



## AYUDAS RAMÓN Y CAJAL CONVOCATORIA 2015

### Turno de acceso general

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#### Título:

The study of dynamic cortical networks underlying cognitive impairment in neurological and psychiatric patients by combining brain-mapping and brain-stimulation techniques

#### Resumen de la Memoria:

Many neurological and psychiatric diseases, such as Stroke, Parkinson's disease, and Multiple Sclerosis, or Schizophrenia and Obsessive-Compulsive Disorder, can cause permanent and serious cognitive impairment, which is being increasingly recognized as a common and adverse consequence of these disorders. How cognitive decline is associated with distinct patterns of cortical-subcortical dysfunction, and the precise functional role of relevant human brain networks underlying the pathophysiology of neurological and psychiatric disorders, remains debated or unknown.

Since beginning my career as research scientist, I have been highly involved in the recording and processing of brain activity obtained by electrophysiological methods to explore the neural bases of visual-spatial attention and the presence of cognitive abnormalities in both healthy subjects and neurological patients.

During my postdoctoral training, and thanks to two Marie Curie Postdoctoral fellowships awarded to me by the European Research Council (ERC) and additional grant funds, I have mainly been investigating the brain mechanisms underlying cognitive function and dysfunction both in healthy subjects and in neurological and psychiatric diseases, using different functional neuroimaging techniques such as electroencephalography (EEG), functional magnetic resonance imaging (fMRI), or transcranial magnetic stimulation (TMS). Due to each method having major limitations with respect to temporal or spatial parameters when used alone, I have focussed particularly on developing simultaneous recordings and strategies based on the multimodal integration of data obtained from these different modalities. I have also gained solid skills in designing new computerized cognitive tasks, and novel technical setups to be implemented in combination with EEG and fMRI environments, or during the co-registration of EEG and TMS/tSMS, and deep brain stimulation (DBS).

Recent methodological advances have firstly, allowed me to use reliable procedures for the multimodal integration of EEG-fMRI data (e.g., using fMRI-constrained EEG/ERP source imaging methods), reducing the spatial mismatches between fMRI activations and instantaneous electrical source activities of EEG information, and secondly, provided a more sensitive measure (e.g., by EEG-TMS/tSMS) for evaluating TMS-impact on brain function than behavioral effects. Finally, the accessibility to deep brain regions through the DBS in treatment-refractory neurological and psychiatric patients is providing a unique opportunity to simultaneously record scalp EEG and intracranial depth EEG (icEEG) data directly from human deep brain structures. Thus, the identification of EEG brain activity patterns during DBS (on/off) stimulation protocols can be a promising functional mapping method used to assess the underlying neurophysiology of DBS effects and the cortical network dynamics also thought to be involved in the pathogenesis of different brain-related disorders. This will allow us to understand the structurally-connected, functional neural circuits involved in the maintenance of cognitive dysfunction and psychiatric symptoms in much greater detail.

#### Resumen del Currículum Vitae:

I obtained my BA degree in Psychology at the University of Seville in 2003. Thanks to two fellowships funded through Spanish research projects and the Multiple Sclerosis Unit of the Hospital Virgen Macarena, I subsequently received my doctoral training in psychophysiology and cognitive neuroscience at the University of Seville. In 2007 I obtained my PhD in Psychology (marked outstanding 'Cum Laude').

From 2008 to 2012, I had the opportunity to start a fruitful period in the Institute of Experimental Neurology of the San Raffaele Hospital (Milan, Italy) as a Marie Curie postdoc fellow and grant funds (FP7-PEOPLE-IEF) supported by the European Research Council (ERC). At the end of this project, I was awarded a new postdoctoral research fellowship supported by the Institute of Experimental Neurology to continue my investigations. I was conducting various lines of interdisciplinary research involving neuropsychology, electrophysiology, and neuroimaging, as well as multimodal integration techniques (EEG and fMRI, EEG and TMS) with a particular focus on cognition in healthy young adults and in neurological patients with multiple sclerosis, amyotrophic lateral sclerosis, parkinson's disease and stroke.

In 2012, I was awarded a new Marie Curie senior fellowship from the ERC's FP7-COFUND Programme, to work at the Centre of Biomedical Technology of the Technical University of Madrid, where I currently work, thanks to a new Research Associate contract and grant funds awarded to me by the Spanish Government (JIN Programme - MINECO) in 2015. This new independent research position and my two previous Marie Curie postdoctoral fellowships have given me the opportunity to create stable links with other European research institutions, gaining international mobility and experience. I have also developed my practical and independent scientific career by implementing novel research lines to study cortical and subcortical networks underlying cognitive impairment in neurological and psychiatric patients, using multimodal integration of electrophysiological (EEG) and hemodynamic (fMRI) data, or EEG and TMS/tSMS data, but also developing novel functional mapping approaches, such as the co-registration of EEG during deep brain stimulation (DBS) protocols, or the concurrent recording of EEG and intracranial EEG (icEEG) data from deep brain regions in psychiatric patients, for therapeutic purposes.



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As a result, I have published (as first author or co-first author) of 12 scientific articles in various national and international journals, and additionally, I have co-authored 25 research articles, some of them in high-impact journals, as well as book chapters. I also have a strong track record in presenting at international and national meetings (author/co-author in more than 130 abstracts in seminars, hands-on workshops, scientific congresses and symposiums). I have worked on more than 10 large research projects, and in my role as principal and co-principal investigator, I have also managed several highly competitive national and international research grants (e.g., ERC, international foundations, and MINECO grants) associated to my main research topics. I have extensive experience in teaching at several Universities, supervising several international undergraduate students (since 2007), and I have recently acted as the director of a doctoral thesis.



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### Turno de acceso general

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#### Título:

Neurofunctional Correlates of Cognitive Aging

#### Resumen de la Memoria:

As a cognitive neuroscientist, I am specifically interested in the linkage between cognitive processes and neural function in older adults in order to obtain insight into the dynamic interplay between neurobiological and cognitive processes across the lifespan. I got my BA degree in Psychology from the University of Santiago de Compostela in 1999. I defended my PhD with honors in 2007 (Cum Laude grade, and Best Doctoral Dissertation Award 2006-2007). My main research interest has been investigating the causes of cognitive decline that accompanies the aging process (both healthy and pathological), and studying in depth its specific neurofunctional characteristics. This kind of research is essential to elaborate future cognitive intervention programs that compensate to some extent the age-related decline process. During the research period of my PhD program, my interest focused on visual-spatial attention processes and more recently in working memory processes. My research combined non-invasive recording techniques of electro-magnetic brain activity (EEG-ERPs/MEG) with behavioral measures. This allowed characterizing psychophysiological several effects of age on these cognitive processes under different stimulus environments and task conditions. Related to my earlier investigations, I have published several papers in international JCR journals (Doallo et al., 2004, 2005; Lorenzo-López et al., 2002, 2004, 2007; Pazo-Álvarez, et al., 2004). As a result of my PhD dissertation, I published two additional papers (Lorenzo-López, Amenedo & Cadaveira, 2008; Lorenzo-López, et al., 2008) in some one of the most outstanding journals in the Neuroscience ISI category. These findings provided novel evidence that the neural circuit supporting visual search process is vulnerable to normal aging. We have also demonstrated (Amenedo et al., 2012), that older adults need more time to allocate spatial attention onto the target and to prevent cross talk between response selection and attention direction. Importantly, we have recently demonstrated (Lorenzo-López et al., 2016) that the mechanism of top-down suppression of task-irrelevant stimuli is preserved for older adults with Age-Associated Memory Impairment (AAMI), but the selection of relevant targets was significantly delayed in these patients compared to healthy older controls. Currently, I am also very interested in frailty status in elderly, as a condition opposed to full health or fitness (Lorenzo-López et al., in press), and it would be interesting to further explore the psychophysiological basis of frailty status by neuroimaging methods in future projects.

#### Resumen del Currículum Vitae:

I have been a full time member of different research groups in several scientific grants funded in public calls by national (11 projects) and international (3 European projects) agencies. I obtained several predoctoral, mobility, and postdoctoral fellowships from the Galician Autonomous Government (including Ángeles Alvariño research contract, 2007-10). My scientific production includes 32 articles published in international refereed indexed journals (28 of them in JCR, 10 included in the 1st quartile Q1; 3 in the 1st decile D1; mean Impact Factor: 2.665) mainly in the fields of Neurosciences & Neurology, and Geriatrics & Gerontology. My h-index is 8; sum of times cited WOS, Jan 2016: 225 (215 without self-citations). My scientific production has gradually and continuously increased with 22 of the 32 articles published in the last 5 years. I am the first author in 9 of the papers (corresponding author in 7). Findings obtained in my studies resulted in 70 communications at national and international meetings and conferences, 39 of them as oral presentations, and 5 as invited speaker (11 of the abstracts were published in JCR journals, mean IF: 2.265). In the last years, I showed a strong international activity, having extensive collaborations and academic networks with Universities in USA, Canada and Austria, and participating as a researcher in several projects with international consortiums. I have completed two postdoctoral stays (24 months) in prestigious neuroscience centers (Center of Magnetoencephalography Dr Pérez-Modrego at the University Complutense of Madrid, and Center for Cognitive Neuroscience at Duke University, North Caroline, USA). I have also collaborated during the last 14 years in teaching/mentoring activities on undergraduate postgraduate levels at the Universities of Santiago de Compostela and A Coruña (courses design, teaching, directing projects and supervising and evaluating students). Since 2014, I participate in the Tutorial Action Plan of the Faculty of Health Sciences at the University of A Coruña. I have received ANECA accreditation for the position of Associate Professor, and I took part of the thesis committee of 3 PhD theses at the University of A Coruña (2 as vogal and 1 as secretary) and 1 at the University of Vigo (as vogal). I have mentored aPhD student at the University of Santiago de Compostela and I am currently supervising a Final Master Project and a PhD thesis at the University of A Coruña. I am a member of several scientific editorial and advisory boards participating as invited ad hoc reviewer in different international journals, such as Human Brain Mapping, Neuropsychologia, International Journal of Psychophysiology, Brain Research, Clinical Interventions in Aging, Aging & Mental Health, BMC Geriatrics, Annals Academy of Medicine Singapore, The Spanish Journal of Psychology, and an external referee for the review panel of national (Agencia Nacional de Evaluación y Prospectiva, ANEP; Fundación Progreso y Salud, Junta de Andalucía) and international evaluation and funding agencies (Research into Ageing, London 2007; Health Research Board, Ireland, 2015). In October 2015, I was invited to join as Review Editor the Editorial Board of Frontiers in Aging Neuroscience. My scientific production and teaching experience have been high in the last years. All of the described above indicates my research skills, independency and capabilities to lead my research career as an independent investigator.



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#### Título:

Neurociencia aplicada a los sistemas con altas exigencias de seguridad. Garantizar la seguridad de las personas, las instalaciones y el medioambiente mediante la monitorización continuada del estado psicofísico del operador

#### Resumen de la Memoria:

Los adelantos en el campo de la Neurociencia han permitido que ésta dé nuevas respuestas en el ámbito de la interacción hombre-máquina. Así, problemas clásicos en Factores Humanos, como son la seguridad, la precisión o el tiempo de ejecución se estudian desde nuevos enfoques buscando la mejora del bienestar integral del operador. En España, aunque haya una tradición importante en Factores Humanos, desafortunadamente, la investigación en Neurociencia aplicada (o Neuroergonomía) está todavía en su estado embrionario. En esta coyuntura, el Dr. Di Stasi es el primer representante de la Universidad de Granada y de universidades españolas en esta área del conocimiento, habiendo unido la Neurociencia a las metodologías clásicas de estudio del puesto de trabajo. Todo ello, siendo capaz de publicar sus trabajos aplicados en las mejores revistas de Neurociencia general. Su último trabajo de revisión al respecto, publicado en 2013 en la prestigiosa revista *Neuroscience and Biobehavioral Reviews*, lo sitúa entre los líderes internacionales en el estudio de los movimientos sacádicos ("top 3" en los últimos 5 años, fuente: [pubmed.com](http://pubmed.com)). Además, es un experto en la utilización de la técnica de eye-tracking para la medición de la fatiga, por lo que está dando importantes respuestas sobre todo en contextos laborales reales, en donde la Neurociencia apenas se ha introducido. Gracias al desarrollo actual de las tecnologías de evaluación neuroergonómica, se puede saber de forma objetiva cuando el desempeño empieza a disminuir debido a, por ejemplo, una sobrecarga de trabajo o un elevado nivel de cansancio. El problema principal hasta la fecha ha residido en los altos costes de esta tecnología, el tamaño de los aparatos o la complejidad de las pruebas. Por ello, el reto de los estudios del Dr. Di Stasi es intentar dotar a los sistemas con altas exigencias de seguridad de innovaciones tecnológicas viables que permitan conocer si el operador está en condiciones óptimas para desempeñar su labor de manera segura para él, para la organización y el medio ambiente. En particular, su trayectoria inmediata está relacionada con la seguridad del paciente y la seguridad aérea en profesionales tan dispares como son los cirujanos y los pilotos, profesionales con altas responsabilidades sociales y presiones, horarios prolongados y una jerarquía laboral rígida. En la mayoría de los trabajos publicados, el Dr. Di Stasi es el primer autor y corresponding author dado que, no sólo ha llevado el peso de las labores de investigación, sino que ha concebido las hipótesis explicativas. Dado el éxito de sus trabajos, el Dr. Di Stasi lidera 4 proyectos cuyo desarrollo en los próximos años es de esperar que sea exitoso, sobre todo por el interés y apoyo que ha recibido tanto de la comunidad académica/industrial como de las instituciones implicadas. Prueba de ello son las diferentes colaboraciones y contratos de investigación de los que disfruta o en los que ha participado. La transferencia del conocimiento es un elemento también muy presente en su labor investigadora y posee dos patentes internacionales registradas. Por otra parte, en los trabajos de divulgación científica, intenta llevar el nombre de la Universidad de Granada y de sus patrocinadores a públicos tan diversos como, por ejemplo, los lectores internacionales de *Scientific American Mind*, la NASA o la DGT.

#### Resumen del Currículum Vitae:

Desde el comienzo de su carrera profesional, el Dr. Di Stasi se ha preocupado por realizar actuaciones científicas y docentes en busca de la excelencia, logrando cimentar así una de las carreras profesionales más prometedoras. Como consecuencia, y pese a su juventud, se perfila como uno de los principales activos de la neurociencia española e internacional. Como se evidencia en el currículum, sus aportaciones van más allá de la investigación básica y aplicada, ya que también están presentes trabajos más clínicos, así como toda una serie de contribuciones a la transferencia del conocimiento. La trayectoria investigadora del Dr. Di Stasi comenzó en el 3er curso de grado, en la Universidad de Padua, publicando los resultados de su proyecto fin de grado en la revista más prestigiosa de Psicología en Italia. Desde ese momento, el Dr. Di Stasi se compromete con una visión global e internacional de la ciencia, lo que le ha supuesto disfrutar de colaboraciones con expertos de todo el mundo y formar parte de importantes grupos de investigación. Así, desarrolló su Trabajo Fin de Máster en la Universidad de Granada, en el marco del programa Erasmus, integrándose con éxito en el Grupo de Ergonomía Cognitiva y realizó estancias en la Universidad de Buenos Aires, en Argentina; en la Universidad de Dresden, en Alemania; y sus estudios postdoctorales en el Barrow Neurological Institute, en Estados Unidos. Además, siguiendo la lógica de búsqueda de la calidad, tras la obtención de una beca FPU, realizó su tesis doctoral bajo la supervisión de expertos en varias áreas y conforme a los estándares para la obtención de la Mención Europea (tesis que ha sido galardonada con el Premio Extraordinario) y logró obtener la única Beca Fulbright que se ha concedido para Psicología desde el año 2011 en ayudas postdoctorales. Además, tuvo la mejor puntuación de todos los candidatos que optaban a las prestigiosas becas Talentia Postdoc en 2014, beca de la que disfruta actualmente. Recientemente, ha obtenido un contrato de investigación bajo el programa Rita Levi-Montalcini (tenure-track) en su Alma Mater, Universidad de Padua para incorporarse a finales de 2016. Su visión de la investigación denota no sólo calidad, sino también interés por la transferencia del conocimiento. Ha desarrollado proyectos de investigación e informes técnicos para empresas privadas (FIAT, Honda Motor y Centro Tecnológico de Automoción de Galicia) y organismos públicos (CRIDA/AENA). Además, su proyecto postdoctoral en Estados Unidos, financiado por la



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Comisión MEC-Fullbright, fue apoyado por diversos organismos (Ministerio de Defensa Español, el US Navy y el St. Joseph's Hospital), por la relevancia del objetivo a investigar: la evaluación de las capacidades atencionales de profesionales con labores de alto riesgo. Sus actuales proyectos están apoyados y financiados por la Fundación Progreso y Salud de la Consejería de Salud de la Junta de Andalucía, la Dirección General de Tráfico, la Fundación BBVA, y el Banco Santander.

De su trayectoria investigadora, han resultado más de 35 trabajos indexados (que han recibido más de 400 citas, con un índice H de 14), publicaciones y actividades de divulgación, 2 patentes, más de 30 comunicaciones en congresos internacionales y la participación en más de 14 proyectos nacionales e internacionales, 4 de ellos como Investigador Principal.



## AYUDAS RAMÓN Y CAJAL CONVOCATORIA 2015

### Turno de acceso general

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#### Título:

Phonology and Affective Processes during Reading

#### Resumen de la Memoria:

During my PHD studies at the Freie Universität Berlin (2004-2008) I investigated cognitive processes involved in visual word recognition from a cross-language comparative approach (including German, Spanish and French).

In particular, focusing on the role of phonological syllables as functional reading units, my research provided novel insights on phonological processes underlying silent reading (e.g. Conrad, Grainger, & Jacobs, 2007; Conrad, Carreiras, Tamm, & Jacobs, 2009), and I could implement the first computational model to account for such syllabic effects (Conrad, Tamm, Carreiras, & Jacobs, 2010).

I later on extended this research focus to bilingual language processing (Conrad, Afonso, Álvarez, & Jacobs, 2015; Oganian et al., 2015a, 2015b).

My second main research line deals with the interplay of language and emotion.

Collecting affective ratings for words in several languages, I contributed to large scale databases essential for emotion research (Vo et al. 2006, 2009; Schmidtke et al. 2014).

Experimental studies I designed allowed for distinguishing valence and arousal effects in early automatic responses to emotion laden words (Recio, Conrad, Hansen, & Jacobs, 2014), or lexical vs. supra-lexical emotion effects during text reading (Hsu, Jacobs, Citron, Conrad, 2015).

I further fundamentally contributed to the emerging neuroscience research field of emotion effects in bilinguals (Conrad, Recio, & Jacobs, 2011; Hsu, Jacobs, & Conrad, 2015).

I generally use the research methods electroencephalography (EEG, ERPs), functional magnetic resonance imaging (fMRI), eye-tracking, together with behavioral data analyses.

From 2004 to date, I acquired research funds with a total volume of about 900.000 Euro for five research projects.

Appr. 50% of this money was granted to me as Principle Investigator of three different research projects (2008-2013) supervising 5 doctoral students within the Research Cluster of Excellence **◆Languages of Emotion◆** at the Freie Universität Berlin.

These projects combined neuroscience research methods with theoretical questions from linguistics and arts (project **◆Sound physiognomy in language organization, processing and production◆**), sociology (**◆The affective foundations of sociality: Language, physiology and social differences◆**), or general psychology (**◆Bilingualism and affectivity in reading◆**).

After moving to the Universidad de La Laguna in 2012 **◆** while continuing to publish empirical results from previous projects - I am cooperating with Horacio Barber and Niels Janssen combining my experience in emotion research with theirs concerning co-registration of ERPs and eye-movements, or multiple regression and linear-mixed-models-approaches to neuroscientific data.

#### Resumen del Currículum Vitae:

I have been doing research in the fields of

- phonological processing during visual word recognition,
- bilingual language processing,
- emotion effects during reading, and
- phonological iconicity.

I have been using the research methods of

- electroencephalography (EEG, ERPs),
- functional magnetic resonance imaging (fMRI),
- near infrared spectrography (NIRS)

eye-tracking or behavioural data analyses.

I have published to date a total of 40 scientific articles in international peer reviewed journals (e.g., Cortex, Journal of Experimental Psychology, HPP; PNAS; Neuroimage) with a cumulative scientific impact factor > 100.



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27 of these scientific articles are published in journals within the first quartile (Q1) of their respective categories (Neurosciences, Experimental Psychology, Applied Linguistics, among others) according to Journal Citation Reports of Thompson Web of Knowledge. According to Web of Science, my work has currently been cited 795 times - resulting in an h-Index of 16.

I have collected a total of > 900,000 Euro of grant money for five different research projects - acting as the sole responsible Principal Investigator for two of them, collaborating with other PIs in three other.

During the course of these projects, I have been directing five dissertation theses on topics related to the research projects (one of them already finished, the other ones to be finished in 2016).

Please consider the following aspects of German academic tradition to avoid misinterpretations - with regard to my scientific independence - of data related to these projects in my CV:

- To offer my PHD students the opportunity to use these publications for their theses, I mainly chose the senior author position on recent publications - regardless of how intense my actual contributions to these papers were.

- My former PHD supervisor is included as a co-author on publications whenever data was collected at his laboratory at the Freie Universität Berlin, and as a supervisor of all doctoral theses resulting from my projects, because the German academic system requires a full professor (catedrático) in this position.

I have been collaborating with researchers from

- the Freie Universität Berlin (Arthur Jacobs, Hauke Heekeren), Germany (where I did my PHD and also gave a number of university courses),

- the Universidad de La Laguna (Horacio Barber, Niels Jannsen, Carlos Álvarez), Spain,

- the Max Planck Institute of Human Cognitive and Brain Sciences, Leipzig (Sonja Kotz), Germany,

- the Université de Provence, CNRS, Aix-Marseille (Jonathan Grainger, Johannes Ziegler), France, and

- the Basque Centre Brain and Language, Donostia (Manuel Carreiras, Nicola Molinaro), Spain,

and I have realised repeated and extended research stays at all these institutions.