern is only found for the allocentric orientation strategy. Future research can focus on cortical dynamics to further understand this tendency.



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## **REDUCED CORTICAL PAIN PROCESSING AND HYPOALGESIA DUE TO SOCIAL STRESS**

Neuropsychology

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Keywords: Pain, Social Stress, Pain Evoked Potentials, Hypoalgesia

### **Objetivos / Objectives**

It is well known that acute stress can influence pain sensitivity, but the direction of this modulation (i.e., whether it causes hypoalgesia or hyperalgesia) remains unclear. Moreover, little is known about the cortical effects of social stress on pain processing in response to acute pain stimulation. Therefore, the aim of this study was to evaluate the effect of social stress in acute pain processing in both cortical response and perceived pain in healthy young volunteers.

### **Metodología / Methodology**

Thirty healthy adults (15 women, aged between 18-25 years old) were enrolled on the study. Participants received individually adjusted electrical pain stimuli before and after completion of the Trier Social Stress Test (TSST). Self-perceived stress, pain perception (intensity and unpleasantness ratings) and pain-related evoked potentials (N1, P1 and P3 components) were evaluated.

### **Resultados y Conclusiones / Results & Conclusions**

As expected, the TSST effectively induced stress to participants, and self-reported measures of stress significantly increased during the TSST. Furthermore, pain intensity and unpleasantness ratings were significantly reduced when pain was applied after the TSST in comparison to before. In agreement with this behavioral observation, P3 amplitudes were decreased after the TSST in central-parietal and parietal areas. No significant differences were found in N1 nor P1 components. Altogether our results suggest that social stress triggers an hypoalgesic effect on young healthy adults, which is indeed mirrored by attenuated evoked potentials, especially in those components related to the cognitive assessment of pain.





## **EFFECTS OF VALPROIC ACID ON EXECUTIVE FUNCTION AND VERBAL MEMORY IN TEMPORAL LOBE EPILEPSY PATIENTS**

Neuropsychology

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Keywords: Temporal Lobe Epilepsy, Valproic Acid, Executive Functions, Attention, Verbal Memory

### **Objetivos / Objectives**

The present work aims to study the effect of valproic acid, an antiepileptic drug frequently used in patients with epilepsy, on executive performance and verbal memory in patients with drug-resistant temporal lobe epilepsy (TLE).

### **Metodología / Methodology**

Eighty-seven people with drug-resistant TLE were divided into two groups according to whether they were taking valproic acid (n=9) or not (n=78) (mean age = 39.9 years, SD = 11.99). All of them underwent a neuropsychological evaluation, in which attention (Trail Making Test A and B; TMT A and B), processing speed (Stroop test), cognitive flexibility (Wisconsin Card Sorting Test; WCST), planning and working memory (Tower of London; TOL) and verbal memory (Test de Aprendizaje Verbal España-Complutense; TAVEC) were assessed.

### **Resultados y Conclusiones / Results & Conclusions**

Patients taking valproic acid had significantly worse attention, executive functions, and verbal memory scores. Regarding executive functions, differences were found in planning, working memory, and processing speed, but not in cognitive flexibility.

Conclusions. Our results show that valproic acid has cognitive effects in patients with TLE, being associated with worse performance in verbal memory, attention, and executive functions. These results have implications for clinical decision making in drug-resistant epilepsy treatment.

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## **OBJECT-LOCATION MEMORY DEFICITS IN LONG COVID: A PRELIMINARY STUDY USING A VIRTUAL REALITY-BASED TASK**

Neuropsychology

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Keywords: Long-COVID, Spatial Memory, Large-Scale Orientation, Virtual Reality

### **Objetivos / Objectives**

Memory impairments can be detected in long-COVID-19 stage and these were mainly collected by self-report measures. The visuospatial component of memory has been less explored than the verbal component. We tested the object-location memory skills of people with self-reported long-COVID-19. We intended to explore the effect of long-COVID-19 stage on immediate- and long-term recall of spatial information using immersive virtual reality (VR).

### **Metodología / Methodology**

Fourteen individuals affected by long-COVID-19 (L-COVID group; 3 men) and seventeen healthy volunteers (C group; 6 men) participated in the study. They had comparable baseline characteristics: age, experience in video games, and cognitive and spatial orientation abilities. The VR task consisted of learning and recalling the location of nine objects in a virtual environment that simulated a work office. There were three trials: learning, immediate recall, and delayed recall (20 minutes later). Three attempts were given to correctly place each object.

### **Resultados y Conclusiones / Results & Conclusions**

The L-COVID group spent more time than the C group to complete the retrieval task in immediate and delayed trials. Also, the L-COVID group made more attempts than the C group to correctly place the virtual objects in the delayed trial. The object-location memory in a large-scale environment is impaired in a sample of individuals with long-COVID-19. The long-COVID-19 symptoms related to spatial memory emerge for the long-term storage of visuospatial associations.

Funding: Conselleria d'Innovació, Universitats, Ciència i Societat Digital de la Generalitat Valenciana (GVA-COVID19/2021/025); Gobierno de Aragón (Dpto. Ciencia, Universidad y Sociedad del Conocimiento) and FEDER "Construyendo Europa desde Aragón" (group: S31\_20D).



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## **SELF-CONCEPT AND LIFE SATISFACTION IN ACQUIRED BRAIN INJURY, A CASE REPORT (II)**

Neuropsychology

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Keywords: Self-Concept, Life Satisfaction, Acquired Brain Injury, Case

### **Objetivos / Objectives**

In Spain, in 2017, more than 78,000 people died from neurological disorders (ND) and, as in the rest of the world, it is among the leading causes of mortality and disability.

Objective: To analyze the different cognitive processes affected and to explore the levels of self-concept and life satisfaction in a patient with brain damage.

### **Metodología / Methodology**

A 52-year-old man suffered a traumatic brain injury in 2019, with bilateral temporoparietal and right frontal subarachnoid hemorrhage. Acute right frontoparietal subdural hematoma and right temporal and frontal subcentimetric contusive foci. The main sequelae are motor difficulties in the left hemibody, severe cognitive impairment amnesic-desjective, and grade II dependence, severe. He has been receiving neuropsychological treatment for a year and a half. A neuropsychological evaluation was carried out using TAVEC-test, Rey Figure Test, Trail Making Test A and B, WAIS-IV digits and Letters and Numbers, Tower of Hanoi, BADS Zoo Map, and KeySearch subtest. Self-concept was measured by Self-Concept Form 5 and life satisfaction by the Satisfaction with Life Scale.

### **Resultados y Conclusiones / Results & Conclusions**

The patient showed severe difficulties in all cognitive domains assessed: Verbal and visual memory, attention and processing speed, working memory, and executive functions. As for self-concept, he scored below his normative group in the social, emotional, and physical dimensions. High scores were observed on the life satisfaction scale. Conclusion: Although three of the areas of self-concept were impaired, the patient showed high life satisfaction. In future studies, it will be interesting to explore the relationship between the degree of impairment, deficit awareness, and life satisfaction in patients with ND.



**EFFECTS OF ACUTE ACADEMIC STRESS ON PSYCHOBIOLOGICAL RESPONSE AND THE RELATIONSHIP AMONG PSYCHOBIOLOGICAL RESPONSE, PERSONALITY TRAITS AND RECOGNITION MEMORY**

Neuropsychology

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Keywords: Keywords: Stress, Psychological Response, Recognition Memory, Personality Traits

**Objetivos / Objectives**

Every day people are exposed to events that can be experienced as stressful. These stressful events can cause hormonal, cognitive, and emotional changes in people. We intended to explore the effect of an acute stressor (examination) on psychobiological response in students as well as the relationship of these variables to the recognition of emotional and neutral pictures.

**Metodología / Methodology**

Seventy-six pre-graduate students of Psychology (10 men) participated in two separated sessions by two days: non-stressful session and stressful session (examination).

**Resultados y Conclusiones / Results & Conclusions**

Results showed that the students had higher levels of cortisol, DHEA, state anxiety and negative affect before the examination in the stressful session than in non-stressful session and after the examination in stressful session. Moreover, cortisol and DHEA levels were negatively related to the recognition of neutral pictures, also DHEA levels were negatively related to the recognition of positive pictures. In addition, students who presented higher levels of extraversion showed lower levels of cortisol and DHEA. Extraversion was negatively linked with subjective stress, whereas neuroticism was positively associated with subjective stress. In conclusion, results suggest that students facing an academic test experience an anticipatory response to the situation.

Cortisol and DHEA responses are related to an impairment in their ability to recognise neutral pictures, also DHEA response impair the recognition of positive pictures.

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**WORKING MEMORY TRAINING IN MULTIPLE SCLEROSIS PATIENTS: EFFECTS AND RELATION TO GRAY MATTER VOLUME**

Neuropsychology

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Keywords: Training, Nback, Working Memory, Multiple Sclerosis, Gray Matter Volume

**Objetivos / Objectives**

Cognitive impairment is common in Multiple Sclerosis (MS) and working memory (WM) is affected in most of these patients. N-back training is one of the most used paradigms to improve WM but their efficacy has been poorly studied in this clinical population. The aims of this study were: to examine the effects of n-back training in a sample of MS patients with different cognitive profiles and to study the relationship between the gray matter volume (GMV) and the training efficacy.

**Metodología / Methodology**

A group of 35 MS patients were radiological and neuropsychological assessed using the Brief Repeatable Battery of Neuropsychological Tests (BRB-N) and were subdivided in two groups regarding their cognitive status: cognitive preserved (CP, n=18) and cognitive impaired (CI, n=17). All patients performed 10 one-hour n-back training sessions. GMV for each patient was obtained using the CAT12 toolbox and pre-post behavior differences in the 2 and 3-back tasks were assessed using the possible maximum individualized improvement (PMPI) score.

**Resultados y Conclusiones / Results & Conclusions**

CI patients presented less GMV as compared to CP in different fronto-parietal and temporal cortical regions ( $p < 0.05$ ). Both groups showed improvements after training, but CI patients showed a significant lower PMPI median value as compared to CP in 2-back and 3-back ( $p < 0.05$ ). Positive significant correlations were observed between the 3-back PMPI index and different cortical regions ( $p < 0.05$ ) in CI patients. In conclusion, WM training has a positive effect in all MS patients, but the effectiveness of training differs between patients regarding their cortical GMV.



## DEMYELINATION OF THE HIPPOCAMPAL COMMISSURE IN ALZHEIMER'S DISEASE

Ageing and dementia

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Keywords: Alzheimer's Disease, Demyelination, Hippocampus, Electrophysiology, Connectivity

### Objetivos / Objectives

Alzheimer's disease (AD) is characterized by a long presymptomatic period that can last decades, with alterations preceding cognitive deterioration. There is evidence of early demyelination in the hippocampus and fornix. Our work aims to evaluate that there is demyelination of the hippocampal commissure, a pathway that connects both hippocampi.

### Metodología / Methodology

We have analyzed the electroencephalographic recordings between the temporal regions of both hemispheres in healthy controls, patients diagnosed with mild cognitive impairment and Alzheimer's patients of similar age. We have also performed nuclear magnetic resonance to analyze the hippocampal commissure by diffusion tensor imaging. On the other hand, we have analyzed the hippocampal commissure by immunohistochemistry in mice.

### Resultados y Conclusiones / Results & Conclusions

Our preliminary results show a progressive desynchronization of temporal oscillations with cognitive decline. In addition, we have observed a loss of phase coupling between both hemispheres in the 8-13 Hz band, which would indicate a decrease in connectivity between the temporal regions. We also found differences in fractional anisotropy and apparent diffusion coefficient between groups, suggesting myelin loss. The immunohistochemical study in AD mice also shows demyelination of the commissure. In conclusion, preliminary results support the demyelination of this region, which would contribute to hippocampal memory failure.



## NEUROPROTECTIVE EFFECTS OF INSULIN-LIKE GROWTH FACTOR II IN A MOUSE MODEL OF PARKINSON'S DISEASE

Ageing and dementia

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Keywords: Insulin-Like Growth Factor II, Neuroprotection, Parkinson's Disease

### Objetivos / Objectives

Progressive degeneration of the nigrostriatal dopaminergic pathway is a core, currently irreversible pathological hallmark of Parkinson's disease (PD) that leads to a variety of motor and non-motor symptoms. Here, we aimed to study the potential neuroprotective effects of insulin-like growth factor II (IGF-II) in a PD mouse model based on the chronic administration of 1-methyl-4-phenyl-1,2,3,6-tetrahydropyridine and probenecid (MPTP/p), which induces loss of dopaminergic neurons in the Substantia Nigra pars compacta (SNc)

### Metodología / Methodology

Male C57BL6/J mice (N=36) received a 5-week treatment with MPTP/p (or vehicle) and were co-treated with chronic IGF-II (or saline) from either the beginning of the procedure (plus an additional week, days 1-44) or once the MPTP/p insult was already triggered (days 21-44). Baseline and post-treatment measurements for motor performance in the Rotarod and self-grooming in an Open Field were taken. Likewise, dopaminergic (TH, DAT) and neuroinflammatory-related (GFAP) markers in the SNc and the dorsal striatum were studied by immunohistochemistry.

### Resultados y Conclusiones / Results & Conclusions

Our results revealed that both early and delayed IGF-II co-treatment were successful in preventing motor and behavioral impairment in the MPTP/p model. Moreover, chronic IGF-II



protected against MPTP/p-induced loss of dopaminergic neurons in the SNc and promoted a significant recovery of dopaminergic activity in the terminals located in the dorsal striatum, further reducing reactive astrogliosis in these brain regions. Thus, we demonstrated the neuroprotective role of IGF-II in a mouse model of PD, highlighting its potential as a promising therapeutic target for treating this disease.

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**TRANSCRANIAL DIRECT CURRENT STIMULATION IN ADDICTION:  
STUDY PROTOCOL OF AN ONGOING DOUBLE- BLIND,  
RANDOMIZED, CONTROLLED CLINICAL TRIAL**

Brain electrical correlates and neuromodulation

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Keywords: Neuromodulation, Transcranial Direct Current Stimulation, Addiction, Inhibitory Control, Functional Near Infrared Spectroscopy

**Objetivos / Objectives**

The maintenance of the abstinence period is still the main challenge of the addiction rehabilitation at present. This neuromodulation study focuses on the effect of transcranial direct current stimulation (tDCS) on the addiction rehabilitation treatment adherence by means of the modulation of the patient's inhibitory control in different stages of their addiction rehabilitation process.

**Metodología / Methodology**

This study is a double-blind, randomized, controlled clinical trial consisting in the administration of 10 sessions (2 mA/20 min) of bilateral dorsolateral prefrontal cortex tDCS stimulation in a sample that is receiving an addiction rehabilitation treatment.

The intervention will be administered at two different phases: at  $\approx 15$  days upon arrival at the center (initial phase) and  $\approx 50$  days upon arrival at the center (advance phase).

The outcome measures will be (1) inhibitory control assessed through the Iowa Gambling Task and the Go/no-go task (2) levels of impulsivity, compulsivity, depression, anxiety and quality of life assessed by questionnaires, (3) craving, (4) fatigue, (5) metabolomic changes and (6) prefrontal and motor resting-state connectivity measures through functional near infrared spectroscopy. These measures will be taken at the beginning and ending of each phase.

**Resultados y Conclusiones / Results & Conclusions**

The hypothesis of this work is that the tDCS treatment will improve the outcome measures benefitting the substance addiction rehabilitation processes contributing to a better understanding of the potential difference of the treatment depending on the targeted rehabilitation phase.

The present study has been funded by the University of Almería: UAL2020-CTS- D2052, the Junta de Andalucía (P20\_00308 and P18-RT-1886) and the Spanish Ministry of Science and Innovation (PID2019-108423RB-I00).



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## NEUROFEEDBACK TRAINING FOR COGNITIVE REHABILITATION IN TRAUMATIC BRAIN INJURY

Brain electrical correlates and neuromodulation

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Keywords: Traumatic Brain Injury, EEG, Neurofeedback, Cognitive Rehabilitation

### **Objetivos / Objectives**

Traumatic brain injuries (TBI) are characterized by changes in brain oscillatory activity associated to physical, behavioral, and cognitive deficits. Long-term cognitive deficits like reduced speed processing, attention, memory and executive functions impair daily functioning. Studies analyzing changes in EEG activity in TBI survivors indicate a generalized slowing of brain activity characterized by the overexpression of slow wave frequency bands like delta (0.5-4Hz) and theta (4-8Hz). Neurofeedback (NFB), intended to enable individuals to modulate their brain electrical activity, is a non-invasive technique that can be useful in cognitive rehabilitation. An important body of evidence suggests that NFB might be a promising technique to improve cognition in clinical and non-clinical populations. Indeed, it has been successfully used in TBI and stroke to remediate attention and memory deficits.

### **Metodología / Methodology**

In the present work we review the available evidence regarding those significant changes in brain electrical activity as well as the results of interventions using specific NFB protocols in order to improve cognitive functioning in TBI survivors.

### **Resultados y Conclusiones / Results & Conclusions**

Although there are no specific EEG patterns in TBI, the most consistent findings across studies are attenuated posterior alpha (8-12Hz) and increased theta (focal or diffuse) and delta power. Differences in alpha and beta (12.5-30Hz) power between anterior and posterior cortical regions are reduced. Studies following the application of specific protocols are scarce, but alpha reinforcement and theta inhibition training to reduce theta-alpha amplitude ratio could have some benefit in sustained attention, long-term memory and visual learning.

Funding: Ministerio de Ciencia, Innovación y Universidades (PGC2018-094937-B-100), Spain.



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**SEXUALLY DIFFERENTIATED RESPONSE TO THE ANXIOGENIC  
DRUG FG-7142 AND TO THE INFRALIMBIC DEEP BRAIN  
STIMULATION IN RATS**

Brain electrical correlates and neuromodulation

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Keywords: Deep Brain Stimulation; Anxiety; Electrophysiology

**Objetivos / Objectives**

Anxiety and depression are the most prevalent mental illnesses worldwide. Both exhibit high comorbidity, affect especially women and share the disruption of the amygdalo-hippocampal-prefrontal circuit, involved in the emotional and cognitive management that is altered in both pathologies. Deep brain stimulation of the infralimbic cortex (DBS-IL), as well as its anatomical equivalent in humans, the anterior cingulate cortex (ACC), is a fast antidepressant treatment. However, its mechanisms of action remain partially unknown. We hypothesize that this effect is due, at least in part, to its ability to control the anxious component of depression.

**Metodología / Methodology**

We investigated the involvement of the amygdalo-hippocampal-prefrontal circuit in a pharmacological model of anxiety (FG-7142), as well as to analyse the therapeutic basis of deep brain stimulation. We analysed the oscillatory activity of the amygdalo-hippocampal circuit in male and female rats under the effect of FG-7142 and in response to deep brain stimulation. Also, we characterised the neuronal activation within a major network involved in the pathophysiology of depression and anxiety in male and female rats.

**Resultados y Conclusiones / Results & Conclusions**

FG-7142 induced a characteristic oscillatory pattern and communication subnetworks in the amygdalo-hippocampal circuit as well as an increase of c-fos in key areas related to the pathophysiology. Interestingly, we found sexually differentiated patterns of hyperactivation. On the other hand, our results show that one hour of deep brain stimulation of the infralimbic cortex induces a consistent reversal of the altered activity of this circuit.



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## **EFFECTS TRANSCRANIAL DIRECT-CURRENT STIMULATION ON FRONTAL CORTEX IN A PRECLINICAL MODEL OF COMPULSIVITY**

Brain electrical correlates and neuromodulation

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Keywords: Compulsivity, Schedule-Induced Polydipsia, Transcranial Direct Current Stimulation, Neuromodulation

### **Objetivos / Objectives**

The aim of the present study was to assess the therapeutic effectiveness of cathodal (a) and anodal (b) tDCS on Schedule Induced Polydipsia (SIP), a preclinical model of compulsivity.

### **Metodología / Methodology**

For that purpose, male Wistar rats that developed high rates of drinking behavior on SIP were divided into three equivalent experimental groups: atDCS; ctDCS; control. All animals were subjected to a constant current of 0.5mA intensity applied for 20 min/8 days; control group were connected without stimulation. In both types of stimulation, the center of the electrode was placed at the midpoint of the lateral angle of the eyes to stimulate the frontal cortex and the other electrode was located on the ventral torso. One day after animals were re-exposed to SIP.

### **Resultados y Conclusiones / Results & Conclusions**

The results will be discussed in terms of the possible effects of neurostimulation by cathodal and anodal tDCS on frontal cortex to reduce compulsive behavior on SIP. Neuromodulation using tDCS might induce neuroplastic changes in the inhibitory control brain circuit, pointing towards a potential treatment for compulsive spectrum disorders.

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**CATHODAL STIMULATION ON THE RIGHT TEMPOROPARIETAL  
JUNCTION FACILITATES PSEUDOWORD READING IN SPANISH: A  
TDCS STUDY**

Brain electrical correlates and neuromodulation

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Keywords: Reading Aloud, Right Temporoparietal Junction, Transcranial DirectCurrent Stimulation

**Objetivos / Objectives**

Previous research has shown that transcranial direct current stimulation (tDCS) at the right temporoparietal junction (TPJ) could facilitate word reading in adult readers. However, some recent results in Spanish show that anodal stimulation in CP6 produces longer reaction times in word naming but not in pseudoword naming. To further explore this interference effect, the present study uses cathodal stimulation at CP6.

**Metodología / Methodology**

A sample of 34 high- and low-ability readers (21 and 13, respectively) was selected. Participants performed various naming tasks (words and pseudowords) just before receiving stimulation and during the last 20 minutes of a tDCS session.

**Resultados y Conclusiones / Results & Conclusions**

Regardless of reading ability, no significant effect was found on word reading. Furthermore, shorter reaction times for naming pseudowords were found during verum stimulation compared to the SHAM condition. These results tentatively suggest that inhibition of the right TPJ might facilitate reading through the sublexical single-word reading pathway. Implications of these findings for the neurobiological basis of word reading are discussed.



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## LINEAR AND NON LINEAR ANALYSES IN A GROUP OF ASD CHILDREN DURING RESTING STATE CONDITION

Developmental Psychobiology

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Keywords: ASD, Complexity Metrics, Multiscale Entropy, Power Spectral Density, Variability

### **Objetivos / Objectives**

The present study analyzes the underlying neural mechanisms of a group of children diagnosed with Autism spectrum disorder (ASD) compares with a group of normally developing children, both aged 5 to 11 years.

### **Metodología / Methodology**

Resting-state EEG data were obtained in the open eyes condition. Linear measures, such as absolute and relative power spectral density (PSD), as well as nonlinear measures, such as multiscale entropy (MSE), were used. For PSD analysis, the logarithm of PSD was computed and then averaged over different frequency bands (ultradelta, delta, theta, alpha, lowbeta and highbeta). The MSE calculation was performed with a coarse-grained procedure on 66 time scales.

### **Resultados y Conclusiones / Results & Conclusions**

Absolute PSD results show a decrease with age in all frequency bands in both groups, as well as a main group effect when controlling for age, in the beta and highbeta frequency band (ASD > controls). Relative PSD shows differences between groups in the theta (controls > ASD) and high beta (ASD > controls) band when controlling for age of subjects. The MSE results show an increase in complexity as the number of scales increases in all areas analyzed and for both groups analyzed. However, the change in MSE with age is more variable in the ASD group, showing a decrease at younger ages and then increasing with increasing age when compared to controls. The main differences in MSE were found in coarse scales with lower complexity for the ASD group. All these results suggest a difference between the groups in high frequency bands and a different complexity in ASD compared to control children.



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**TIME-FREQUENCY DIFFERENCES BETWEEN CONTROLS AND ADHD CHILDREN DURING A WORKING MEMORY TASK**

Developmental Psychobiology

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Keywords: ADHD, Working Memory, Delayed Match-To-Sample Task, Theta Band

**Objetivos / Objectives**

Working Memory (WM) impairments have been frequently observed as an important feature of attention-deficit/hyperactivity disorder (ADHD). In the present study, we tried to test if during a Delayed Match-to-Sample (DMTS) experimental paradigm, time-frequency differences appear between controls and ADHD children.

**Metodología / Methodology**

For this purpose, a sample of children composed of 35 healthy control subjects and 29 ADHD subjects aged 6-17 years were recorded with 32 electrodes during a DMTS task. EEG was analyzed by mean of wavelet transform. Selected bands and electrodes were analyzed by means of a bivariate regression model including age and group.

**Resultados y Conclusiones / Results & Conclusions**

The results showed that controls present an increase in Event Related Spectral Power in the theta band, during the encoding and matching phases, in comparison to the ADHD group. The present data suggest that the behavioral differences that have been reported between both groups are due to an impaired encoding and matching of the presented items in ADHD.



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**MODULATION OF BEHAVIORAL AND PHYSIOLOGICAL EFFECTS OF  
PRENATAL EXPOSURE TO CHLORPYRIFOS BY GESTATIONAL  
TREATMENT WITH A PROBIOTIC SUPPLEMENTATION**

Developmental Psychobiology

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Keywords: Neurodevelopment, Chlorpyrifos, Autism, Probiotic, Microbiota

**Objetivos / Objectives**

Autism Spectrum Disorder (ASD) is a heterogeneous neurodevelopmental disorder with a complex etiology characterized by early-appearing communication deficits, social impairment and repetitive sensory-motor behaviors, activities or interests.

Although the important role of genetics in autism is undeniable, it is also modulated by external environmental variables. The prenatal exposure to Chlorpyrifos (CPF) has proved to have medium and long-term behavioral and molecular effects that are reminiscent of those observed in autism. Furthermore, gastrointestinal issues and dysbiosis are common comorbidities in this disorder. In recent years, links between the gut microbiota and ASD have been established. In fact, CPF exposure has been proved to induce dysbiosis in animal models. Based on this, we consider that ASD-like behaviors following gestational CPF exposure could be reverted by exposing animals to a probiotic supplement during gestation. We also aimed to study the gene expression levels of important genes for the principal neurotransmitter systems and the expression of some cytokines as a marker of neuroinflammation.

**Metodología / Methodology**

Wistar Rats' performance in the 3-Chambered Test, the Open Field Test and the emission of ultrasonic vocalizations by pups (PND7) in an isolated condition were observed. RTqPCR was conducted in microplates, composed of SYBR green mastermix, nuclease-free water, primers, and the cDNA.

**Resultados y Conclusiones / Results & Conclusions**

We found that probiotic supplementation affected development and different behaviors (motricity, vocalizations) during neonatal and adolescent ages and genes from the main neurotransmitter systems. In future studies, it should be analysed the levels of relevant proteins in the brain and the composition of the gut microbiota.





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**INTERPLAY OF EARLY LIFE STRESS, NUTRITION, AND IMMUNE  
ACTIVATION PROGRAMS ADULT EMOTIONAL RESPONSES AND  
BRAIN METABOLISM**

Developmental Psychobiology

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Keywords: Early Life Stress, High-Fat and High-Sugar Diet, Infection, Depression, Anxiety

**Objetivos / Objectives**

Multiple environmental factors exert a significant impact during the early stages of neurodevelopment and behavior. Among them, nutrition and early stress are two common key factors that influence early life programming of neurodevelopment. In addition, maternal immune activation caused by common viral or bacterial infections has also been found to alter offspring neurodevelopment and increase the risk for several mental disorders. However, the combined effects of diet, early life stress, and immune activation on brain function and behavior are currently unknown. Therefore, the purpose of this study was to assess in male and female rats the effects of maternal and postnatal consumption of an obesogenic diet and exposure to early life stress on depression-like and anxiety-like behaviors.

**Metodología / Methodology**

The combined effects after maternal and postnatal exposure to a high-fat, high-sugar (HFS) diet, early-life stress by maternal separation and maternal administration of the bacterial endotoxin lipopolysaccharide (LPS) were evaluated in adult Wistar rats. The possible effects on anxiety-like and depression-like behaviors were measured using the elevated zero-maze and forced swim test respectively.

**Resultados y Conclusiones / Results & Conclusions**

Significant behavioral effects were found for specific combinations of the environmental factors studied, with compensatory effects also emerging between several factors. Consumption of HFS diet and exposure to early-life stress showed a compensatory effect between them. Conversely, maternal LPS administration increased anxiety-like and depression-like behaviors in all experimental groups, regardless of exposure to the other environmental factors.

The combination of multiple adverse environmental shows sex-specific and complex synergies, not merely additive effects.



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## **PRENATAL EXPOSURE TO LOW DOSES OF CHLORPYRIFOS IMPAIRS LEARNING AND MEMORY ON APOE4 TRANSGENIC MICE**

Learning and memory

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Keywords: Learning, Memory, ApoE4, Chlorpyrifos, Mice

### **Objetivos / Objectives**

Pesticides have toxic properties that cause adverse health effects, especially when the exposure occurs in the early stages of life. The exposure to the widely used organophosphate pesticide chlorpyrifos (CPF) has been associated with increased hazard of developing neurodegenerative diseases, such as Alzheimer's (AD) or Parkinson's disease. Moreover, there is a growing evidence which points out that individual genetics influence the response to a toxic exposure. The apolipoprotein E (ApoE) gene is one of the most studied candidates in relation to AD. In fact, the ApoE4 isoform is the strongest genetic risk factor for sporadic AD in women. Hence, the aim of this study is to assess learning and memory in humanized ApoE3 and ApoE4 homozygous mice prenatally exposed to CPF at very low doses which are relevant for human exposures.

### **Metodología / Methodology**

Animals were exposed to 0 or 1 mg/kg/day of CPF through the diet, from gestational day 12 to 18. At 3 months of age, learning and memory were assessed by a Morris water maze (MWM) test.

### **Resultados y Conclusiones / Results & Conclusions**

Results showed differences between genotypes, being ApoE4 mice the ones that have the worst learning, especially the females. Moreover, ApoE4 mice also showed an affectation in memory when they were treated with CPF; furthermore, when results were analyzed by sex, we realized that females were the most affected ones. This suggests that prenatal exposure to CPF could affect learning and memory of ApoE4 young females, which is in accordance with the epidemiological data previously observed in humans.



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**THE ROLE OF THE GOLDFISH TELENCEPHALIC PALLIUM IN TASTE AVERSION LEARNING\_ A LESION AND VOLTAGE SENSITIVE DYE IMAGING STUDY**

Learning and memory

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Keywords: Telencephalic Pallium, Teleost, Gustation, Taste Aversion Learning, Optical Recording

**Objetivos / Objectives**

Recent studies indicate that the dorsomedial (Dm) region of the teleost telencephalic pallium is a heterogeneous division comprising an area likely homologue to the mammalian amygdala, involved in emotional processing, and also discrete sensory areas. Tract-tracing studies have revealed the presence of direct ascending gustatory pathways to Dm, however data on the role of Dm in gustatory processing, and specially on taste aversion conditioning, are scarce.

**Metodología / Methodology**

We use gustatory sensory stimulation, behavioral taste aversion conditioning procedures, lesion techniques, and in vivo voltage sensitive dye imaging to assess the functional identity of the different subregions of Dm.

**Resultados y Conclusiones / Results & Conclusions**

The analysis of the spatiotemporal dynamics of the gustatory evoked response revealed that Dm encodes gustatory stimulus features, and suggests that the area Dm3 could provide the substrate for complex representation of gustatory stimuli. In a follow-up experiment we first trained goldfish in a taste aversion learning (TAL) procedure in which during successive days one flavor (CS+) was followed by a lithium chloride injection and the other flavor (CS-) was followed by a saline injection. After training, we imaged the pallial response during the retrieval of the learned response during the presentation of the CS+ and CS- flavors. The results showed significant differences in the level of activity of Dm3 and the putative homologue of the amygdala (Dm2) after CS+ or CS- presentations. Finally, in a lesion experiment we observed that Dm2 and Dm3 lesions, but not Dm1 or Dm4 damage impaired the acquisition of a TAL procedure.

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## ROTATION ANGLE AND DIRECTION OF ROTATION MODULATE PERFORMANCE IN A SPATIAL RECOGNITION TASK

Learning and memory

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Keywords: Spatial Memory, Recognition, Rotation Angle

### **Objetivos / Objectives**

The use of perspective in the evaluation of spatial memory has facilitated the development of simpler tasks that facilitate neuropsychological evaluation. Different studies have shown that the angle of rotation and the direction of rotation could be modulating variables of performance. In this study we evaluate the influence of perspective, using the angle of rotation and the direction of rotation as variables in the execution of the Almería Spatial Memory Recognition Test (ASMRT).

### **Metodología / Methodology**

For this, we apply the test to a sample of university students ( $n=72$ ) between 20 and 30 years old. They must memorize and recognize the position of a certain number of boxes in a virtual room. In the recognition image, the room is shown from different angles, with respect to the original image, being possible to play with both the angle and the direction of rotation of the image.

### **Resultados y Conclusiones / Results & Conclusions**

The analyzes showed that the participants made more errors when the angle of rotation with respect to the original image was greater than  $60^\circ$ . In addition, turning anticlockwise made it difficult to perform the task. Those trials in which both variables coincided were more complex. On the other hand, it was also observed that there was sexual dimorphism in execution, with men showing better performance compared to women. Although there does not seem to be an influence of the turn and the angle of rotation on the different sexes. It's important to evaluate these variables in order to establish better orientation and memory assessment tests in humans.



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**PATTERNS OF COLLATERALIZATION OF MIDLINE BRAINSTEM  
RAPHE AND INCERTUS NUCLEI TO THE SEPTOHIPPOCAMPAL  
SYSTEM**

Learning and memory

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Keywords: Nucleus Incertus, Entorrinal, Relaxin 3, Raphe Nucleus

**Objetivos / Objectives**

The nucleus incertus 3 (RLN3) and the serotonergic raphe nuclei are modular parts of the central nervous system that affect several brain functions, including contextual behaviors of the septohippocampus. This work seeks to define the mechanism by which the serotonergic cluster of the midbrain receives afferents from the NI and the projection of the NI to the SM.

**Metodología / Methodology**

For this purpose, we injected retrograde fluorogold (FG) subunit B tracers of cholera toxin (CTB) into the medial septum (MS) and hippocampus associated with immunofluorescence of 5HT, RLN3 and CTB.

**Resultados y Conclusiones / Results & Conclusions**

Our results show a high density of RLN3 projection fibers in the medial and dorsal regions of the raphe. In these same zones, RLN3 fibers are found close to the 5HT neuronal soma, while others show synaptic connections. Some 5HT neurons originating from the MS have been revealed in the medial and dorsal raphe. Finally, a number of neurons from the SuM send signals to the entorhinal/hippocampal system and MS. In addition, this group of neurons receives RLN3 from the NI. These results reveal the division of the modulatory circuit between RLN3 from NI and 5HT from Raphe, as well as its interaction with the septohippocampus, which receives projections from SuM. Based on this evidence, we can conclude that SuM is a relevant component of NI upstream projections in the entorhinal-hippocampal circuit that is involved in memory generation, encoding and retention.



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**SCHEDULE-INDUCED ALCOHOL INTAKE MODULATES  
HIPPOCAMPAL SYNAPTIC PLASTICITY AND SPATIAL MEMORY IN  
ADOLESCENT RATS**

Learning and memory

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Keywords: Ethanol, Self-Administration, Spatial Memory, LTP, Hippocampus

**Objetivos / Objectives**

Our previous results showed that the intermittent administration of ethanol in adolescent animals impaired hippocampus-dependent spatial memory, and this was more deleterious under conditions of excessive ethanol administration. In the current study, we wanted to elucidate the effects of binge alcohol consumption on learning and memory in adulthood via a model of induced drinking during adolescence.

**Metodología / Methodology**

In order to obtain an elevated rate of alcohol self-administration, adolescent male and female Wistar rats were subjected to a schedule-induced alcohol intake procedure, while hippocampus-dependent spatial memory was assessed in the Y-maze. We also studied the effects of schedule-induced alcohol consumption during adolescence on hippocampal synaptic transmission and plasticity, as well as the expression levels of AMPA and NMDA glutamate receptor subunits and GSK3 $\beta$ .

**Resultados y Conclusiones / Results & Conclusions**

The results showed that both male and female rats presented a similar drinking pattern throughout the sessions of the schedule-induced drinking protocol, and both sexes exhibited elevated blood alcohol levels. Nevertheless, only male rats that consumed alcohol presented spatial memory impairment in the Y-maze in concordance with the inhibition of hippocampal synaptic plasticity mechanisms observed in the same group. On the other hand, alcohol did not modify hippocampal gene expression of AMPA and NMDA glutamate receptor subunits or GSK3 $\beta$ . In conclusion, alcohol intake during adolescence seems to have a negative impact on spatial memory and hippocampal synaptic plasticity in a sex-dependent manner, although both sexes exhibit similar blood alcohol concentrations and drinking patterns.



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## EFFECT OF DIFFERENT CONFIGURATIONS ON REINSTATEMENT OF CONDITIONED PLACE PREFERENCE AND C-FOS EXPRESSION

Learning and memory

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Keywords: Conditioned Place Preference, Cocaine, Memory, Reinstatement, C-Fos Expression

### **Objetivos / Objectives**

Addictive drugs are potent neurophysiological agents capable of inducing long-lasting changes in brain circuits responsible for learning and memory. Exposure to environmental stimuli associated with the drug administration can trigger relapse after abstinence. An animal model widely used for evaluating the conditioned effects of addictive drugs is the Conditioned Place Preference (CPP). Two configurations used are “One-compartment” (1C; animals have access to the whole CPP apparatus) and “Two-compartments” (2C; animals are confined to one side). The aim of this experiment is to evaluate the neurobiological impact of exposure to different configurations in the memories of acquisition, extinction and reinstatement of cocaine-induced CPP.

### **Metodología / Methodology**

1C or 2C configurations were used in the acquisition and extinction phases in male C57BL/6 mice. Brain was collected after reinstatement test to analyze c-fos expression.

### **Resultados y Conclusiones / Results & Conclusions**

No differences were found in the acquisition or extinction of cocaine-induced CPP. However, animals trained following a 2C configuration reinstated CPP after receiving a subthreshold dose of cocaine, while the 1C group did not. Activation of the CA1, Dental Gyrus and Lateral Habenula was associated with 2C configuration on cocaine-induced reinstatement. Activation of the Lobule VIII and IX of the Cerebellum was associated with the cocaine administration on reinstatement. Our data suggest and the involvement of the hippocampus and habenula may be modulated by apparatus configuration. Understanding how different stimuli configurations trigger cocaine-induced memories to induce relapse and whether they recruit similar or distinct neural mechanisms, is critical for the development of more effective pharmacotherapies to reduce the risk of relapse.



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**OCCURRENCE OF TRAUMATIC EVENTS AND DISSOCIATIVE SYMPTOMATOLOGY ON WOMEN DIAGNOSED WITH ANOREXIA NERVOSA: A PILOT CASE-CONTROL STUDY IN A GALICIAN SAMPLE**

Cognition and emotion

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Keywords: Anorexia, Dissociative Disorder, Trauma, Stress

**Objetivos / Objectives**

Anorexia Nervosa (AN) significantly impairs life quality. Stressful events can trigger AN symptomatology, even facilitating episodes of dissociation. This relationship between AN, stress and dissociation has not been extensively studied in the literature. The goal of this work was to explore and give visibility to the relationship between AN, stressful events and dissociation.

**Metodología / Methodology**

We recruited 40 women (20 with AN, 20 control) from the Galician population. They fulfilled the Dissociative Experiences Scale (DES), the Life Events Questionnaire (CVS), and the Food Attitudes Test (EAT-40). We used the Mann-Whitney U test to compare group scores. Also, we performed a Spearman correlation analysis to explore the relationship between variables.

**Resultados y Conclusiones / Results & Conclusions**

The results obtained indicate that the patients with AN had higher scores in dissociative symptomatology and stress than the control group. However, we did not observe a relationship between dissociative symptomatology and the severity of the disorder. Our results suggest that dissociative episodes may occur as a spillover mechanism rather than a gradient response to stress in women with AN.





## A CHEMOGENETIC APPROACH TO DISENTANGLE THE BRAIN CIRCUIT FUNCTION IN HIGH COMPULSIVE RATS

Cognition and emotion

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Keywords: Compulsivity; Schedule-Induced Polydipsia; Chemogenetics; DREADD; HM4Di; HM3Di

### Objetivos / Objectives

Compulsivity is associated with the loss of inhibitory control over a broad range of behaviors that are prone to excess. Preclinical and clinical studies on compulsivity have demonstrated that fronto-limbic structures are implicated in the pathophysiology of compulsive spectrum disorders. The present study was designed to assess the effects of chemogenetic stimulation or inhibition of orbitofrontal cortex (OFC)-amygdala circuit in a preclinical model of compulsivity.

### Metodología / Methodology

Initially, male Wistar rats (approx. 300 g) were selected as either high compulsive (HD) or low (LD) drinkers according to their level acquisition of water intake (ml) on schedule-induced polydipsia (SIP, fixed timeschedule of 60s) after 20 sessions. In a first experiment, we used designer receptor-mediated inhibition (hM4Di) in HD and LD rats' OFC. In a second experiment, we used designer receptor-mediated activation (hM3Dq) in HD and LD rats' amygdala. Finally, we re-exposed rats to SIP. Repeated measured ANOVA revealed no significant effects nor by the chemogenetic OFC inhibition, nor by the chemogenetic amygdala activation in the water intake of HD and LD rats on SIP.

### Resultados y Conclusiones / Results & Conclusions

The chemogenetic inhibition or activation of the OFC-amygdala circuit did not have effect on the compulsive behavior observed on SIP. Future studies should explore other brain areas implicated in the inhibitory control, such as medial prefrontal cortex, with chemogenetic stimulation on preclinical models of compulsivity to identify the underlying mechanisms related to obsessive-compulsive disorder.



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## **PREVENTION OF COMPLICATED GRIEF IN UNIVERSITY STUDENTS**

Cognition and emotion

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Keywords: Grief, Prevention, Students, Coping, Cognitive-Behavioral

### **Objetivos / Objectives**

Grief is a process of oscillation between loss-oriented coping and restoration-oriented coping, which can lead to complicated grief depending on the use of coping strategies. It is necessary to prevent it in university students because it generates problems in different areas of their lives. This synchronous workshop aimed to implement psychological intervention strategies to prevent complicated grief

### **Metodología / Methodology**

Five modules were worked on, 10 female university students participated, with an average age of 21 (SD=19), a non-probabilistic sampling and a pre-experimental design were carried out, the Stress Coping Questionnaire (SCQ) was applied, which evaluates 7 factors in 2 areas, the Emotion-Focused Coping Strategies (EFC) and the Problem-Focused Coping Strategies (PFC) and the Inventory of Complicated Grief (ICG)

### **Resultados y Conclusiones / Results & Conclusions**

In the pre-test, low frequency was identified in the use of the EFC (M=21.5, SD=7) and PFC (M=14.9, SD=7), in addition to a greater probability of developing a complicated grief (M=39.1, SD=17); In the post-test, the data remained in the range of low frequency use of the EFC (M=19, SD 3.3) and PFC (M=21.1, SD=5.7).

However, there was an increase in both, and the probability of developing a complicated grief decreased (M=22.9, SD=14.21), in addition, a small effect size was obtained in the EFC (r=0.38) and in the PFC (r = -0.16), and high in the probability of developing a complicated grief (r=0.85). The results suggest that it is possible to prevent complicated grief in university students by promoting PFC through cognitive behavioral techniques.



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**IDENTIFICATION OF A DISCRETE REGION OF THE DORSOMEDIAL  
AREA OF THE GOLDFISH TELENCEPHALON WHOSE ACTIVATION  
PRODUCES AVERSION IN A CONDITIONED PLACE PREFERENCE  
PROCEDURE**

Cognition and emotion

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Keywords: Teleost Fish, Telencephalic Pallium, Avoidance, Place Conditioning

**Objetivos / Objectives**

The dorsomedial area of the telencephalic pallium (Dm) of teleost fish is involved in emotional processing, and it is widely accepted that this structure is homologous to the pallial amygdala of land vertebrates. Nevertheless, this region is not a homogeneous structure in neuroanatomical terms, but can be subdivided into several subregions whose functional role remains still unknown. The objective of this experiment is to analyze whether the Dm subregions are differentially involved in emotional processing.

**Metodología / Methodology**

The possible aversive effects of intracerebral electrical microstimulation in the area Dm1 versus the area Dm2 were assessed by means of a conditioned place avoidance procedure.

**Resultados y Conclusiones / Results & Conclusions**

Electrical microstimulation through microelectrodes localized in Dm2 produced a powerful aversive effect. Animals receiving electrical stimulation at Dm2 consistently learned to avoid the stimulation-contingent compartment throughout the different reversals of the procedure. By the contrary, stimulation of Dm1 did not produce any significant change in place preference. These results indicate that the activation of the Dm2 area, but not the Dm1 area, produces a powerful aversive reinforcer, suggesting that the area Dm2 is part of a brain circuit for processing negative incentive attribution and encoding of emotional memories in teleost fish.

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## THE EFFECTS IN RISKY DECISION MAKING IN A PRECLINICAL MODEL OF ISCHEMIC STROKE

Cognition and emotion

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Keywords: Decision-Making, Stroke, Rodent Gambling Task, Medial Prefrontal Cortex, Endothelin-1

### Objetivos / Objectives

In the present study, we assessed impulsive decision-making behavior in a preclinical model of stroke.

### Metodología / Methodology

Male Wistar rats were trained on Rodent Gambling Task (rGT), a rodent analogue to Iowa Gambling Task, where rats choose among four different holes to gain as many sugar pellets as possible within 30 min and each hole was associated with the probability to gain a reward or to be punished. Once learning criteria stability was achieved, animals underwent focal ischemia induced in the medial Prefrontal Cortex (mPFC) using bilateral intracerebral injections of endothelin-1, or sham surgery.

Subsequently, we carried out a second phase of rGT in both groups of rats to assess impulsive decision making after the stroke damage

### Resultados y Conclusiones / Results & Conclusions

Results: The results will be discussed in terms of the effects of stroke on mPFC and the long term alterations in inhibitory control deficit behaviors such as impulsive risky decision making, perseverative responses and behavioral flexibility. Conclusions: Preclinical models of focal stroke in the mPFC could help to understand the cognitive impairments and the association with the neuroplastic changes after damage.

Funded by Gobierno de España MCIN/ AEI /10.13039/501100011033/ grant number PGC2018-099117-B-C21 and UAL2020-CTSD2068 FEDER I+D+I “Una manera de hacer Europa”.



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**INDIVIDUAL DIFFERENCES IN RISK DECISION-MAKING STRATEGIES: AN STUDY USING A RAT GAMBLING TASK**

Cognition and emotion

**Teresa López-Hernández**, Natalia De Las Heras-Martínez, Manuela Olmedo-Córdoba, Ángeles Prados-Pardo, Daniel Jesús Cruz-Garzón, Margarita Moreno, Elena Martín-González

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Keywords: Decision-Making, Rodent Gambling Task, Impulsivity, Individual Differences.

**Objetivos / Objectives**

The aim of this study was to assess the differences in the individual strategies of decision-making.

**Metodología / Methodology**

Here, twenty adult male Wistar rats were trained on the rat Gambling Task (rGT), a rodent analogue to IGT where rats choose among four different holes to gain as many sugar pellets as possible within 30 min. Each hole was associated with the probability to gain a reward or to be punished. Animals were divided in two groups, good decision and bad decision, depending on their performance on the rGT and variables related to inhibitory control were measured. Moreover, we explore different decision-making strategies that might be underlying the good/bad performance behavior on rGT.

**Resultados y Conclusiones / Results & Conclusions**

Results will be discussed in terms of win-stay or lose-shift strategies and their relation with inhibitory control domains. The rGT is a useful tool to study the neurobehavioral basis of gambling behavior and individual characterization of bad performers might be important to improve detection and treatment of gambling disorders.

Funded by Gobierno de España MCIN/ AEI /10.13039/501100011033/ grant number PGC2018-099117-B-C21 and UAL2020-CTSD2068 FEDER I+D+i “Una manera de hacer Europa”.



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## **WOMEN'S PROSOCIAL BEHAVIOR IN GROUPS: EFFECTS OF GROUP SEX COMPOSITION, MATERNITY AND RELATIONSHIP STATUS**

Ethology and Comparative Psychology

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Keywords: Behavior In Groups, Cooperation, Parental Investment, Public Goods Game, Women

### **Objetivos / Objectives**

Prosocial behavior is defined as voluntary actions that benefit others and include behaviors such as helping, sharing, cooperating, etc. Despite its importance, prosocial behavior has been extensively studied in men but has been rarely focused in women. Since women mainly cooperate with a selected group of individuals to gain and reinforce social status in their social groups, it is expected that they should cooperate with some individuals of the group to increase the offspring caring support (alloparental care), or with a possible mate, by displaying prosocial behavior as a sexually attractive signal. This work aims to understand women's prosocial behavior in groups under an evolutionary and functional perspective.

### **Metodología / Methodology**

In a population of 384 participants (288 women and 96 men) from Chile, we will study the effect of group sex composition (same-sex and mixed groups), maternity (mother and non-mother) and relationship status (single and partnered) over women's prosocial behavior from the use of a public goods game (PGG) in laboratory-controlled conditions. Groups of six participants participate on each session.

### **Resultados y Conclusiones / Results & Conclusions**

At the moment we have data on 240 participants and we will complete data collection in mid-June. Prosocial behavior for each participant will be measured as the individual contribution made by a participant to the group. Data will be analyzed by generalized linear models (GLM) and t-student analyses on R. We expect to test our main prediction that single mothers cooperate more than other women in all groups but single non-mother women cooperate more only in mixed groups.



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## STRESS ENHANCES CAUTIOUS DECISIONS IN THE BALLOON ANALOGUE RISK TASK

Cognition and emotion

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Keywords: Stress, Decision-Making, Balloon Analogue Risk Task (BART)

### **Objetivos / Objectives**

Studies have shown that stress alters person's decision-making, but the direction remains unclear. The effect of the stress seems to depend on the context assessed, but many incongruences also could emerge from the general way of assessing decision-making. So, it is necessary to not consider decision-making as a single dimension but analyse its underlying cognitive processes. Our aim is to study through computational modelling how stressed people make decisions in a context where assuming risks is rewarded.

### **Metodología / Methodology**

For this purpose, 90 healthy participants were submitted to the Balloon Analogue Risk Task (BART), but only half were exposed to the virtual Trier Social Stress Test (TSST) in order to induce them stress. Furthermore, the EWMV computational model was used to gain insight into the cognitive processes involved in decision-making during BART.

### **Resultados y Conclusiones / Results & Conclusions**

An increase in the prior belief that the balloon was going to burst shortly, and a cautious approach towards pumping of the balloon was found in stressed participants which exhibited increased heart rate and perceived stress during TSST. Further studies should be done using the computational model to further support these findings as well as other stress-inducing tasks to measure different types of stress and their influence on decision-making during BART. However, our results support that stress would facilitate an alert state that leads to a risk-avoidance. Since risk is rewarded in BART, this would indicate a maladaptive decision-making under stress.



## **EMOTIONAL STROOP TASK IN CHRONIC PAIN PATIENTS: A SYSTEMATIC REVIEW ON BRAIN AND EMOTIONAL ACTIVATION**

Psychophysiology

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Keywords: Chronic Pain, Emotional Stroop Task, Brain Regions, Emotional Regulation, Attentional Bias

### **Objetivos / Objectives**

Chronic Pain (CP) is an unpleasant sensory and emotional experience that persists more than three months and is often accompanied by symptoms such as depression, fatigue, sleep disturbances, and cognitive impairment. Emotions are known to modulate the experience of pain by influencing cognition and behavior. A useful task to explore emotional processing and emotional dysregulation is the Emotional Stroop Task (EST). The main objective of the present systematic review was to analyze all studies using an EST and the associated alterations of specific brain regions and the behavioral performances in patients with CP.

### **Metodología / Methodology**

This review was conducted in accordance with Cochrane Collaboration guidelines and PRISMA statements. The selected articles were extracted from PubMed, Scopus and Web of Science databases. The Cochrane Risk of Bias (ROB) tool was used to assess the quality of the selected articles.

### **Resultados y Conclusiones / Results & Conclusions**

Reviewed studies demonstrated alterations in brain regions related to pain and emotional regulation, as well as attentional bias and higher response time latencies (related to the words' emotional load) in patients with CP. Further, the attentional bias towards negative information was associated with a greater presence of pain. Results confirm the validity of the EST to measure emotions, selective attention and associated cerebral alterations in CP patients and advocate for its continuity in the examining of the exact neuroanatomical correlates underlying the disease as well as in the clinical effect of future psychological intervention.





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## **PERSONALITY TRAITS IN NURSING STUDENTS: AN EXPLORATORY DESCRIPTIVE STUDY**

Others

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Keywords: Personality Traits, Nursing Students, Selection, Training

### **Objetivos / Objectives**

Health Sciences students should have personality typology to predicts empathic behavior and emotional stability for management stressful situations implicit in professional performance. The aim of this study was to describe the personality of the students through psychometric tests and compare them with Spanish reference population characteristics.

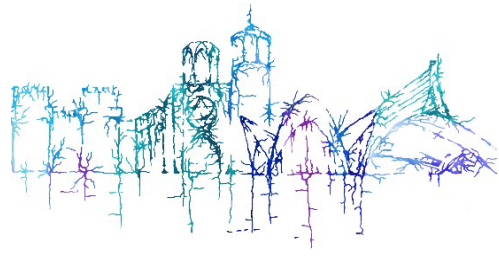
### **Metodología / Methodology**

A personality analysis was carried out on 90 nursing first year students through the questionnaire NEO PI-R (Revised NEO Personality Inventory) third edition for Spanish population. This inventory is a prestigious instrument for non-pathological personality evaluation and has become one of the most validated and used tools.

### **Resultados y Conclusiones / Results & Conclusions**

Students showed high scores for Neuroticism factor and low ones in Extraversion, Agreeableness and Conscientiousness factors and normally in Openness factor. With facets results obtained, we have a detailed description of the students' personality structure. Personality traits description showed a lowly empathetic profile and lowly emotional stability. These personality characteristics can hinder the establishment of a satisfactory relationship with the patient in a clinical setting and the ability to cope with adverse situations. With these results, the question arises of previously evaluating the personal typology of the students in order to plan training programs during the undergraduate studies or to previously take into account personality traits for access to undergraduate studies.

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**POSTER SESSION 2**

**PSYCHOPHARMACOLOGY & ADDICTION**

**MOTIVATION: MECHANISMS OF DEFICIT AND REWARD**

**PSYCHOPHYSIOLOGY**

**SOCIAL ISOLATION, LONELINESS AND STRESS**

**SEX/GENDER IN THE PSYCHOBIOLOGICAL RESEARCH**

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## **DIGESTION OF PERINEURONAL NETS IN THE CEREBELLUM TO PREVENT RELAPSE OF DRUG SEEKING**

Psychopharmacology & addiction

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Keywords: Addiction, Cerebellum, Perineuronal Nets, Chondroitinase, Drug-Seeking

### **Objetivos / Objectives**

Addictive behaviour derives from aberrant activation of drug-induced plasticity and metaplasticity mechanisms that restrict subsequent synaptic modifications and stabilized drug-associated memory. Perineuronal nets (PNNs) are specializations of the extracellular matrix that enwraps the soma and proximal dendrites of some subsets of neurons and have been related to synaptic stabilization and long-term memory. In the cerebellar cortex, the only neurons that express PNNs are Golgi interneurons and Lugaro cells. Cocaine-induced conditioning increased PNNs around Golgi cells in the posterior cerebellar cortex.

Here, we aimed to assess the expression of cerebellar PNNs and their components in a model of extended access to cocaine self-administration at different time points after withdrawal. We also investigate whether their manipulation may change the probability of relapse.

### **Metodología / Methodology**

For intravenous cocaine self-administration, animals were trained in operant chambers connected to a catheter running into the right jugular vein for 1h or 6h per day for 12 consecutive days and sacrificed after two different periods of abstinence, 24h or 28 days. In the group of 28 days, PNNs were removed in lobule VII using an intracranial infusion of "Chondroitinase ABC", 48h after the last self-administration session.

### **Resultados y Conclusiones / Results & Conclusions**

Extended access to cocaine self-administration increased the expression of Golgi-bearing PNNs during protracted abstinence. PNN removal during prolonged abstinence enhanced intrasession extinction of drug seeking. Our findings suggest that PNNs play a key role in the stabilization of neuroplasticity underlying the incubation of drug-seeking that occurs during abstinence.



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## **ALCOHOL IMPACT ON MICRORNA EXPRESSION DURING ADOLESCENCE IN RATS**

Psychopharmacology & addiction

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Keywords: Alcohol, MicroRNA, Adolescence, Hippocampus

### **Objetivos / Objectives**

Ethanol has been shown to induce epigenetic changes, including dysregulation of small non-coding RNAs (about 19-24 nucleotides), known as microRNAs (miRNAs). This might alter the expression of a wide variety of genes, thus interfering with brain development and function. Large scale studies on miRNAs changes produced by alcohol has focused on prenatal exposure. Voluntary consumption, however, begins in adolescence and is widely spread at this stage. The aim of this study was to use next-generation sequencing (NGS) in order to explore if repeated exposure to alcohol during adolescence would alter normal miRNA hippocampal expression profiles as well as if they persist in adulthood.

### **Metodología / Methodology**

Twenty-two adolescent male and female rats received intermittent 2g/kg alcohol (AIE) or volume-matched saline (AIS) by intraperitoneal injections on a 2 day on/off schedule from PND-28 to PND-41. Half of the subjects were sacrificed on the last day of AIE/AIS and we extracted the brains to test short-term effects on the hippocampus. The other half was sacrificed on PND-98 to assess long-term effects in the same area.

### **Resultados y Conclusiones / Results & Conclusions**

This design allows us to explore the hippocampal expression patterns of miRNAs related to both alcohol consumption and adolescent brain development. The results are relevant to understand the epigenetic short- and long-term impact of alcohol intake during adolescence on brain development.

Funded by PID2020-114269GB-I00 (MICIU, Spain), BSEJ.514.UGR20 (FEDER, Junta de Andalucía, Spain) and FPU18/05012 (MIU, Spain).



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**THE CONTRIBUTION OF REELIN TO THE COGNITIVE  
DETERIORATION IN AUD PATIENTS UNDERGOING AN ALCOHOL  
DETOXIFICATION PROGRAM**

Psychopharmacology & addiction

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Keywords: Alcohol Use Disorder, Cognitive Impairment, Reelin

**Objetivos / Objectives**

In humans, Reelin has been related to the pathogenesis of some neuropsychiatric disorders, neurodegeneration and cognitive impairment. We studied whether plasma Reelin levels were predictive of cognitive decline by domains assessed in multiple tests in a cohort of adult Alcohol Use Disorder (AUD) diagnosed patients and matched control subjects.

**Metodología / Methodology**

24 abstinent patients with AUD recruited from an outpatient alcohol program at the Hospital Universitario 12 de Octubre (Madrid) and 34 healthy control subjects were tested using a battery of neuropsychological tests specific to AUD and named "Test of detection of cognitive impairment in alcoholism (TEDCA)". TEDCA identifies the presence of cognitive impairment (GCF) by assessing three cognitive dimensions: Visuospatial Cognition, Memory and Executive Function (EF). Blood extractions from all participants allowed obtaining plasma in which Reelin was determined by an Enzyme-Linked Immunosorbent Assay (ELISA) kit.

**Resultados y Conclusiones / Results & Conclusions**

There were significant differences in Reelin between AUD patients with and without deficit in GCF, memory and EF. Reelin was shown to be significant for GCF and EF (binary logistic regression) and explained 42.3% and 54.0% of the variance of the deficit, respectively (Nagelkerke R<sup>2</sup> value). Furthermore, Reelin and cognitive performance in GCF, memory and EF showed a linear relationship and in regression analysis predicted performance in GCF (R<sup>2</sup>=0.44; p<0.01); Memory (R<sup>2</sup>=0.36; p<0.01) and EF (R<sup>2</sup>=0.53; p<0.01).

Reelin plasma levels could be good predictors of the presence of cognitive impairment in GCF and, more precisely, in EF. Reelin could also predict the degree of cognitive performance in GCF, memory and EF in adult AUD patients.



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## IMPACT OF ALCOHOL AND CANNABIS ON SEXUAL SATISFACTION

Psychopharmacology & addiction

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Keywords: Sexual Satisfaction; Alcohol; Cannabis; Women; Men.

### **Objetivos / Objectives**

The use of cannabis and alcohol is becoming more frequent, especially in their use prior to sexual intercourse. For this reason, the aim of this study is to investigate the role of these drugs during sexual intercourse, considering certain psychosocial and demographic variables, such as sex or marital status.

### **Metodología / Methodology**

A questionnaire on sexual satisfaction was administered to the population via social networks (WhatsApp). It was created from two existing questionnaires (ASEX and GRISS) and divided into 4 sections: sexual satisfaction without drug use, with alcohol use, with cannabis use, and with use of other drugs. The latter group was discarded in the statistical analyses due to an insufficient sample.

### **Resultados y Conclusiones / Results & Conclusions**

Men reported greater sexual satisfaction than women in the "no consumption" and "cannabis" groups. In the variable "marital status", couples who had previously consumed alcohol showed greater satisfaction than singles. Finally, people without sexual problems reported greater sexual satisfaction than those with sexual problems in the "no consumption" and "cannabis" groups. However, no significant differences in sexual satisfaction were observed among any of the three groups (no-users, alcohol and cannabis users); and no significant differences were observed according to sexual orientation. In conclusion, alcohol or cannabis use before sexual intercourse did not increase sexual satisfaction in general, with other variables (sex, marital status and sexual problems) being more decisive than drug use. Future research would be convenient to update the questionnaires on sexual satisfaction taking into account sex and use of other drugs.





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**INACTIVACION OF DEEP CEREBELLAR NUCLEI REVERTS THE EFFECT OF A NEUROTOXIC LESION IN THE APICAL VERMIS ON THE ACQUISITION OF COCAINE-INDUCED CPP**

Psychopharmacology & addiction

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Keywords: Addiction, Cerebellum, Cocaine, DREADDs, Place Conditioning

**Objetivos / Objectives**

Previous findings of our group have shown that cocaine-induced conditioned place preference (CPP) enhanced c-Fos expression in the apical region of the granular layer of the vermis (Carbo-Gas et al. 2014). However, a neurotoxic lesion in this cerebellar region dramatically facilitated the acquisition of cocaine-induced conditioned preference and increased neuronal activity in the ventral and dorsal striatum and mPFC (Gil-Miravet et al. 2019). We demonstrated that there is a monosynaptic projection from the deep cerebellar nuclei (DCNs) to the ventral tegmental area (VTA) that also receives Purkinje axons from LVIII (Gil-Miravet et al. 2020). This cerebellum-VTA pathway is under inhibitory control of Purkinje neurons from the cerebellar cortex. The aim of the present investigation is to test whether inhibition of the DCNs by designer receptors exclusively activated by designer drugs (DREADDs) would prevent the effects of the lesion of LVIII on the acquisition of CPP.

**Metodología / Methodology**

We expressed AAV5-hSyn-hM4D(Gq) or AAV5-CaMKIIa-hM4D(Gq) in rats infused in the vermis with Sham or quinolinic acid (QA) as cytotoxic agent. The viral vectors and QA were infused by stereotaxic surgery into the Interposed nucleus (IP), and DREADDs were activated by intracranial infusion of clozapine N-oxide (CNO) into IP.

**Resultados y Conclusiones / Results & Conclusions**

Our results indicated that the inhibition of the IP prevented the facilitation of cocaine-induced CPP by QA and could decrease the activity in other cortico-limbic-striatal regions.

**Funding:**

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**OPERANT ALCOHOL SELF-ADMINISTRATION WITHOUT SUCROSE  
FADING IN SPRAGUE-DAWLEY RATS: A STUDY OF SEX  
DIFFERENCES**

Psychopharmacology & addiction

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Keywords: Alcohol, Operant Self-Administration, Sexual Differences, Sprague-Dawley Rats.

**Objetivos / Objectives**

Animal models of alcohol self-administration are crucial for the study and understanding of alcohol use disorder, as well as for the development of potential treatments. We aimed to develop a new operant alcohol self-administration protocol that does not require sucrose fading, minimizes water deprivation, and may be used to study sex differences in alcohol consumption.

**Metodología / Methodology**

We used young adult male and female Sprague Dawley rats. The initial protocol had three phases. (I) auto-shaping: 1 daily session /30 min: 100µl 15% (v/v) ethanol administration every 5 min (water deprivation 12h before the start of the session). Each administration was signalled by the illumination of a cue light. (II) Operant training under a fixed-ratio 1 (FR1) operant self-administration (1 day/60 min) in which two levers were extended, and each press of the active lever resulted in the delivery of 100µl of 15% (v/v) ethanol (we placed a smashed food-pellet on the active lever to facilitate lever exploration. The lever remained extended for the whole duration of the session). A cue light (the same as in the previous session) signalled alcohol delivery for 5s. (III) Twenty 30-minute FR1 sessions (without food-pellet on the active lever).

**Resultados y Conclusiones / Results & Conclusions**

Preliminary results show robust self-administration behaviour with individual differences, good discrimination between active and inactive levers, and alcohol-seeking behaviours after active lever pressing. We did not detect evident sex differences in overall alcohol consumption. This model may be of interest for the study of sex differences in alcohol consumption, relapse and therapeutic development.



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**LONG-TERM EXPOSURE TO ETHANOL INCREASES ETHANOL-INDUCED DOPAMINE RELEASE IN THE NUCLEUS ACCUMBENS: IMPACT OF THE PRESENCE OF INFLAMMATORY PAIN**

Psychopharmacology & addiction

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Keywords: Ethanol, Dopamine, Nucleus Accumbens, Microdialysis

**Objetivos / Objectives**

This research presents two objectives. On one hand, these microdialysis experiments aim to analyse the adaptations of the dopaminergic system after alcohol long-term exposure by measuring dopamine extracellular levels as a response to a single administration of ethanol. On the other hand, the second aim is to analyse the impact of inflammatory pain on the observed effects.

**Metodología / Methodology**

Male and female SD rats (8 weeks) were administered with the Complete Freund Adjuvant (CFA), to produce inflammatory pain, or saline subcutaneously in the hindpaw. 48h later, necessary time to develop a stable inflammation and increased nociception, rats were continuously exposed to a two-bottle choice paradigm (water and 20% alcohol) for a total period of time of 3 months. At the end of the alcoholization period rats were surgically implanted with two microdialysis cannulae in the NAc core and a session of microdialysis was performed 48h after the implantation. During the microdialysis experiment, dopamine extracellular levels were monitored before and after a saline injection (control) followed by an ethanol injection (1.5 g/Kg).

**Resultados y Conclusiones / Results & Conclusions**

Data show that dopamine extracellular levels were significantly increased up to approximately 300% from baseline dopamine extracellular levels that is a higher increase than previously reported in alcohol-naïve rats. In addition, in the presence of pain, ethanol-induced dopamine release was impaired.

All together this data indicate that the history of alcohol intake induces neuroadaptations that alters dopamine release in response to a single dose administration, and inflammatory pain blunts the ability of ethanol to increase DA release in the NAc.



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**INFLAMMATORY PAIN ALTERS ALCOHOL CONSUMPTION IN A SEX-DEPENDENT MANNER AFTER MORPHINE SELF- ADMINISTRATION**

Psychopharmacology & addiction

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University of Valencia, Valencia, Spain

Keywords: Pain, Morphine, Alcohol, Sex/Gender

**Objetivos / Objectives**

Our objective is to assess the impact of morphine self-administration experience on alcohol drinking behaviour under pain conditions.

**Metodología / Methodology**

We selected male and female SD rats (8-weeks) that we injected with the Complete Freund's Adjuvant (CFA) in the hindpaw, to produce inflammatory pain, or saline as control. Following, rats were surgically implanted with a permanent catheter in the jugular. One week after the CFA injection and catheter implantation, rats started a morphine (1.5 mg/kg/infusion) self-administration (MSA) protocol under fix ratio 1 for 10 sessions to mimic pain treatment. This access period was followed by a morphine dose-response session where 0.5, 1.5 and 3.0 mg/kg/infusion doses were available for one-hour period within the same MSA session. After the MSA period, rats initiated 5 sessions of drinking in the dark (DID) in a 2-bottle choice paradigm of 20% of ethanol or water followed by 2 final where ethanol concentration was elevated up to 40%.

**Resultados y Conclusiones / Results & Conclusions**

Inflammatory pain did not impact the acquisition of MSA or the posterior alcohol drinking behaviour under the DID 20% ethanol paradigm. Nevertheless, when ethanol concentration was increase up to 40%, CFA male rats drunk less ethanol than saline male rats, while CFA female rats shown the same ethanol consumption that saline female rats. In conclusion, we observed that the access to MSA under inflammatory pain condition affects the posterior drinking behaviour in a sex-dependent manner. Further investigation is needed to assess what mechanisms are implicate in this phenomenon and if exposition to different doses might impact the drinking behaviour.



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## ROLE OF CEREBELLAR PERINEURONAL NETS IN COCAINE-INDUCED CONDITIONED MEMORY

Psychopharmacology & addiction

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Keywords: Perineuronal Nets, Cerebellum, Chondroitinase ABC, Addiction, Cocaine

### **Objetivos / Objectives**

Perineuronal nets (PNNs) are net-like structures of extracellular matrix molecules that enwrap the cell-body and proximal dendrites of subsets of neurons. PNNs stabilize their incoming connections and restrict plasticity, therefore, they have been proposed as a candidate mechanism for drug-induced learning and memory. In the cerebellum, PNNs surround Golgi inhibitory interneurons, and both inhibitory and excitatory neurons in the deep cerebellar nuclei (DCN). Previous studies from the lab showed increased PNN expression in the apical region of the granule cell layer in the posterior vermis only in those animals that exhibit a preference towards cocaine-associated cues. The present research aimed to investigate the role of cerebellar PNNs in cocaine-induced conditioned preference.

### **Metodología / Methodology**

We use the enzyme chondroitinase ABC (ChABC) in order to digest PNNs at different time points of the learning process to ascertain whether their removal can affect drug-induced memory.

### **Resultados y Conclusiones / Results & Conclusions**

Our results show that PNN digestion using ChABC in lobule VIII prior to conditioning did not affect the acquisition of cocaine-induced conditioned preference. However, PNN digestion in the posterior vermis -but not in the DCN- once drug memory was acquired, disrupted short-term memory of conditioned preference. Moreover, even though PNN removal facilitated extinction, this new memory was not consolidated over time. Indeed, reinstatement of cocaine-induced conditioned preference was promoted under PNN digestion. Therefore, PNNs around Golgi interneurons are needed to maintain cocaine-induced Pavlovian memory but also to consolidate extinction, and degradation of PNNs in the vermis might be used as a promising tool to manipulate drug-induced memory.



## CAN BACTERIAL PRODUCTS REACH THE BRAIN AFTER ALCOHOL BINGE DRINKING?

Psychopharmacology & addiction

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Keywords: Alcohol, Binge Drinking, LPS, Lipid A, Neuroinflammation

### Objetivos / Objectives

Alcohol binge drinking (ABD) induces leaky gut, allowing the entry of lipopolysaccharide (LPS), a bacterial component, to the systemic circulation, activating the innate immune system, and inducing neuroinflammation, leading to cognitive and emotional changes. It is unknown whether LPS could reach the brain to exert its functions, although recent evidences suggest that small parts of this LPS, such as Lipid A, could be transported through apolipoproteins in physiological conditions.

### Metodología / Methodology

Here, we studied the presence of Lipid A in its free form or binded to specific apolipoproteins (ApoAI and ApoB) or its receptor TLR4 in prefrontal cortex (PFC) of male and female rats exposed to ABD by gavage. Free Lipid A, ApoAI, ApoB and TLR4 levels and binding aggregates were measured by western blot and Co- Immunoprecipitation.

### Resultados y Conclusiones / Results & Conclusions

Lipid A, ApoAI and ApoB were not increased in their free forms compared with controls. However, Lipid A / ApoAI ( $p=0.0374$ ) and Lipid A / ApoB ( $p=0.0438$ ) ratios were increased after ABD, indicative of the binding of Lipid A with these apolipoproteins, as confirmed by Co-Immunoprecipitation. Additionally, the LPS agonist TLR4 was also increased ( $p=0.0209$ ) in its free form, which is a known core element of neuroinflammation. The presence of bacterial products joined to apolipoproteins in the rat PFC suggests that LPS may infiltrate the brain in ABD and could be related to the neuroinflammatory LPS/TLR4 signaling. No sexual differences were found. Current studies are exploring the impact of this Apo-Lipid A binding in ABD-induced emotional/cognitive alterations.



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**BINGE-LIKE ALCOHOL CONSUMPTION AND C-FOS EXPRESSION  
USING A MULTIPLE BOTTLE CHOICE DRINKING- IN-THE-DARK  
(DID) PROCEDURE IN C57BL/6J MICE**

Psychopharmacology & addiction

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Keywords: Binge-Like Drinking, Drinking-In-The-Dark, Addiction, Ethanol, C57BL/6J

**Objetivos / Objectives**

Binge alcohol (ethyl alcohol; EtOH) drinking has been associated with long-term neural adaptations that can lead to the development of alcoholism. In laboratory research, the drinking-in-the-dark (DID) procedure has been extensively used to study the neurobiology of binge-like EtOH drinking. DID procedures promote high intakes and blood EtOH levels relevant to human behavior. Despite the fact that availability of more than one bottle tends to increase overall intake in rodents, standard DID procedures generally use one EtOH bottle. In the current study, we present a modified version of a DID procedure introducing multiple bottle availability to promote even higher levels of EtOH drinking.

**Metodología / Methodology**

One-, two-, three- or four-bottle tests were performed with different (separate experiments) EtOH concentrations (5, 10, 20 or 40% v/v). Young adult and older C57BL/6J mice (8 vs. 20 weeks old) were used for comparison. Apart from the standard 4-day protocol with a 4-h test on day 4, we also conducted a 4-week experiment to evaluate the time course of EtOH drinking. EtOH-induced neural activation was evaluated with c-Fos expression.

**Resultados y Conclusiones / Results & Conclusions**

Our results showed that a 4-bottle test significantly increased EtOH intake (compared to 1 bottle) and this effect was found across concentrations but was not found with water. Using the most common 20% EtOH concentration, we confirmed that the increased 4-bottle intake was found in young and older adult mice and that this effect not only lasted but slightly increased over time. Histological results showed increased c-Fos expression in the Edinger-Westphal nucleus.



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**OLEOYLETHANOLAMIDE PREVENTS THE STRESS-INDUCED  
INCREASED REWARDING EFFECTS OF COCAINE BY ATTENUATING  
TLR4 ACTIVITY**

Psychopharmacology & addiction

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Keywords: Oleoylethanolamide, Cocaine, Stress, Social Defeat, TLR4

**Objetivos / Objectives**

The lipid-derived messenger oleoylethanolamide (OEA) has been involved in multiple physiological functions including metabolism and the immune response. In the brain, OEA has been observed to modulate reward-related behavior. Stress is a major risk factor for drug use and a predictor of drug relapse. Social stress has been largely studied using the social defeat (SD) model. Here, we investigated whether OEA modulated the increased properties of cocaine induced by SD. In addition, we measured the effect of OEA pretreatment in TLR4 activity caused by SD in the cerebellum.

**Metodología / Methodology**

Adult OF1 mice (N=60) were assigned to an experimental group according to the stress condition (exploration or SD) and treatment (vehicle or OEA). Mice were divided into (1) EXP group (2) SD group (3) EXP+OEA and (4) SD+OEA. We administered OEA i.p injections 10 minutes previously to each SD encounter. Three weeks after the last SD encounter, conditioned place preference (CPP) was induced by a subthreshold cocaine dose (1mg/kg).

**Resultados y Conclusiones / Results & Conclusions**

As we expected, socially-defeat mice presented higher vulnerability to the conditioning reinforcing effects using a subthreshold cocaine dose. Conversely, under a non-stressed condition this effect was not observed (EXP and EXP+OEA). Most importantly, we observed that OEA pretreatment prevented the stress-induced cocaine CPP in the SD+OEA group. Biochemical analysis showed that OEA administration previous to SD decreased TLR4 inflammatory signaling in the cerebellum caused by SD. In summary, our results suggest that OEA may have a protective effect on stress-induced increased cocaine sensitivity by exerting an anti-inflammatory action.





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**BLOCKADE OF RECONSOLIDATION OF MEMORIES ASSOCIATED WITH HEROIN SELF-ADMINISTRATION BY INHIBITION OF THE MTOR COMPLEX 1: PRELIMINARY RESULTS WITH MALE RATS**

Psychopharmacology & addiction

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Keywords: Opiates, Self-Administration, Reconsolidation Blockade, Rapamycin, MTOR

**Objetivos / Objectives**

One of the challenges of overcoming substance use disorders is the elevated risk of relapse triggered by the exposure to stimuli associated with drug use. Although the nature of these associations is unclear, there is growing evidence suggesting that they may be weakened by blocking the reconsolidation of their corresponding memories. The mTOR intracellular signalling network has recently been proposed as a potential target for pharmaceutical blockade of drug-associated memories, with successful results in rodent models of alcohol and cocaine problematic use. The objective of this study is to test the potential of rapamycin, an inhibitor of the mTOR complex 1, as a blocker of reconsolidation of heroin self-administration associated memories and the subsequent reduction of cue-induced drug-seeking.

**Metodología / Methodology**

We trained male rats to self-administer heroin (60 µg/kg/infusion) over 10 daily 3h sessions. After 3 days of withdrawal, heroin-associated memories were activated by intermittent exposure to the stimulus present during heroin infusions. Immediately afterwards, two groups of rats were treated with either rapamycin (20mg/kg, i.p.) or its vehicle. The other two groups received the same treatments 6 hours after the reactivation sessions, a time frame supposed to be out of the temporal window of memory reconsolidation.

**Resultados y Conclusiones / Results & Conclusions**

The preliminary results suggest that mTORC1 systemic blockade may, indeed, reduce opiate seeking through blockade of the memories associated with drug use.



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## **CARDIOVASCULAR RESPONSES OF ADOLESCENTS IN A BINGE DRINKING STUDY**

Psychopharmacology & addiction

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Keywords: Binge Drinking, Cardiovascular System, Blood Pressure, Heart Rate, Adolescents

### **Objetivos / Objectives**

Alcohol is the psychoactive substance most consumed by the general population of allages in Spain. The prevalent alcohol consumption pattern among adolescents and young adults, the population most affected by this problem, is Binge drinking (BD). The aim of this study was to clarify the effects of BD on cardiovascular response: systolic and diastolic blood pressure (SBP and DBP) and heart rate (HR), in male andfemale adolescents.

### **Metodología / Methodology**

Participants were 150 (75 females and 75 males) adolescents (18-19 years old). They were assigned to three different experimental conditions: refrainers who received refreshment (R-R), subjects with BD history who received refreshment (BD-R) and subjects with BD history who received a BD alcohol dose (BD-ABD). Then SBP, DBP and HR were evaluated in all participants.

### **Resultados y Conclusiones / Results & Conclusions**

The results showed that the Gender factor was significant in SBP, with men showing higher levels than women. The Experimental Condition factor was also significant in HR, with BD-ABD participants showing increased HR. In conclusion, gender differences were observed in SBP, as previously reported results in adolescent population. In addition, acute alcohol consumption activates the cardiovascular system,reflected in higher HR.



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## CEREBELLAR CORRELATES OF HABIT BIAS IN NATURAL-REWARDED BEHAVIOUR

Psychopharmacology & addiction

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Keywords: Addiction, Habit, Cerebellum, Drugs, DREADDs

### **Objetivos / Objectives**

Extended experience with drug use can lead to a mismatch between flexibility and repetition in action selection and can develop into habit-bound, becoming insensitive to reward devaluation. Although the circuitry involved has been well described, the role of the cerebellum is unknown. In the present investigation, we investigated the cerebellar correlates of insensitivity to devaluation in naturally rewarded behaviors after prolonged drug experience. We also investigated the role of the cerebellum and associated regions as the Infralimbic cortex using Designer Receptors Exclusively Activated by Designer Drugs (DREADDs) in order to propose a predictive model.

### **Metodología / Methodology**

Before or after extended treatment with cocaine or alcohol rats were trained in operantboxes to consume food in a reinforcement schedule that favors the transition to habit, then the reward was devalued by satiety. Neural activity and perineuronal nets (PNNs) in the cerebellum were analyzed.

### **Resultados y Conclusiones / Results & Conclusions**

Drug-treated rats showed a sensitivity to reward devaluation similar to the control group. However, we found differences between cocaine-treated and control rats in neuronal activity and synaptic stabilization mechanisms in the cerebellum. Effects depend on the timepoint at which the drug treatment was administered. Furthermore, when the function of the deep cerebellar interpositus nucleus (IP) was blocked expressing inhibitory DREADDs, treated animal show sensitivity to devaluation as opposed to the control animals that were all insensitive to reinforcer devaluation. Thus, the IP appears to play a key role in this transition.



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**PROTRACTED ALCOHOL ABSTINENCE DOWNREGULATES GLT-1  
AND GLAST EXPRESSION IN NUCLEUS ACCUMBENS: A  
PRECLINICAL STUDY IN MALE WISTAR RATS**

Psychopharmacology & addiction

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Keywords: Glutamate, AUD, GLAST, Relapse, GLT-1

**Objetivos / Objectives**

Alcohol Use Disorder (AUD) is a chronic and recidivant neurobehavioural disorder which supposes a serious health as well as economic problem worldwide. Nowadays, relapse prevention is considered the main target for therapies against drug addiction, but after decades of research, few drugs have been marketed for this purpose.

Literature has shown that astrocytic dysfunction in regulating basal glutamate levels as well as clearance of synaptic glutamate is a primary mechanism whereby cues associated with drugs of abuse can drive relapse. The aim of the present research was to explore the effect of (i) continuous ethanol consumption during 32 weeks or (ii) protracted ethanol withdrawal (21 days) on the expression of glutamate type 1 transporter (GLT-1), glutamate and aspartate transporter (GLAST) and system xC<sup>-</sup> antiporter (xCT) in the nucleus accumbens (Nacc) and dorsolateral striatum (DS).

**Metodología / Methodology**

For this purpose, a cohort of 20 male Wistar rats were used.

**Resultados y Conclusiones / Results & Conclusions**

Obtained results in Nacc revealed that, under our experimental conditions GLT1 and GLAST expression was not altered after chronic ethanol consumption. Surprisingly, it was significantly decreased during the abstinence period. Concerning xCT expression in Nacc, no statistical differences were detected among the different groups. In DS, neither the continuous exposure to ethanol intake nor the protracted abstinence led to significant changes in the expression of the three transporters studied. Our results gather evidence in the identification of new targets associated with the relapse neurobiology that could help to optimise present pharmacotherapies or address future ones.



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**EFFECTS OF CHRONIC-INTERMITTENT ALCOHOL AND  
INDOMETHACIN ON NOVEL OBJECT RECOGNITION IN MICE**

Psychopharmacology & addiction

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Keywords: Binge Drinking, Alcohol, Indomethacin, Recognition Memory, Mice

**Objetivos / Objectives**

In previous research, we found that chronic-intermittent ethanol administration (CIEA), model of binge drinking (BD) alcohol consumption pattern, impaired emotional memory in mice; and this memory impairment was counteracted by the anti-inflammatory indomethacin. In the present work, we have evaluated the effects of CIEA and indomethacin on recognition memory in adolescent mice of both sexes. The objectives of the work were: (1) to determine if BD consumption produces deficits on recognition memory; (2) to evaluate if the anti-inflammatory indomethacin partially counteracts the memory deficit caused by BD consumption.

**Metodología / Methodology**

Animals were randomly assigned to four groups in each sex: SS (saline+saline), SA (saline+alcohol), SI (saline+indomethacin), and AI (alcohol+indomethacin). They were injected (i.p.) with saline, ethanol (3 g/kg) and indomethacin (10 mg/kg) in chronic-intermittent administration (the first three days of each week, throughout three weeks). After treatment, recognition memory was assessed by the Novel Object Recognition (NOR) test.

**Resultados y Conclusiones / Results & Conclusions**

The results showed that the SA group spent less time exploring the familiar object than the SI group. Likewise, the SA group spent less exploration time for the novel object than the SS group and the SI group. There were not significant differences in the discrimination index. No significant sex differences were observed in any of the measures. In conclusion, BD alcohol consumption causes deficiencies in recognition memory in mice and indomethacin improves this recognition for novel objects, counteracting partly the memory impairment caused by BD.



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## **CHRONIC COCAINE EXPOSURE DURING ADOLESCENCE IN MICE INDUCES ALTERATIONS IN HIPPOCAMPAL NEUROGENESIS AND SPATIAL MEMORY**

Psychopharmacology & addiction

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Keywords: Cocaine, Hippocampus, Adult Hippocampal Neurogenesis, Novel Place Recognition, Adolescence

### **Objetivos / Objectives**

Cocaine is the second most widely consumed illicit drug even at early ages, with a prevalence of 2.9% in Spain in the 14-18 age group. Chronic consumption produces several cognitive-behavioral and hippocampal alterations, which can be more dangerous if it begins in adolescence, a sensitive period in brain development. The objective of this work is to study the hippocampal and behavioral consequences of cocaine exposure during adolescence.

### **Metodología / Methodology**

In a first experiment, adolescent male C57BL/6J mice (PND30) received intraperitoneal injections of cocaine (20 mg/kg): one group for 7 consecutive days and another group for 21 days, both with a control group injected with saline (N=24). On the last day of administration, all mice received bromodeoxyuridine (BrdU) (100 mg/kg, i.p.). One day later, mice were sacrificed, and brain tissue was processed by immunohistochemical procedures to assess adult hippocampal neurogenesis (AHN) (BrdU, DCX and p-H3 markers) and neuroinflammation (Iba1). In a second experiment, a novel place recognition (NPR) test was performed with 21-day administration conditions (N=28).

### **Resultados y Conclusiones / Results & Conclusions**

Cocaine administration for 21 days down-regulates AHN and up-regulates Iba1 expression when the administration was for 7 days. Interestingly, mice that received cocaine for 21 days displayed impairments in the NPR test. Cocaine administration during adolescence causes a deleterious effect on the hippocampus that could be directly related to difficulties in performing spatial memory tasks. These results may be useful in designing new therapeutic approaches to mitigate the effect of cocaine on developing brains.

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## **BEHAVIORAL ANALYSIS OF THE DRUG “EPHENIDINE” FOR THE TREATMENT OF DEPRESSION**

Psychopharmacology & addiction

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Keywords: Immobility, Ephedrine, Rats, Fast-Acting

### **Objetivos / Objectives**

Currently, pharmacological treatments for depression have a very limited effectiveness due to their long latency in the onset of action. In this frame of time there is a risk of suicidal behavior; thus fast-acting antidepressants, such as Ketamine, have been registered to avoid this problem. Nevertheless, ketamine has the serious drawback that it also produces dissociative and hallucinogenic effects. In an attempt to find another fast-acting antidepressant drug devoid of these side effects, we tested the efficacy of the anesthetic Ephedrine.

### **Metodología / Methodology**

For this purpose, male Wistar rats were administered three different doses of Ephedrine (2.5mg/kg; 5mg/kg and 10mg/kg) and two control groups were administered either Ketamine (10mg/kg) or saline. Subsequently, 24 hours after the administration, the animals underwent an open field test to determine possible motor drug effects and 48 hours after the administration, they went through a forced swimming test to evaluate possible antidepressant effects.

### **Resultados y Conclusiones / Results & Conclusions**

After analyzing the results, it was observed that Ephedrine did not produce an increase in motor activity, an effect reminiscent of psychotomimetic activity in humans. In addition, for the 5mg/kg and 10mg/kg doses, an improvement in depressive symptomatology was found compared to the controls that received saline. However, the complexity of operationalizing hallucinogenic patterns in rodents implies waiting for a possible clinical study in humans, in which its efficacy and possible dissociative effects will be determined.



## EFFECTS OF ACUTE ADMINISTRATION OF KETAMINE ON FRUSTRATIVE REWARD-DEVALUATION TASK

Motivation: mechanisms of deficit and reward

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Keywords: Ketamine, Frustrative Reward-Devaluation Task, Sucrose, Consummatory Suppression

### Objetivos / Objectives

The present study investigated the behavioral effects of ketamine in animals exposed to a frustrative reward-devaluation task.

### Metodología / Methodology

In this experiment, male, food-restricted rats were randomly assigned to groups having access to 32% sucrose (4% in controls) for 5 min during 10 daily sessions (preshift phase), followed by 4 subsequent sessions with access to 4% sucrose (postshift phase). This manipulation has been shown to be effective in inducing frustration in the form of consummatory suppression (dependent variable: fluid intake in ml/kg). Two groups (one downshifted: Group 32/Ket, and one unshifted: Group 4/Ket) received ketamine (10 mg/kg, IP) 30 minutes before postshift sessions 1 and 2. An additional downshifted group (Group 32/Sal) received two equal-volume injections of saline.

### Resultados y Conclusiones / Results & Conclusions

The results showed a similar reward downshift effect (consummatory suppression) in groups 32/Ket and 32/Sal compared to Group 4/Ket on postshift session 1. On subsequent postshift sessions (2 to 4), the downshifted group injected with ketamine (Group 32/Ket) exhibited lower sucrose intake than both the unshifted control (Group 4/Ket) and the downshifted group receiving saline (Group 32/Sal). Thus, ketamine increased consummatory suppression induced by reward devaluation. The results are discussed in terms of ketamine's anxiogenic/pro-frustration effects, conditioned taste aversion, memory interference, and motor impairment.





## **EFAVIRENZ INDUCES ACTIVATIONAL AND EFFORT DEFICITS IN MICE: RELATION TO DOPAMINERGIC MARKERS IN NUCLEUS ACCUMBENS**

Motivation: mechanisms of deficit and reward

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Keywords: Effort, Behavioral Activation, Dopamine, Motivation

### **Objetivos / Objectives**

Efavirenz (EFV), an antiretroviral prescribed for HIV-infected patients with well-demonstrated efficacy, has adverse CNS effects, and it produces depressive symptoms. In addition to emotional symptoms, psychomotor retardation, and fatigue are motivational symptoms often seen in people with depression. Impairments in nucleus accumbens (Nacb) dopamine (DA) function affect these effort-related processes.

However, little is known about the impact of EFV on DA function and effort-related processes.

### **Metodología / Methodology**

CD1 male mice received EFV and were evaluated on tests of vigorous behavioral activation induced by positive (voluntary running wheel, RW) or aversive conditions (Forced-Swim-Test FST), and on effort-based decision-making tasks (T-maze-barrier). Novel environment exploration (OF), anxiety (dark-light-box, DL; elevated-plus-maze, EPM), and social interactions (SI) were also evaluated. Bupropion (BUP), a catecholamine uptake blocker that enhances extracellular DA levels and is used as an antidepressant, was assessed on EFV treated animals. Finally, the impact of EFV on DA-related markers (vesicular monoamine transporter, VMAT-2, and DA-receptor-related markers; pDARPP-32(Thr75)) were studied in Nacb.

### **Resultados y Conclusiones / Results & Conclusions**

EFV reduced voluntary RW activity, increased immobility and decreased climbing in the FST, as well as reducing high-effort responses in the T-maze-barrier and novel exploration. However, EFV did not affect anxiety parameters and social interactions. BUP reversed most of the impairments induced by EFV; increasing RW activity and climbing in the FST, but not the low effort vias in the T-maze. EFV reduced VMAT-2 positive cells in Nacb but increased pDARPP-32(Thr75). EFV, by affecting DA parameters may be inducing fatigue, a key symptom in depression. Further studies of this relation are warranted.



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**EFFECT OF SOCIAL DISTANCING ON WILLINGNESS TO EXERT  
EFFORT IN ADULTHOOD IN MICE OF BOTH SEXES: STUDY OF  
DOPAMINERGIC PARAMETERS**

Motivation: mechanisms of deficit and reward

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Keywords: Social Distancing, Effort, Motivation, Sex, Dopamine

**Objetivos / Objectives**

Early-life stress alters brain function and leads to psychiatric disorders later in life. Sustained stress affects the response of the mesolimbic dopaminergic (DA) system. Nucleus Accumbens plays a key role in the regulation of the activational component of motivated behavior, including effort-based decisions.

In the present work we evaluate the effect of social distancing (SD; two mice in a cage separated with a transparent barrier with holes) starting at PND28 in male and female mice.

**Metodología / Methodology**

Willingness to exert effort in an operant task was used to study anergia. In this task, animals choose between working for a preferred drink (high sucrose) by lever pressing on a highly demanding schedule vs. obtaining a less concentrated drink that is freely available. Additionally, we characterized the impact of this sustained stress on voluntary wheel running, anxiety, social interaction, and CDNF immunoreactivity.

**Resultados y Conclusiones / Results & Conclusions**

SD clearly increased preference for social interaction with a same-sex conspecific in both sexes. In male mice, SD did not affect lever presses for a high concentrated sucrose solution although it increased free concurrent sucrose consumption. However, in females, SD decreased lever pressing on effortful schedules. Females were more anxious than males, but there was no impact of SD on voluntary RW, anxiety or CDNF immunoreactivity. The present SD parameters seem to affect both sexes in terms of social behavior, although only females showed anergia on effort-based decisions. Further studies should address other DA parameters and brain structures.



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**BEHAVIORAL ACTIVATION AND EFFORT-BASED DECISION-  
MAKING TASKS IN YOUNG AND OLD MALE RATS: CDNF LEVELS IN  
MESOCORTICOLIMBIC CIRCUITS**

Motivation: mechanisms of deficit and reward

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Keywords: CDNF, Dopamine, Decision-Making

**Objetivos / Objectives**

Dopamine (DA) in nucleus accumbens (Nacb), plays an important role in the regulation of effort and vigor, or perseverance in motivated behaviors. Deficits in behavioral activation and exertion of effort are motivational dysfunctions frequently seen in people with depression and other disorders. Young rodents, with impaired DA transmission reallocate their instrumental behavior away from food-reinforced tasks with high response requirements, and instead select less effortful behaviors. However, little is known about the pattern of behavior in older rodents. In aging humans, reduction in DA levels and the loss of DA receptors seems to be related with lower vigorous physical activity. Fatigue is also a common symptom among this population. Because neurotrophic factors, such as BDNF, enhance survival of DA neurons, we investigated the cerebral dopamine neurotrophic factor (CDNF) in DA mesocorticolimbic structures in the two age groups in relation to their performance in avoluntary running wheel (RW), and in an operant task with different effort requirements.

**Metodología / Methodology**

In this task animals choose between working for a preferred drink (high sucrose) by lever pressing on a highly demanding schedule vs. obtaining a less concentrated drink that is freely available.

**Resultados y Conclusiones / Results & Conclusions**

Older rats lever pressed less than young animals as the ratio requirements increase to obtain the high concentrated sucrose drink, and instead consume more of the free sucrose. They also run less in the wheel. However, a positive correlation was found between CDNF in Nacb and running wheel activity among old animals, indicating that this neurotrophic factor could be preserving DA function.



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**DIFFERENCES IN SKIN CONDUCTANCE RESPONSE IN THE IOWA GAMBLING TASK IN POPULATION WITH HIGH AND LOW COGNITIVE INFLEXIBILITY**

Psychophysiology

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Keywords: Cognitive Inflexibility, Gains, Iowa Gambling Task, Losses, SCR

**Objetivos / Objectives**

The aim of the present study was to evaluate the skin conductance response (SCR) during the Iowa Gambling Task (IGT) in a population with high and low level of cognitive inflexibility. We investigated whether healthy individuals high in cognitive inflexibility showed skin conductance response (SCR) hyperreactivity to rewards or topunishment.

**Metodología / Methodology**

Participants were 48 students (14 men) from the University of Granada ranging in age from 18 to 37 years ( $M = 20.51$ ;  $SD = 4.059$ ) who were selected by their extreme scores in persistence (cognitive inflexibility), evaluated by using The Temperament and Character Inventory-Revised (TCI-R) in the Spanish version. All participants performed a computerized version of the Iowa Gambling Task. The IGT consisted of 100 trials divided into 5 blocks of 20 trials. To examine the physiology in the trials, we made a categorization of gain or loss: a median distribution of the monetary amounts associated each trial. We performed a mixed ANOVA  $2 \times (2 \times 12)$ .

**Resultados y Conclusiones / Results & Conclusions**

The results show a differential pattern measured during the 6 s. after the desk choice indicating: a) SCR was higher in losses; b) throughout IGT blocks when participants lost money their SCR increased, c) no significant differences were found between groups.



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## LANGUAGE PROCESSING AND PUPIL DIAMETER CORRELATIONS IN LOW-PREVALENCE CHROMOSOPATHIES

Psychophysiology

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Keywords: Electroencephalography (EEG), Eye-Tracking, Event-Related Potentials (ERPs), Language Disorders, Low-Prevalence Chromosopathies (LPC)

### **Objetivos / Objectives**

Language deficits in low-prevalence chromosopathies (LPC) are scarcely known. Standardized tests are not always appropriate to evaluate language deficits in children. An interesting approach to these linguistic phenotypes comes from biomarkers related to language processing which can be evaluated by electroencephalography (EEG) and eye-tracking systems.

### **Metodología / Methodology**

In order to address this challenge, we have recruited three children diagnosed with different LPC between eight and fifteen years old, previously assessed through a battery of cognitive and linguistic tests (CELF-5 and BRIEF-2). We have registered brain activity by EEG to measure the event-related potential N400 and pupil response by eye-tracker system while subjects performed a semantic congruency task. During this audiovisual passive task, the participants watched a picture that could be semantically congruent, related or incongruent with the heard word.

### **Resultados y Conclusiones / Results & Conclusions**

The results show that incongruent condition reached larger peak amplitude N400 comparing to congruent condition, although this difference showed a distinct pattern in each case. With respect to pupil diameter, it did not show differences between congruent and incongruent conditions as we expected in neurotypical children. We conclude that psychophysiological (N400) and pupil diameter measures can be a useful tool to complete the early diagnosis of LPC and enable us to define with greater accuracy the linguistic and cognitive profiles of those affected and, consequently, better adapt the evaluation and rehabilitation.



## PUPIL DIAMETER CHANGES AFTER SUBTHALAMIC STIMULATION AS PSYCHOPHYSIOLOGICAL MARKER IN PARKINSON'S DISEASE

Psychophysiology

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Keywords: Pupil Diameter, Parkinson's Disease, Deep Brain Stimulation, Emotional Processing, Biomarkers

### Objetivos / Objectives

Studies on the relationship between deep brain stimulation (DBS) in the subthalamic nucleus (STN) and psychophysiological markers of brain state changes, such as pupil diameter, are scarce. We aimed to investigate the relationship between phasic fluctuations in pupil diameter and emotional processing type (explicit/implicit) in unmedicated patients with Parkinson's disease (PD) during sequential sessions of STN-DBS On/Off.

### Metodología / Methodology

Thirteen STN-DBS PD patients and 17 age-, gender- and education-matched healthycontrols were recruited. Patients performed the experimental session with STN-DBS On and STN-DBS Off in a randomized order and without dopaminergic medication. Participant's initial constriction and later pupil dilation were recorded while viewing emotional scenes under varying explicit (emotional valence) and implicit (stimuli characteristic) attention demands.

### Resultados y Conclusiones / Results & Conclusions

Pupillary constriction and dilation were reduced during STN-DBS Off when compared to STN-DBS On and to healthy controls. Comparing STN-DBS On/Off states, a significant initial contraction was detected during implicit processing, while late dilation differences were more evident during explicit processing. Pupil constriction differences were particularly marked during Off medication-STN-DBS Off states, while pupillary responses returned to normal followed by STN stimulation despite Off medication. These results suggest that STN-DBS modulate the response of the autonomic nervous system, reflected in the pupillary recovery to normal levels. Remarkably, our results also show the role of STN in parasympathetic-dopaminergic function, and his cortical influences when attention demands are manipulated. Pupillary response is a potentially useful psychophysiological marker that could be used in the on-line assessment of symptomatic effects of levodopa and DBS therapies.



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## EFFECTS OF RUBBER HAND ILLUSION ON ELECTROENCEPHALOGRAPHIC RESTING-STATE

Psychophysiology

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Keywords: RHI, Embodiment, EEG, Resting-State, Functional Connectivity

### **Objetivos / Objectives**

Rubber hand illusion (RHI) manipulates the multisensory integration of a fake hand into the representation of the own body, in other words, induces the embodiment of a fake hand. Previous studies demonstrated that RHI alters the brain functional connectivity between frontal, central, parietal and occipital areas during the synchronous stimulation of a fake hand and the own hand. However, it is unclear whether RHI influences on resting-state functional connectivity after the stimulation. This study is aimed to verify whether the RHI induction changed the resting-state sensory-motor rhythm (SMR) power and functional connectivity using electroencephalogram (EEG).

### **Metodología / Methodology**

Forty healthy graduate students experienced two RHI conditions: congruent (fake hand and own hand have the same position) and incongruent (fake hand has an inverted position with respect to own hand). After each condition degree of embodiment of fake hand was measured using the pictographic assessment embodiment scale (PAE) and then 2 minutes of EEG resting-state was recorded.

### **Resultados y Conclusiones / Results & Conclusions**

Our results indicated that, compared with after incongruent, the embodiment of fake hand was significantly higher after congruent. SMR power was lower in postcentral, parietal and occipital areas after congruent compared with after incongruent. Furthermore, SMR connectivity between frontal, precentral, postcentral, parietal and occipital areas was higher in the resting after congruent than in the resting after incongruent. In conclusion, brain changes observed during the induction of RHI seem to be still present in the posterior resting-state.



## **EFFECTS OF UNCERTAINTY ABOUT THE PHOBIC STIMULI ON AUTONOMIC ACTIVITY IN BLOOD-INJECTION-INJURY PHOBIA AND SPIDER PHOBIA**

Psychophysiology

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**Keywords:** Blood-Injection-Injury Phobia. Spider Phobia. Uncertainty. Heart Rate. Peripheral Pulse Volume. Skin Conductance

### **Objetivos / Objectives**

Following previous research on the effects of the uncertainty of aversive stimuli on vegetative activity in anxious individuals, we studied whether the autonomic imbalance usually observed in blood-injection-injury (BII) phobia would depend on the uncertainty about their phobic stimuli.

### **Metodología / Methodology**

We selected a sample of BII phobia (n=15), spider phobia (n=14), and non-phobia (n=18) individuals. The experimental stimuli were pictures depicting mutilations (n=30), spiders (n=30) and neutral objects (n=30). The task consisted of 90 trials. In the 45 certainty trials, a 2s warning signal (the word “blood”, “spider” or “neutral object”) indicated that 4s later a 6s picture would appear related to the word, whereas in the 45 uncertainty trials the warning signal was a question mark (“?”) that did not indicate the category of the upcoming picture. We measured the PPV, HR and SCR provoked by the pictures.

### **Resultados y Conclusiones / Results & Conclusions**

In spider phobic participants, spider pictures provoked larger SCRs, vasoconstriction, and HR acceleration than other pictures— independently of the uncertainty, whereas uncertain spider pictures provoked the greatest initial HR deceleration. In BII phobia, mutilation pictures provoked the largest SCRs, but elicited cardiovascular responses similar to those evoked by the other pictures.

Our data showed a dissociation of the sympathetic activity in different physiological systems in BII phobia that was unrelated to the uncertainty of the pictures. Mutilation pictures provoked in these individuals an increase of the arousal, as revealed by SCR, without a correspondence in the cardiovascular system. These results underline the atypical reaction observed in BII phobia.





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## **REPLICABILIDAD TEST-RETEST DE LA ACTIVIDAD GAMMA EVOCADA E INDUCIDA EN UNA TAREA DE ODDBALL VISUAL**

Psychophysiology

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Keywords: Actividad No-Fase, Electroencefalografía, Gamma, Replicabilidad, TSE

### **Objetivos / Objectives**

En el presente estudio se persigue, como objetivo principal estudiar la replicabilidad de la actividad gamma (evocada e inducida) y como objetivos secundarios conocer si existen diferencias significativas entre ambos tipos de actividad así como por el tipo de estímulo (objetivo y estándar).

### **Metodología / Methodology**

Dicho experimento se realizó en sujetos neurotípicos a fin de conocer si las mediciones en esta banda conforman un indicador fisiológico fiable. Para ello se aplicó un paradigma Oddball Visual con una separación media de  $49.5 \pm 48.9$  días.

### **Resultados y Conclusiones / Results & Conclusions**

Se ha encontrado una excelente replicabilidad de dicha banda tanto para la actividad fase como la no fase, independientemente del tipo de estímulo al que el sujeto se encuentre atendiendo (Objetivo o Estándar). Por tanto, esto sitúa a la banda gamma como un excelente indicador fisiológico a nivel grupal y recomienda su uso en estudios longitudinales.



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## HEART RATE VARIABILITY DURING ATTENTIONAL FOCUS AND WORRY IN MAJOR DEPRESSION

Psychophysiology

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Keywords: Major Depression, Worry, Cognitive Control, Heart Rate Variability

### Objetivos / Objectives

Worry, which refers to uncontrollable chains of thoughts and images with negative affective load, is a transdiagnostic symptom of various mental disorders including major depression, MD. Current theories relate excessive worry to deficient top-down control of automatically occurring perseverative thinking. This study investigated parasympathetic cardiac control in MD in the context of worry and cognitive control.

### Metodología / Methodology

Heart rate variability (HRV) was recorded, in the high frequency (HF) and low frequency (LF) bands, in 36 MD patients and 36 healthy controls while they performed a breathing focus task. The task included two phases during which participants' ability to concentrate on their breathing was assessed before and after an instructed worry phase.

### Resultados y Conclusiones / Results & Conclusions

In addition to higher self-reported worry, MD patients exhibited lower HF and LF HRV at rest, and lower LF HRV during the task than controls. MD was also associated with impaired breathing concentration ability, more negative and neutral thought intrusions, more negative mood during breathing focus and increased stress during instructed worry. In the total sample, LF HRV correlated negatively with self-reported worry and negative thought intrusions, and positively with mood ratings. The reduction of HRV confirms the notion of low parasympathetic cardiac control in MD. Moreover, low HRV represents a correlate of blunted prefrontal activity and impaired cognitive control that characterize the disorder. Impaired cognitive control may exacerbate worry, which is in turn involved in the genesis of aversive emotional states and maintenance of MD.



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## **A SYSTEMATIC REVIEW ABOUT THE EFFECTS OF PSYCHOLOGICAL STRESS ON DECISION-MAKING AS A FUNCTION OF THE TYPE OF DECISION-MAKING TASK**

Social isolation, loneliness and stress

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Keywords: Psychological Stress; Decision-Making Process; Decision-Making Task; Healthy Individuals

### **Objetivos / Objectives**

Evidence suggests that psychological stress has effects on decision-making (DM). It is well known that a person under stress makes unsystematic and hurried decisions. Moreover, many decisions must be made under stressful conditions, even, the process of DM itself can be stressful, especially when a decision involves high risk and its outcome is uncertain. The objective of the present study was to perform a systematic review of the available evidence about the effects of psychological stress on the DM process as a function of the type of DM task in healthy individuals.

### **Metodología / Methodology**

A search was performed using the EMBASE, PsycInfo, Pubmed, and Scopus databases in February 2020. Based on the PRISMA criteria, 18 studies carried out between 2015 and 2020 that examined the effects of psychological stress on DM were selected.

### **Resultados y Conclusiones / Results & Conclusions**

The types of DM tasks employed were: uncertainty-based economic tasks, tasks in hypothetical situations that can be encountered in real life or in a specific setting, and prosocial tasks. Most of the studies exploring the association between stress and DM using uncertainty-based economic tasks found statistically significant differences as a function of stress exposure, whereas most of the studies that employed non-economic DM tasks in hypothetical situations did not find statistically significant differences. When prosocial DM was evaluated, more altruistic decisions were found. Results suggest that it is important to consider the type of DM task to help people to make better decisions under psychosocial stress.



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**UNIVARIATE AND MULTIVARIATE VOLUMETRIC SEX DIFFERENCES IN LANGUAGE PROCESSING AREAS: HOW LARGE THEY ARE REALLY?**

Sex/gender in the psychobiological research

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Keywords: Sex Differences, Sex Similarities, Multivariate, Gray Matter Volume, Language

**Objetivos / Objectives**

1) To study multivariate sex differences and similarities in gray matter volume (GMVOL) within the main language processing brain areas; 2) To assess to which extent these effects depend of gross morphological female-male differences (operationalized in terms of total intracranial volume; TIV).

**Metodología / Methodology**

“Raw” and TIV-adjusted GMVOL at the brain areas of the “core network” of the SENSEAS atlas was estimated in a sex-balanced sample of right-handed participants (N=600). Univariate sex differences (median) were calculated using distribution-free methods in 10,000 bootstrapped samples. To avoid the limitations of traditional multivariate methods (e.g., MANOVA) and those of the classification-based approaches, multivariate sex differences and similarities were first assessed by bootstrapped dendrogram-based and ANOSIM analyses operating over dissimilarity Euclidean and Spearman distance matrices (which served to quantify the individuals’ disparity in terms of the magnitude of their accumulated differences in GMVOL and the discordance in the shape of their brain profiles, respectively). Complementarily, these multivariate differences, and similarities were also estimated by using relative distribution methods, quantile comparisons, and other statistically-robust and informatively-rich statistics to assess the males-females distributional divergences in the univariate metric space provided by the logistic regression classification probabilities.

**Resultados y Conclusiones / Results & Conclusions**

When raw estimates of GMVOL are considered, sex differences in language processing brain areas are statistically significant, “large” and widespread, but they do not stem from divergences between “male-typical profile” and a “female-typical profile”. Moreover, all these differences fade away when TIV-variation is ruled out, hence raising the question of whether they can really be considered as “brain sex” differences.



**SEX DIFFERENCES IN CORTISOL LEVELS AND THEIR  
RELATIONSHIP WITH MEMORY AND NEGATIVE AFFECTIVITY IN  
PATIENTS WITH DRUG-RESISTANT EPILEPSY**

Sex/gender in the psychobiological research

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Keywords: Epilepsy, Cortisol, Gender Differences, Negative Affect, Memory

**Objetivos / Objectives**

Drug-resistant epilepsy is characterized by uncontrollable seizures and an affectation of all spheres of the individual. These patients present a high comorbidity of anxiety and depression, memory alterations and other aspects that suppose a great emotional burden, being considered a model of chronic stress. The association between cortisol levels, mood and memory processes has been poorly studied for this clinical population. Despite of gender differences have been found in stress response, mood and memory, this issue has been misleading in neurological samples. Therefore, the objective of this study is to examine possible differences based on gender, as well as a differential pattern of relationships between cortisol, memory and mood based on demographic and clinical characteristics.

**Metodología / Methodology**

For this, a sample of 52 adult patients diagnosed with drug-resistant epilepsy (29 men and 23 women) were evaluated before surgery.

**Resultados y Conclusiones / Results & Conclusions**

The results point to differences in evening cortisol levels, with men showing higher levels than women. In men, cortisol levels were associated with memory processes and negative affectivity, while in women they were related to clinical variables. Trait anxiety was negatively associated with memory and was shown to be a reliable predictor of memory performance in men, but not in women. Taken together, these results suggest that cortisol levels and trait anxiety may be plausible indicators of memory and state alterations in patients with drug-resistant epilepsy, showing the need to address gender differences.

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## **MICROGLIAL ALTERATION IN CHRONICAL STRESSED FEMALE MICE: AN IMBALANCE IN THE CX3CL1: CX3CR1 AXIS**

Psychoendocrinology and Psychoimmunology

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Keywords: Social Stress, CX3CL1, CX3CR1, Microglia, Female

### **Objetivos / Objectives**

The aim of this study was to assess the impact of Chronic Social Instability Stress (CSIS) on the activation of the microglia in the striatum and in the hippocampus in OF1 female mice.

### **Metodología / Methodology**

To this purpose, subjects (n=91) were divided into 2 groups, the stressed (n=52) and the non-stressed (n=39) ones. The stressed group was submitted to CSIS model for 28 days. In order to measure the CX3CL1 and CX3CR1 expression, the hippocampus and striatum dissection took place immediately after the experimental procedure. Samples were then processed and the resulting cDNA was analyzed through Real-Time RT-PCR.

### **Resultados y Conclusiones / Results & Conclusions**

Stressed mice showed no differences in the CX3CL1 mRNA gene expression levels in none of the analyzed structures (F [1,86] =0.293; p =0.590;  $\eta^2$  =0.003 in the hippocampus and F [1,86] =2.829; p =0.096;  $\eta^2$  =0.032 in the striatum). However, differences were observed in CX3CR1 expression; the stressed mice showed significant higher CX3CR1 expression levels in both, in the hippocampus (F [1,86] =53.579; p =0.000;  $\eta^2$  =0.384) and in the striatum (F [1,86] =66.940; p =0.000;  $\eta^2$  =0.438). This increase resulted in a lower CX3CL1: CX3CR1 ratio in both structures, in the hippocampus (F [1,87] =12.833; p =0.001;  $\eta^2$  =0.129) and in the striatum (F [1,87] =20.913; p =0.000;  $\eta^2$  =0.194). These data demonstrate that CSIS has an effect on the neuron-microglia interaction in the two stress-sensitive brain structures measured. This suggests that microglial activation could intervene in adapting to a stressful condition.



## LEPTIN AND NON-CLINICAL DEPRESSION SYMPTOMS IN ADOLESCENCE

Psychoendocrinology and Psychoimmunology

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Keywords: Adolescence, Leptin, Anxiety, Depression

### **Objetivos / Objectives**

Leptin is an adipokine produced by white adipose tissue. In addition to its metabolic role, leptin can affect mood. However, its association with psychological status is inconclusive. Here, we assess the relationship between leptin, depression, and anxiety in adolescents with different body mass index (BMI).

### **Metodología / Methodology**

89 healthy adolescents (45 females; mean age:  $15.12 \pm 1.98$ ; age range: 12 – 19) underwent a medical and neuropsychological evaluation. Anxiety and depression were assessed with the Hospital Anxiety and Depression Scale (HADS). Serum leptin values were obtained after an overnight fasting state. We excluded participants showing significant anxiety and depression symptoms (i.e., anxiety or depression symptoms total score  $\geq 11$  in the HADS). Participants were defined according to their BMI: normal-weight and overweight/obesity. Pearson correlations were performed between psychological variables and serum leptin values. Next, controlling by age, BMI-z score, and sex, we fitted multiple regression models to further assess the relationship between anxiety, depression, and leptin.

### **Resultados y Conclusiones / Results & Conclusions**

Bivariate correlations indicated a relationship between depression and leptin ( $r = 0.3$ ;  $P = 0.004$ ). Anxiety scores were not significantly associated with leptin. Regarding multiple regression, only the HADS depression model ( $R^2_{Adj} = 0.10$ ;  $P = 0.01$ ) was significantly predicted by leptin ( $b = 0.05$ ;  $P = 0.003$ ). That is, for each unit of leptin (ng/ml), there was an increment of 0.05 in the HADS depression score. Either sex, BMI-z score nor age significantly predicted depression scores changes. In adolescents, higher leptin concentrations are associated with depression symptoms at a non-clinical level.



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**MORE DATA ABOUT 2D:4D CONFLICTING RESULTS ON  
HANDEDNESS, SEXUAL ORIENTATION AND SEX DIFFERENCES**

Psychoendocrinology and Psychoimmunology

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Keywords: 2D:4D, Handedness, Sexual Orientation, Sex Differences

**Objetivos / Objectives**

Several studies have discussed the value of the second-to-fourth digit ratio (2D:4D) as a measure of exposure to sex hormones before birth. The debate has also questioned 2D:4D association with individual features previously related to this exposure such as handedness and sexual orientation. We have tested in a large sample (935 men and 900 women) these relationships.

**Metodología / Methodology**

Given that it has been argued that sex differences in 2D:4D could be a consequence of body-size differences, we have tested the allometric relationship between finger lengths and body size. We have also tested the association between self defined sexual orientation and 2D:4D and 2D:4D and handedness (evaluated through self-reported preference and hand performance, measuring the difference in hand grip strength between the hands).

**Resultados y Conclusiones / Results & Conclusions**

Our results show that the association between finger lengths and size is either allometric or isometric, depending on the analyses performed. In any case, the deviation from isometry is not large enough to explain the usually found sex differences in the trait. We find a relationship between 2D:4D and sexual orientation in men but not in women. Finally, we did not find any relationship between 2D:4D and handedness. Our main conclusion is that 2D:4D shows differences between sexes beyond their disparity in body size. In our opinion, 2D:4D can be used cautiously as an indicator of intrauterine exposure to sex hormones taking into account some considerations, such as analysing large sample and taking careful measurements of the ethnicity of the sample.





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## EXPLORING THE EFFECT OF A TEMPORAL GAP IN DECISION MAKING

Others

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Keywords: Decision Making, Working Memory, Temporal Gap, Humans, Behavioral Neuroscience

### **Objetivos / Objectives**

Researchers are challenging the idea that progressive, continuous accumulation of evidence is the only crucial factor for decision making. In this regard, we wanted to investigate to what extent a time gap (located between visual stimuli) would cause any informational leak (by affecting working memory) or any change in decision strategy (e.g., by increasing urgency).

### **Metodología / Methodology**

21 human adults performed a modified version of the random dot motion task, played on a computer. In each trial, 15 dots sequentially jumped from a central circle to a left or a right one. Each dot disappeared shortly after it jumped. Participants were asked to guess to which of the two peripheral circles the majority of the dots would have gone by the end of each trial. They reported their decision by moving a computer mouse. In half of the trials, a time gap was included, where no jumps occurred and no information was visually available. There were five trial types (different sequences of left-right movements). After the experiment, we controlled the lack of awareness of the gap (or the trial types) with a questionnaire. The data were analyzed in RStudio.

### **Resultados y Conclusiones / Results & Conclusions**

Participants decided after fewer dots had moved when there was a gap. Thus, decisions were made even if less information was available. This could mean the gap increased urgency. Moreover, the gap increased accuracy in a specific trial type. Overall, our results suggest that the process of perceptual decision making still evolves in the absence of visual evidence.



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## **EVOLUTION OF THE EPISODIC-LIKE MEMORY FUNCTIONS OF THE HIPPOCAMPUS**

Others

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Keywords: Episodic Memory, Hippocampal Pallium, Trace Classical Conditioning, Brain Evolution, Teleost Fish

### **Objetivos / Objectives**

An increasing amount of experimental evidence indicates that some basic behavioral attributes of episodic memory can be found in nonhuman primates, rodents, and birds, which suggests that this form of memory could have a long evolutionary history.

Additionally, comparative neuroanatomical evidence indicates that a hippocampus homologue can also be found in nonmammalian vertebrates, including fish. In the last years several confronted hypotheses have tried to explain when and how the hippocampus acquired its episodic memory function through the vertebrate phylogeny. A widely accepted hypothesis claims that the hippocampus first evolved as a dedicated system for spatial navigation in ancestral vertebrates, being transformed later to support a broader role in episodic memory with the emergence of mammals. An alternative hypothesis holds that the hippocampus originally encoded both the spatial and temporal dimensions of relational memories since its evolutionary appearance.

### **Metodología / Methodology**

Here we present several experiments revealing that the hippocampal pallium of teleost fish, a vertebrate group that shares with mammals a common ancestor that lived about 400 Mya, is like the mammalian hippocampus, also involved in encoding the temporal relationships of the experienced events.

### **Resultados y Conclusiones / Results & Conclusions**

This finding challenges the idea that navigation preceded relational memory in evolutionary appearance and suggests that a relational memory function that associates the experienced events in both the spatial and temporal dimensions could be a primitive feature of the hippocampus conserved throughout the evolution of the separate vertebrate lineages.

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**PSYCHOBIOLOGY OF THE GOLDFISH TELENCEPHALIC PALLIUM:  
CLUES TO DECIPHER THE EVOLUTION OF THE CEREBRAL CORTEX**

Others

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Keywords: Telencephalic Pallium, Cerebral Cortex, Evolution, Teleost, Parcellation

**Objetivos / Objectives**

Although considerable advancements in the scientific understanding of the anatomy and functions of the cerebral cortex have been made during the last century, knowing how this complex brain structure developed along the evolution of vertebrates remains unresolved today. Reconstructing the evolutionary history of the cerebral cortex necessarily requires making comparisons across living vertebrate species within a phylogenetic perspective. As the ray-finned fishes (actinopterygians) are the closest relatives of land vertebrates and other lobe-finned fishes (sarcopterygians), to study the organization of the pallium of actinopterygians (for example, goldfish) is crucial to reconstruct the ancestral state of the cerebral cortex and to identify what of their features are primitive or derived. Here we present a detailed anatomical and functional cartography of the main areas of the goldfish telencephalic pallium in order to compare them with their putative homologues in the pallium of land vertebrates.

**Metodología / Methodology**

We used a combination of Nissl, Golgi and COX stainings to define cytoarchitectonic regions and borders, as well as in vivo optical recording of neural activity induced by sensory (visual, auditory, somatosensory, and gustatory) stimulation and local electrical microstimulation of the defined areas.

**Resultados y Conclusiones / Results & Conclusions**

This study allows subdividing the pallium of goldfish in different areas on the basis of neuroanatomical and functional criteria. The possible homologies of these subdivisions are discussed, as well as the significance of the present results for the evolution of the pallium of land vertebrates and the cerebral cortex of mammals.

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## TEACHING PSYCHOBIOLOGY THROUGH SOCIAL NETWORKS: THE INSTAGRAM EXPERIENCE

Others

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Keywords: Psychobiology, Instagram, Neuroscience, Educational Innovation, Social Networks

### **Objetivos / Objectives**

The digitization of educational strategies and the advancement of technologies and social networks lead to important changes in the teaching-learning process that universities must attend. One of the main difficulties observed in students is the lack of skills to search for information and the ability to disseminate scientific concepts, both key issues in the learning of Psychobiology. Thus, we designed and carried out an educational innovation project with the aim to make scientific dissemination in Psychobiology through Instagram.

### **Metodología / Methodology**

The study was carried out over 2019-2022, with the participation of 452 students of the Universitat de València. The students received specific training to search reliable information in appropriate databases and afterwards, they write the news or record educational pills to disseminate them on the Instagram account. The teachers reviewed all the content to ensure scientific requirements and quality criteria were met. The students fulfilled a questionnaire at the beginning and at the end of the activity, regarding motivations and type of use of new technologies and social networks, as well as their opinion and level of satisfaction.

### **Resultados y Conclusiones / Results & Conclusions**

As a result, @Psicobionews account has been created, it is currently active with 735 followers and 278 publications. In general, the students showed great satisfaction with the activity and more interest for scientific dissemination. These innovative actions are focused on the process of digitization of universities complementing more traditional educational strategies and enabling the student to be their own creator of reliable and attractive Neuroscience content as a training for their professional future.



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## FROM RESEARCH TO INTERVENTION. PSYCHOBIOLOGY IN THE GENOMIC REVOLUTION

Others

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Keywords: Psychobiology, Genomic Revolution, Genetic Test

### **Objetivos / Objectives**

**INTRODUCTION:** In recent decades, genomics has experienced exponential development thanks to the advances on genotyping techniques and the increasing knowledge of the function of the different parts of the genome, provided by genome-wide association studies. This has been translated into greater possibilities to understand the genetic bases of complex traits and, in parallel, greater availability of analytical tests. Such availability is reflected in a wide variety of clinical tests, aimed at health professionals, and direct-to-consumer genetic tests. **OBJECTIVE:** Analyze the role of Psychology, and specifically of Psychobiology, in this new scenario.

### **Metodología / Methodology**

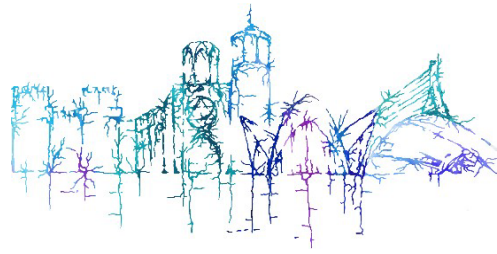
A bibliographic search was carried out in Pubmed and PsycInfo using the keywords: "Psychology", "Psychobiology", "Psychiatry", "Genetic Test", and their derivatives.

### **Resultados y Conclusiones / Results & Conclusions**

The scenario generated by the genomic revolution raises the emergence of a whole series of issues with few previous references in the field of Psychology, and Psychobiology in particular. Among them: which is the basic knowledge needed to interpret correctly genetic tests; how to disseminate scientific information among the non-expert public; how to communicate specific information to the target group; how this predictive or risk information will affect decision-making and attitudes about health; how to manage uncertainty as well as the possible emotional and vital impact. Psychology, led by Psychobiology, and in collaboration with other related disciplines, is called to answer all these questions, considering this new reality in research and clinical practice.

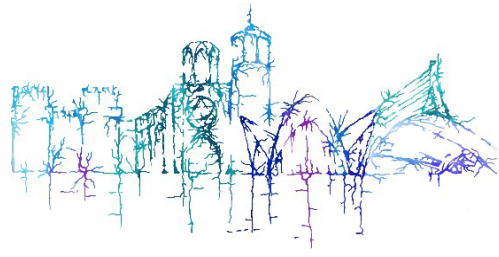
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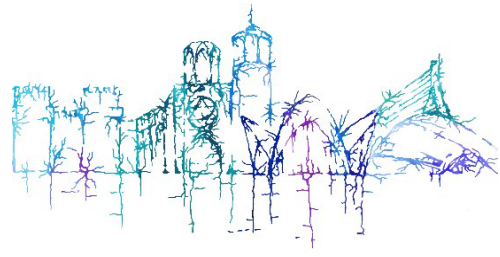


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