

**XXVII Congreso Internacional de la
Sociedad Española de Psicología
Comparada (SEPC)**

**XXVII International Congress of the
Spanish Society for Comparative
Psychology (SEPC)**



Libro de Resúmenes
Abstract Book



Universidad de Sevilla,
9 al 11 de septiembre de 2015

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ISBN: 978-84-944366-0-4

Edición, maquetación y producción:
Fénix Editora. Sevilla.
www.fenixeditora.com

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Índice / Contents

Programa / Programme	9
Conferencias invitadas / Guest Lectures	17
Simposios / Simposia	25
Comunicaciones / Talks	41
Sesión de pósteres 1 / Poster Session 1	91
Sesión de pósteres 2 / Poster Session 2	113



**XXVII International Congress of the Spanish Society
for Comparative Psychology**

University of Seville, 9 - 11 September, 2015



XXVII Congreso Internacional de la Sociedad Española de Psicología Comparada (SEPC)

XXVII International Meeting of the Spanish Society for Comparative Psychology (SEPC)

**Universidad de Sevilla,
9 al 11 de septiembre de 2015**

Programa - Programme



WEDNESDAY 9th

9:00-9:30 REGISTRATION

9:30-10:00 OPENING OF THE CONGRESS

10:00-11:15 INAUGURAL CONFERENCE:

Peter C. Holland (Johns Hopkins University). *Deployment of attention in learning and action*

11:15-12:00 COFFEE BREAK & POSTER SESSION 1

12:00-13:15 TALK SESSION 1: Flavor learning

12:00-12:15 Bura, Soto, Gasalla, López, and Dwyer. Hypertonic NaCl as a pain inducing agent in taste aversion learning may differentially affect preparatory and consummatory responses

12:15-12:30 Boakes, Sun, and Kwok. Thinking can get in the way of learning: Mediated serial overshadowing of long-delay taste aversion learning

12:30-12:45 Cuenya, Bura, Serafini, and López. Evaluation of hedonic changes in frustration responses through taste reactivity

12:45-13:00 Soto, Gasalla, Bura, and López. Conditioned changes in hedonic responses in flavour preference learning

13:00-13:15 Gonzalez, Morillas, and Hall. Latent inhibition in flavor-preference conditioning using fructose and maltodextrin: Effects of motivational state and the nature of the reinforcer

13:15-15:15 LUNCH AT "RESTAURANTE LA RAZA"

15:15-16:30 TALK SESSION 2: Stimulus Preexposure

15:15-15:30 Iliescu, Recio, and De Brugada The effects of a distractor placement in animal perceptual learning

15:30-15:45 Recio, Iliescu, Bergés, Gil, and de Brugada. The effect of additional exposure to the unique features in a perceptual learning task can be attributed to a location bias

15:45-16:00 Artigas, and Prados. Differential representation in intermixed and blocked pre-exposure

16:00-16:15 Rodríguez, and Hall. Human Latent Inhibition and the Density of Predictive Relationships in the Context in which the Target Stimulus Occurs.

16:15-16:30 Márquez, Esber, Serrano-Barroso, López, and Diaz. D1 and D2 dopaminergic receptor involvement in recovery of a CS with a latent inhibition procedure

16:30-17:45 SYMPOSIUM: EVOLUTION OF LEARNING AND SPATIAL COGNITION IN VERTEBRATES. Chair: Rubén N. Muzio

Rubén N. Muzio: **Brief presentation of the Symposium**

First talk

Emilio Durán, Cristina Broglio, Fernando Rodríguez and Cosme Salas (Universidad de Sevilla). **Spatial learning and memory in teleost fish: the role of the hippocampal pallium**

Second talk

María Inés Sotelo, Vern P. Bingman and Rubén N. Muzio (Universidad de Buenos Aires and Bowling Green State University). **The use of slope as a navigational beacon in amphibians**

Third talk

Verner P. Bingman and Vincent J. Coppola (Bowling Green State University). **The Avian Hippocampus: A Dedicated Spatial Module?**

Fourth talk

Virginia Mesa, Alba Osorio and Victoria D. Chamizo (Universitat de Barcelona). **Geometrical information vs. non-geometrical information: Explaining male rats' selective preferences**

17:45-19:00 TALK SESSION 3: Neural correlates of learning

17:45-18:00 Grau-Perales, Morillas, Gómez-Chacón, and Gallo. Role Of The Posterior Piriform Cortex Of Rats In Flavor Recognition Memory

18:00-18:15 Perez-Díaz, Díaz, Villén, Márquez, and López. Dorsal striatum and prefrontal cortex involvement in CS processing in latent inhibition.

18:15-18:30 Méndez, Arias, Méndez-López, and Arias. Spatial Learning In Rat: Brain Circuits Mapped With Cytochrome Oxidase Histochemistry

18:30-18:45 Balea, Portavella, and Vargas. Representation of 3d space is shaped by episodic memory traces

18:45-19:00 Sanchez-Nogales, and Aguilar. Prenatal sex-hormone exposure, aggression and dominance in men and women

19:00-19:30 COFFEE & POSTER SESSION 1

19:30: GUIDED VISIT TO THE ANCIENT TOBACCO FACTORY (MAIN BUILDING OF SEVILLE UNIVERSITY)

THURSDAY 10th

9:00-10:00 TALK SESSION 4: Human Learning

- 9:00-9:15 Blanco y Matute. Illusions of control over undesired events: reversing the outcome-density bias
- 9:15-9:30 Torres, Megías, Catena, Cándido, and Maldonado. Effect of the non-contingent feedback in the risk behavior.
- 9:30-9:45 Morís, Barberia, Vadillo, Andrades, and López Slowed reacquisition of a previously extinguished response: the effect of partial extinction in human contingency learning
- 9:45-10:00 Alvarado, Cruz, Estrada y Vila. Temporal Weighting Rule with change context physical in human beings

10:00-11:15 TALK SESSION 5: Attention and Learning

- 10:00-10:15 Callejas-Aguilera, Alcalá, Aristizabal, and Rosas. Ambiguity Produced by Discrimination Reversal Facilitates subsequent Learning of a Temporal Discrimination in Rats
- 10:15-10:30 Alcalá, Callejas-Aguilera, Aristizabal, and Rosas. Interference facilitates spatial learning about new cues in rats
- 10:30-10:45 Gámez, Alcalá, Callejas-Aguilera, y Rosas. Extinction may Facilitate Subsequent Learning of Complex Discriminations in Human Predictive Learning
- 10:45-11:00 Aristizabal, Ramos-Álvarez, Callejas-Aguilera, y Rosas. The context change after short acquisition training increases eye-fixations to the context in human predictive learning
- 11:00-11:15 Vila, Monroy, Bernal, and Pérez. Using the overshadowed cue as occasion setter determines Overshadowing

11:15-12:00 COFFEE BREAK & POSTER SESSION 2

12:00-13:15 SEPEX LECTURE:

Andrew R. Delamater (Brooklyn College & the Graduate Center of the City University of New York). *Additional Explorations of Pavlovian Extinction Learning in Appetitive Tasks*

13:15-15:15 LUNCH AT "RESTAURANTE LA RAZA"

15:15-16:30 TALK SESSION 6. Behavior modulation by psychological and physiological processes

- 15:15-15:30 Aguado, Dieguez-Risco, Martinez-García, and Solís-Olce. Task-Dependent Contextual Modulation Of Emotion Recognition

- 15:30-15:45 Strempler-Rubio, Iturria, and Vila. Information integration and flexibility in Episodic Like-Memory of preschoolers and young adults.
- 15:45-16:00 Bernal-Gamboa, Mason, Tapia, Flores, and Nieto. Social Modulation In The Reacquisition Of Appetitive Responses
- 16:00-16:15 Megías, Ferioli, Catena, Maldonado, Baltruscha, Gervilla, Díaz-Piedra, and Cándido. Cognitive and neurophysiological factors characterizing the risky decision making process in driving
- 16:15-16:30 Mena, Pinto, Fernández, and De la Casa. Testing Prepulse inhibition in a context associated with MK-801 counteracts the effect of the drug

16:30-18:30 SYMPOSIUM: A TRIBUTE TO NICK MACKINTOSH. *Chair:* Victoria Diez Chamizo

Victoria Diez Chamizo: **Brief presentation of the Symposium**

First talk

Geoffrey Hall (University of York): **Associating With Mackintosh**

Second talk

Anthony Dickinson (University of Cambridge): **Collaborating With Nick Mackintosh On Instrumental Learning**

Third talk

Victoria D. Chamizo (Universitat de Barcelona): **Spatial Learning And Cognition: Remembering A Master**

Fourth talk

Javier Campos-Bueno (Universidad Complutense de Madrid): **Open Science At The Royal Society: Nick Mackintosh's Report On "Neuroscience And Law" (Useful Insights On Legal Responsibility, Read Minds Of Liars, Nature Of Pain, Brain Death And Neuroethics)**

Fifth talk

Gabriel Ruiz (Universidad de Sevilla): **A Collaborative Enterprise: Nicholas Mackintosh And The Renaissance Of Animal Psychology In Spain**

FINAL 10-15 MINUTES FOR PEOPLE IN THE AUDIENCE TO SPEAK ABOUT PROFESSOR MACKINTOSH, NICK (SPANISH OR ENGLISH WILL BE WELCOME).

Closing of the symposium: John M. Pearce, Cardiff University.

18:30-19:30 COFFEE & POSTER SESSION 2

21:00 GUIDED VISIT TO SEVILLE (INCLUDING TYPICAL BARS AN TAPAS)

FRIDAY 11th

9:00-10:00 TALK SESSION 7: POLIDIPSIA

- 9:00-9:15 Lopezzolsa-Gómez y Pellón. Scheduled-induced drinking and temporal adjustment in fixed interval schedules
- 9:15-9:30 Íbias, Pellón, Miguens, and Sanabria. Methylphenidate modulates Motivational and Motor Characteristics of Schedule-Induced Polydipsia in an animal model of ADHD
- 9:30-9:45 Vidal, and Pellon. Resistance to change of schedule-induced drinking under pharmacological disruption
- 9:45-10:00 Gutierrez-Ferré, and Pellon. Competition among adjunctive behaviours and its relation to inter-food interval length

10:00-11:15 INVITED LECTURE:

Geoffrey Schoenbaum (National Institute on Drug Abuse, USA). *How do you (estimate you will) like them apples? The role of the orbitofrontal cortex in imagining outcomes and changes caused by the use of an addictive drug.*

11:15-12:00 COFFEE BREAK & POSTER SESSION 2

12:00-13:15 CLOSING LECTURE:

Mauricio Papini (Texas Christian University). *Pandora's box in the learning lab: From expectancy to habit, and back*

13:15-15:15 LUNCH AT "RESTAURANTE LA RAZA"

15:15-16:45. TALK SESSION 8: New Perspectives in Associative Learning

- 15:15-15:30 Balleine. Losses and gains: Inhibitory predictions and choice
- 15:30-15:45 Loy, Álvarez, Acebes y Muñoz-Diez. Cue interactions: association or decision?
- 15:45-16:00 Kokkola, Alonso, and Mondragón. A double error model of classical conditioning: integrating associatively mediated effects
- 16:00-16:15 Luzardo, Mondragón, and Alonso. Towards a Learning-Timing Model
- 16:15-16:30 Moris. Inhibition of delay using SOP revisited
- 16:30-16:45 Murphy. Associative Inhibition: Implications for impulsivity and psychopathy

16:45-18:00 SIMPOSIUM III: INVERTEBRATE LEARNING. *Chair:* Ignacio Loy

Ignacio Loy: **Brief presentation of the Symposium**

First talk

David Reyes Jiménez, María J. F. Abad, and Concepción Paredes-Olay (Universidad de Jaén). **Preliminary studies of classical conditioning in earthworms (*Eiseniafoetida*).**

Second talk

Beatriz Alvarez, Joris Koene, Ignacio Loy, and Karen Hollis (Universidad de Oviedo, Vrije Universiteit, and Mount Holyoke College). **Adaptive benefits of Pavlovian conditioned feeding and reproductive behaviour in snails**

Third talk

Karen L. Hollis, Kelsey McNew, Alexandra Bemis, Talisa Sosa, Felicia Harrscha, and Elise Nowbahari (Mount Holyoke College, and Université Paris). **Pavement ants, *Tetramorium* sp. E, learn to avoid predatory antlions' pit traps**

Fourth talk

Jose Prados (University of Leicester). **The Evolution of Learning: Towards a *Phylogenetic Epistemology***

18:00-19:30 TALK SESSION 9: Attention, emotion, and associative learning

18:00-18:15 Dwyer, Clarkson, Hall & Good. Depression in a dementia model?

Tg2576 mice display lower lick cluster sizes in response to palatable sucrose

18:15-18:30 Liberal, Rodríguez, and Alonso. Disruption of the learned predictiveness effect in individuals with high divergent thinking ability.

18:30-18:45 Ruiz, Galvao, Vázquez y Díaz. Condicionamiento evaluativo y análisis de las expectativas (CNV)

18:45-19:00 Cobos, Vadillo, Luque, and Le Pelley. The effect of experience and instructions on learned attentional biases

19:00-19:15 Serrano-Barroso, Pérez-Díaz, Vargas, and López. Variation of incentive salience processing during ontogenic development

19:15-19:30 Benjumea, González-Tirado, Berlanga de Ávila, and Ruiz. Absence of derived stimuli relations in pigeons despite obtaining high levels of efficiency in a double conditional discrimination using a single-key "go-no go" procedure

19:30-20:00 BUSINESS MEETING OF THE SEPC

22:00 CLOSING DINNER AT "RESTAURANTE RIO GRANDE"

Conferencias invitadas

Guest Lectures



Universidad de Sevilla

INAUGURAL CONFERENCE

Deployment of attention in learning and action

PETER C. HOLLAND

*Department of Psychological and Brain Sciences
Johns Hopkins University*

Animals often must direct attention toward some stimuli and away from others, both for future learning about those stimuli and for the control of current action. However, the ecological demands on attention in learning and action may be quite different. Behavioral action decisions are likely to be optimized by a bias to attend to the most reliable available predictors of the future. By contrast, in learning it may be more adaptive to bias attention to cues whose consequences are not yet well-known, rather than to preferentially attend to cues whose predictive powers are already established. Indeed, behavioral and neuroscientific evidence shows that in many circumstances, attention in action is guided by prediction and attention in learning is guided by prediction error. Furthermore, this evidence suggests that different aspects of attention may be expressed and altered independently. For example, in tasks that demand simultaneous action decisions and new learning, we have found that rats may simultaneously attend to one element in an array for purposes of action but to another element for purpose of new learning. Furthermore, we have found that in a number of associative learning procedures, different brain systems mediate increases and decreases in attention, and the deployment of attention in learning and action. In this presentation I will summarize the results of two decades of research exploring these issues, with a focus on recent findings concerning attentional memories.

SEPEX LECTURE

Additional rxplorations of Pavlovian extinction learning in appetitive tasks

ANDREW R. DELAMATER

Brooklyn College & the Graduate Center of the City University of New York

Traditional theoretical approaches and more recent neurobiological research suggest that Pavlovian extinction processes should entail a combination of weakening of old excitatory associative learning as well as the development of new inhibitory associative learning. Today I will review some of this literature and talk about our recent work exploring the effects of extinction upon learning of highly specific associations between the conditioned stimulus and the sensory properties of the unconditioned stimulus or reinforcing outcome (i.e., sensory-specific S-O associations) in Pavlovian tasks with rats. In particular, under a variety of conditions we have shown that extinction, especially when given after a limited amount of Pavlovian training, can result in a substantial and enduring loss of control by these specific S-O associations. The neural circuits involved in this loss of control by specific S-O associations are largely unknown. I will also describe some of our preliminary data examining the roles of the basolateral amygdala and infralimbic prefrontal cortex in modulating these extinction effects.

INVITED LECTURE

How do you (estimate you will) like them apples? The role of the orbitofrontal cortex in *imagining* outcomes and changes caused by the use of an addictive drug

GEOFFREY SCHOEMBAUM

National Institute on Drug Abuse, USA

The orbitofrontal cortex is often critical to value-guided behavior and learning. I will review evidence from inactivation and single-unit recording studies that suggests this is only true when the underlying value must be derived or estimated through knowledge of the underlying associative structure of the environment and not when it can be pre-computed or cached based on direct prior experience. If time permits, I will present parallel data showing that this function is selectively disrupted in rats after self-administration of cocaine.

CLOSING LECTURE

Pandora's box in the learning lab: From expectancy to habit, and back

MAURICIO R. PAPINI

Department of Psychology, Texas Christian University

In rats, lever pressing induced by Pavlovian pairings between the presentations of a lever and food (called autoshaping) has been related to strong individual differences, impulsivity, and addictive behavior. In our lab, lever pressing has shown properties familiar from runway experiments involving surprising reward omissions or devaluations, including the frustration effect, successive negative contrast (SNC), and the partial reinforcement extinction effect. With these results in mind, we planned a regular SNC experiment as part of a series dealing with tolerance to frustration. Using a regular SNC design, instead of the expected SNC effect, we found that lever pressing did not change or even increased slightly during 30 postshift sessions after a downshift from 12 to 2 pellets. This result opened a sort of “Pandora’s box” that led us away from the original purpose of the experiment. Several simple alternatives were discarded, including individual-difference effects, competition with goal responses, and noncontingent lever presentations. One possibility was that extensive preshift experience had caused a shift in the control of lever pressing from expectancy-dependent actions (sensitive to current outcome value) to expectancy-independent habits (sensitive to stimulus strength, at least in the short term). These modes of control are usually depicted as arising sequentially, with expectancies guiding behavior early in training and habit being typical after extensive training. Evidence using pre-session feeding (a reward-devaluation procedure) suggests that lever

pressing is more sensitive to devaluation after a limited amount of training than after extensive training. Thus, autoshaping exhibits both outcome-dependent and outcome-independent properties as a function of the amount of training. Subsequent experiments showed that rats do not respond differentially to levers signaling 12 vs. 2 pellets (in one-lever trials), but they exhibit preference for the 12-pellet lever if given a choice (two-lever trials). Moreover, a 12-to-2 pellet downshift (another reward devaluation procedure) caused an increase in lever pressing relative to the unshifted lever (one-lever trials), but a clear preference for the unshifted lever, relative to the downshifted lever (two-lever trials) – a clear SNC effect. Thus, animals that failed to show evidence of SNC in one-lever trials produced such evidence when confronted with both lever during choice trials. Therefore, even after the kind of extensive training that yields evidence of habitual behavior, control of appetitive behavior by outcome expectancy can be rescued by encouraging comparisons among alternative outcome expectancies.

Simposios Simposia



Universidad de Sevilla

SYMPOSIUM I: EVOLUTION OF LEARNING AND SPATIAL COGNITION IN VERTEBRATES

Chair: RUBÉN N. MUZIO

Universidad de Buenos Aires – CONICET. Argentina

Talk 1: Spatial learning and memory in teleost fish: the role of the hippocampal pallium

EMILIO DURÁN, CRISTINA BROGLIO, FERNANDO RODRÍGUEZ, AND COSME
SALAS

Laboratorio de Psicobiología, Universidad de Sevilla

In mammals and birds the hippocampus, the most medial division of the telencephalic pallium, is crucial for relational memories, such as allocentric spatial cognition. In this talk I'll summary behavioral and neurobiological evidences showing that teleost fish, like mammals and birds, are able to use allocentric frames of reference for flexible navigation, and that these abilities depend on the dorsolateral pallium (DI), the most likely homologue of the hippocampal pallium. In contrast, DI lesioned goldfish are limited to the use of guidance and other rigid, body-centered orientation strategies. In addition, cytochrome oxidase histochemistry mapping and other neural activity mapping techniques reveal that place memories selectively increase the DI activity. Finally, I'll summarize recent data showing that DIv, like the hippocampus, is also involved in non-spatial relational memories (for example, trace eyeblink conditioning).

Talk 2: The use of slope as a navigational beacon in amphibians

MARÍA INÉS SOTELO ¹, VERN P. BINGMAN ², AND RUBÉN N. MUZIO ¹

¹. *Grupo de Aprendizaje y Cognición Comparada, Instituto de Biología y Medicina Experimental (IBYME-CONICET) and Facultad de Psicología, Universidad de Buenos Aires, Argentina*

². *Department of Psychology and J.P. Scott Center for Neuroscience, Mind and Behavior. Bowling Green State University, USA*

Amphibians are rarely considered in spatial cognition studies. We recently demonstrated that toads use geometry and features of the environment for navigation, preferring the former to find a goal location. Moreover, geometry appeared to be encoded by hippocampal formation in a variety of vertebrate species. In this presentation we'll summarize previous results on amphibian spatial learning, and present evidence showing that terrestrial toad is capable to encoding information of slope and geometry of the environment for orientation, but when both type of information are in conflict they also prefer geometry to locate the goal. Neurobiological studies are being carried out to test whether the toad medial pallium, the homologue of the mammalian hippocampus, would also be important for the geometric learning reported. The results generally agree with findings from other vertebrates, and support the idea that at the behavioral level geometric orientation is a conserved feature shared by all vertebrates.

Talk 3: The avian hippocampus: A dedicated spatial module?

VERNER P. BINGMAN AND VINCENT J. COPPOLA

Department of Psychology and J.P. Scott Center for Neuroscience, Mind and Behavior, Bowling Green State University, Ohio, USA

In their seminal book, O'Keefe and Nadel proposed "the hippocampus" as a cognitive map. Forty years later, it is now generally acknowledged that the mammalian hippocampus is more broadly involved in episodic memory. Perhaps surprisingly, it is the avian hippocampal formation (HF) whose functional properties seem to most closely resemble the hippocampus envisioned by O'Keefe and Nadel. A role of the avian HF in non-spatial cognition, although not unprecedented, is difficult to uncover. Recent evidence from homing pigeons even suggests that the avian HF participates in the perception of space antecedent to memory formation. From a comparative perspective, it is noteworthy that some have speculated that the dentate gyrus evolved only after the mammalian lineage separated from other vertebrate groups. This observation nurtures the idea that the broader role of the mammalian hippocampus in episodic memory may be related to the unique contribution of the dentate gyrus to hippocampal processing.

Talk 4: Geometrical information *vs.* non-geometrical information: Explaining male rats' selective preferences

VIRGINIA MESA, ALBA OSORIO, AND VICTORIA D. CHAMIZO

Universitat de Barcelona / Universidad de Barcelona

Previous work with adult rats has shown that in the presence of multiple cues, males tend to use geometrical information while females tend to rely more on landmarks to solve a spatial task. However, it has been recently found (Torres et al., 2014) that the females' preference for a landmark cue can depend on the specific characteristics of the landmarks. A landmark cue wins out over a geometrical cue (i.e., the specific shape of a pool) only when it looks the same from all perspectives. If a landmark looks different from different perspectives, females' preference for a landmark cue tends to disappear. Would it be possible that a similar finding of selective preference could be found in males? In the present study a set of experiments addresses male preferences between geometrical and non-geometrical information, showing that geometrical cues do not always win out.

SYMPOSIUM II: A TRIBUTE TO NICK MACKINTOSH

Chair: VICTORIA DIEZ CHAMIZO

Universitat de Barcelona / Universidad de Barcelona

Talk 1: Associating with Mackintosh

GEOFFREY HALL

University of York

Those of us who associated with Nick Mackintosh know that, in his own estimation, his major contribution to psychology was to be found in his books. Foremost among these are the two (1974 and 1983) that dealt with animal learning and conditioning. The central theme of both books, implicit in the first and explicit in the second, was the way in which the phenomena of animal learning could be explained in terms of the notion of association formation (a review of the 1974 work referred to Mackintosh as “the compleat associationist”). In fact his associationism was not “compleat” -- he is widely known for his emphasis on the role played by attentional processes in learning; and he was surprisingly modest in his assessment of the role of associative mechanisms in human learning. Nonetheless, an associative analysis was successfully applied not just to Pavlovian conditioning, but also to instrumental learning, avoidance, discrimination learning, spatial learning, and some aspects of perceptual learning. Although resisted by some, his persuasive writing established the associative account as the default position – that researchers today are still busy trying to prove him wrong is a tribute to the power and persistence of the ideas he developed.

Talk 2: Collaborating with Nick Mackintosh on instrumental learning

ANTHONY DICKINSON

University of Cambridge

Although it is often assumed that the associative processes discovered by the study of Pavlovian conditioning also mediate instrumental learning, there is little direct evidence for the commonality of learning. In my tribute, I shall reprise experiments addressing this issue that were conducted while I was a research assistant with Nick Mackintosh (Mackintosh & Dickinson, 1979). Using an induced wheel-running procedure with rats, which was inspired by the early work of Konorski and Miller on Type II conditioning, we demonstrated that a tone can overshadow instrumental learning in simultaneous blocking and relative validity paradigms. Subsequently, Adams and I found that the tone functions as a discriminative rather than overshadowing stimulus when episodes in which both running-alone and the tone-alone are non-reinforced. Finally, Mackintosh and colleagues reported that induced wheel-running overshadows and blocks acquisition of the conditioned reinforcing properties by a clicker (Garrud, Goodall, & Mackintosh, 1981). Taken together, these results suggest that common processes mediate Pavlovian and instrumental learning.

References

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- Mackintosh, N. J., & Dickinson, A. (1979). Instrumental (Type II) conditioning. In A. Dickinson & R. A. Boakes (Eds.), *Mechanism of Learning and Motivation* (pp. 143-169). Hillsdale, N.J: Lawrence Erlbaum Associates.

Talk 3: Spatial learning and cognition: Remembering a master

VICTORIA D. CHAMIZO

Universitat de Barcelona / Universidad de Barcelona

In a book by O'Keefe and Nadel (1978) that is now considered a modern "classic", these authors developed their mapping theory, which assumes that spatial learning differs radically from standard conditioning. Nick Mackintosh did not agree with this claim. Are the processes underlying the formation of a map or its use in behaviour so distinct from those processes explored in traditional studies of associative learning? In the last 30 years Nick and I, in collaboration with other colleagues (mainly from the University of Barcelona) developed systematic comparisons to address this question. Our main results being the demonstration that the basic phenomena of Pavlovian conditioning (like blocking, overshadowing, latent inhibition, perceptual learning,...) also appear when working with spatial tasks (both in the elevated maze and in the Morris water maze). In this talk I will concentrate on two of our experiments, blocking experiments (1985, 1997). These demonstrations clearly contradict the original proposal by O'Keefe and Nadel, and have been replicated in many other laboratories.

References

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Talk 4: Open science at the royal society: Nick Mackintosh's report on "*neuroscience and law*" (Useful insights on legal responsibility, read minds of liars, nature of pain, brain death and neuroethics)

JAVIER CAMPOS-BUENO

Universidad Complutense de Madrid

In April 2010 the Royal Society (RS) started the Brain Waves project that included a series of modules which aims to understand how advances in neurosciences have implications for society and public policy. *Neuroscience and Law* is the 4 module supported by RS to evaluate the potential and risk of using neuroscience findings in the criminal justice system. Professor Nicholas Mackintosh, who always accepted the abiding challenge of opening the latest science for society, headed the RS working group on *Neuroscience and Law*. Neuroscientist seek to understand how brain functions affect behaviour, and as the Law is also concerned with regulating human behaviour it follows that neuroscientific research is becoming increasingly relevant to the law. Here will be presented key findings and recommendations included in the report. Topics such as: age of criminal responsibility, the influence of genetics or brain tumours on behaviour, nature of pain, reliability of reading minds of liars thorough functional magnetic resonance imaging (fMRI), brain death and neuroethics, will be discussed.

Recommendations included working across the legal system with experts, law degrees incorporating basics principles of neuroscience, training for lawyers and judges. They also developed further research on models of risk assessment and studied the use of neuroscience in combination with other related approaches.

The report was praised by the media, which highlighted its caution in proposing the use of neuroscience in legal cases. Since it appeared in 2011 *Neuroscience and Law* has been quoted in the most prestigious journals.

Supported by PSI2013-48260-C3-1-R. Spain.

Reference

Mackintosh, N. *et al.* (2011). Brain waves 4: neuroscience and the law. *The Royal Society* [online], https://royalsociety.org/~media/royal_society_content/policy/projects/brain-waves/brain-waves-4.pdf

Talk 5: A collaborative enterprise: Nicholas Mackintosh and the renaissance of animal psychology in Spain

GABRIEL RUIZ

Universidad de Sevilla

The aim of this talk is to explore the scientific importance and personal significance of Nicholas Mackintosh in the origin and further development of the Spanish Society for Comparative Psychology (SEPC). In order to achieve this, I will take into account the evolution of Spanish Psychology during the 1970s and 1980s from a philosophical, theoretical and local discipline, mainly concerned with applied problems, to a more international and sophisticated discipline committed with scientific research. Therefore, my contribution will have three different parts. Firstly, I will recall the first steps of animal psychology in Spain during the 1920s. Secondly, I will propose some reason why these former and promising developments disappeared during the Spanish Civil War (1936-1939) and during Franco's times (1940-1975). Finally, I will move from the mid-70s to the late 80s, a time in which a new generation of young psychologists interested in animal learning and comparative psychology arose -Victor García-Hoz, Victoria Díez Chamizo, Antonio Maldonado, Luis Aguado, Sindi Alonso, Matías López, Ricardo Pellón, etc. Through canvassing the thoughts and experiences of those Spanish psychologists who spent time in the laboratories of Sussex and Cambridge, Nicholas Mackintosh appears as one on the major influences on this new generation that was looking for a new scientific approach to the study of mind and behavior, far away from the old-fashioned philosophical and theoretical point of views supported by the Spanish psychologists during the 60s and 70s.

SYMPOSIUM III: INVERTEBRATE LEARNING

Chair: IGNACIO LOY
Universidad de Oviedo

Talk 1: Preliminary studies of classical conditioning in earthworms (*Eiseniafoetida*).

DAVID REYES JIMÉNEZ, MARÍA J. F. ABAD, AND CONCEPCIÓN PAREDES-
OLAY
Universidad de Jaén

The study of invertebrate learning is an interesting topic in the field of Comparative Psychology that has been revitalized along the last years. In this talk we present two different procedures of classical conditioning in earthworms (*Eiseniafoetida*). In the first experiment we use an odor (rose) as conditioned stimulus (CS) and, in the second one a vibration was employed. In both experiments, a bright light was employed as unconditioned stimulus (US). The experimental results show an increase in the contraction response in experimental groups, where CS and US were paired. Control groups results rule out explanations in terms of habituation, sensibilization or pseudoconditioning. Additionally we employed these procedures to reproduce some associative phenomena in earthworms in order to extent the data already observed in other *phyla*.

Talk 2: Adaptive benefits of Pavlovian conditioned feeding and reproductive behaviour in snails

BEATRIZ ALVAREZ ¹, JORIS KOENE ², IGNACIO LOY ¹, AND KAREN HOLLIS ³

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Snails can learn by means of associative learning: an odour cue paired with access to food results in an increase in the number of tentacle lowering responses. Learning associations between stimuli that are biologically relevant have been shown to provide fitness benefits for animals in reproductive efficacy (e.g., Hollis et al., 1989) or growth (e.g., Guillette et al., 2009; Hollis et al., 2011). In the present work we examined how learning can provide a biological advantage to snails in growth or reproduction. We first showed that juveniles of the species *C. aspersus* that learn by means of conditioning show a better use of the limited time for food ingestion. The role of Pavlovian conditioning in reproduction was also examined in *L. stagnalis* and *C. aspersus*. Evidence of improvement in feeding and reproduction (i.e., fitness) due to learning can contribute to a broader understanding of the role that psychological aspects may play in the process of evolution. Furthermore, it can have practical implications for snail farming or pest control.

Talk 3: Pavement ants, *Tetramorium* sp. E, learn to avoid predatory antlions' pit traps

KAREN L. HOLLIS ¹, KELSEY McNEW ¹, ALEXANDRA BEMIS ¹, TALISA SOSA ¹, FELICIA HARRSCHA, AND ELISE NOWBAHARI ²

¹ Mount Holyoke College, South Hadley, Massachusetts, USA

² Université Paris 13, France

Pavement ants, *Tetramorium* sp. E, often inhabit the same sandy soils as a common predator, pit-digging larval antlions (*Myrmeleontidae* spp.). Previous research in our laboratory has shown that pavement ants are able to rescue captured nestmates from antlions' pit traps, thus sabotaging antlions' attempts to capture them. Recent work suggests that pavement ants possess yet another antipredator strategy, namely the ability to learn to avoid antlion pits following a successful escape from a pit trap. In Phase I, an ant was confined to a bowl containing an antlion pit and, if it fell into the pit and successfully escaped, it was tested for its ability to avoid a pit in Phase II. Seven different experimental conditions, including the presence or absence of an actual antlion in the pit during either or both phases, and the opportunity to confront the same or a different pit, allowed us to test various explanations of how ants might avoid antlions. Results suggest that ants are able to form a generalizable memory of pit characteristics and that the ability to avoid pits does not depend on cues that the ant, itself, leaves behind in the pit or cues emanating from an antlion's presence.

Talk 4: The evolution of learning: Towards a *Phylogenetic Epistemology*

JOSÉ PRADOS

University of Leicester

Animals as different as rats, snails, honey-bees and planaria seem to learn in similar ways. They all show Pavlovian conditioning phenomena like blocking and latent inhibition, and respond in similar ways to drugs which are known to modulate learning. The similarities could be extended to other organisms, like the unicellular *Stentor* or the *Paramecium*. The same molecular mechanism has been shown to mediate short-term habituation in the unicellular non-neural *Stentor* and the neural *Aplysia*-in both cases learning depends on the *voltage dependent channels*. The same could be said about the rat and the *Paramecium* in respect of long-term Pavlovian conditioning, which seems to be mediated in both cases by protein synthesis. This suggests that learning does not depend on the existence of a nervous system; instead, some of its molecular mechanisms pre-existed the nervous system and have been maintained throughout evolution.

Comunicaciones

Talks



Universidad de Sevilla

TALK SESSION 1: Flavour learning

Hypertonic NaCl as a pain-inducing agent in taste aversion learning may differentially affect preparatory and consummatory responses

STEFANA BURA ¹, ALBERTO SOTO ¹, PATRICIA GASALLA ²,
MATÍAS LÓPEZ ¹, AND DOMINIC DWYER ²

¹ *Universidad de Oviedo, Spain.* ² *Cardiff University, UK*

We examined the effects of a pairing a palatable flavour with internal pain in rats, using taste reactivity and licking microstructure methods to assess hedonic responses. We paired saccharin solutions with the intraperitoneal injection of hypertonic NaCl - varying the schedule and number of administrations as well as doses levels. Pairing saccharin with hypertonic NaCl reduced the amount of saccharin consumed, and also reduced the number of appetitive taste reactivity responses (as well as increasing passive dripping) without influencing the number of aversive hedonic responses. The same study also revealed no effect of hypertonic NaCl on mean lick cluster size (which indexes hedonic responses). In addition, repeated administrations of low dose hypertonic NaCl produced small and quickly extinguished decreases IN consumption along with an increase in lick cluster size. Prior work indicates that pairing flavours with LiCl-induced nausea results in reduced consumption accompanied by substantial increases in aversive taste reactivity and substantial reductions in lick cluster size. It appears that although both internal pain (hypertonic NaCl) and nausea (LiCl) can reduce consumption, they have somewhat different effects on the hedonic responses. We will discuss this in terms of whether the internal pain and nausea differentially affect preparatory and consummatory responses.

Thinking can get in the way of learning: Mediated serial overshadowing of long-delay taste aversion learning

BOAKES, R.A., SUN, Q., AND KWOK, D.W.S.

School of Psychology, University of Sydney

Mediated overshadowing occurs when an evoked representation of one stimulus interferes with the formation of an association between two other stimuli. This study tested for such an effect in long-delay taste aversion learning. The general strategy was to first pair a cue with hydrochloric acid (HCl) and then introduce the cue during the delay between the target taste (sucrose) and injection with lithium chloride. Either two or six cue-HCl pairings were given. In Experiment 1 the introduction of almond was found to produce greater overshadowing of the sucrose aversion in the group given two almond-HCl pairings (Paired-2) than in an unpaired control. Interestingly the opposite pattern was found in the group given six almond-HCl pairings (Paired-6). This group acquired a stronger sucrose aversion than its unpaired control. This confirms that few pairings can be better than many in determining whether representation-mediated effects occur (Holland, 1990). A possible explanation for the Paired-6 results is that almond evoked an aversive response rather than memory of the sour HCl and that this added to the aversion produced by the sucrose-lithium pairing. Experiment 2 obtained similar results when a context was used as the cue intended to evoke an HCl representation.

Supported by the Australian Research Council.

Evaluation of hedonic changes in frustration responses through taste reactivity

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The *consummatory Successive Negative Contrast* (cSNC) is an animal model to study frustration responses. A high-magnitude reinforcement (16% sucrose solution) is presented for several days and then devalued by one of a lower magnitude (2%). This procedure generates an abrupt suppression of consumption compared to animals that always receive the low magnitude reward. Few studies have examined the hedonic changes involved in cSNC. The objective of this experiment was to evaluate the changes in hedonic responses in this paradigm by the taste reactivity test. Twenty-four rats were implanted with an intraoral cannula and trained in an adapted protocol of cSNC. In each trial they received an infusion of sucrose for 2 min. In the pre-shift phase (10 trials), the experimental group received a sucrose solution of 16%, and 2% in the post-shift. The appetitive orofacial responses were compared to a control group receiving 2% sucrose in both phases. The change rate (response post/pre) was significantly lower in the experimental group compared to the control. These data suggest that frustration responses produced by a devaluation of an expected reward involve a palatability or hedonic properties decrement of the devalued reward.

Supported by UBAC y T 2014-2017-20020130300017BA (L.C.). Argentina.

Conditioned changes in hedonic responses in flavour preference learning

ALBERTO SOTO, PATRICIA GASALLA, STEFANA BURA, AND
MATÍAS LÓPEZ

Universidad de Oviedo

In this study with the taste reactivity method, rats exposed to simultaneous compound of a neutral flavour (grape or cherry) and a palatable taste (8% sucrose) subsequently showed an increase in the consumption of the neutral flavour when presented alone. The subsequent devaluation of sucrose, saccharin, or maltodextrin by pairings with illness reduced the conditioned preference for the flavour previously paired with the sucrose. More importantly, the devaluation of sucrose or maltodextrin, but not of saccharin, supported conditioned changes in hedonic responses to the previously sucrose-paired flavor. The results are discussed in terms of the dissociation between palatability and nutrient-based conditioned flavour preferences.

Supported by Ministerio de Economía y Competitividad, Spain. Ref.-PSI2012-34743 (M.L.).

Latent inhibition in flavor-preference conditioning using fructose and maltodextrin: Effects of motivational state and the nature of the reinforcer

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¹ *Universidad de Granada, Spain*

² *University of York, UK, and University of New South Wales, Australia*

In two experiments rats received pairings of the flavor of almond with either fructose or maltodextrin, and the conditioned preference for almond was then tested. In each experiment half the rats had received prior exposure to almond on its own; half received no preexposure. In Experiment 1, in which the rats were hungry during the test, the preference was greater in the nonpreexposed subjects, both for those trained with fructose and those trained with maltodextrin; that is, latent inhibition was obtained with both reinforcers. In Experiment 2, in which the rats were not food-deprived prior to the test, not only was there no latent inhibition with either of the reinforcers, but, for both, the preference was greater for preexposed than for nonpreexposed subjects. These results give no support to the proposal that the different types of reinforcer generate different types of learning. They are, however, consistent with the proposal that different types of learning control behavior when the rat is hungry and when it is not, and that the form that generates the preference in the latter case is not susceptible to the latent inhibition effect.

Supported by research project PSI2012-33552 (MINECO, Spain).

TALK SESSION 2: Stimulus Preexposure

The effects of distractor placement in animal perceptual learning

ADELA F. ILIESCU, SERGIO A. RECIO, AND ISABEL DE BRUGADA

Universidad de Granada

Research in perceptual learning shows that the way stimuli are presented leads to different outcomes. The intermixed/blocked (I/B) effect is one of these outcomes and different mechanisms have been proposed to explain this phenomenon. In human research it seems that comparison between stimuli is important, and the placement of a distractor between the preexposed stimuli interferes with the effect. Results from animal research indicate that such a comparison process does not seem to be responsible for obtaining the I/B effect, because the type of procedure normally used in animal perceptual learning does not favor comparison. Previous experiments using procedures that allow concurrent exposure to two similar stimuli did not show an improvement in discrimination over the standard intermixed group. In our experiments we explore the possibility that a distractor, placed between the to-be-discriminated stimuli, may interfere with the perceptual learning process. The stimuli are presented in a short time lapse to favor comparison and the distractor is presented in between. This short time lapse presentation could lead to more generalization than the usual intermixed design. To prevent this, we used test procedures to minimize generalization due to direct associations between the unique elements. Results are discussed in terms of current theories of perceptual learning.

Supported by research project PSI2012-31641 (MINECO, Spain).

The effect of additional exposure to the unique features in a perceptual learning task can be attributed to a location bias

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Lavis et al. (2011) claimed that human perceptual learning could be explained by a better encoding of the unique features during intermixed exposure. However, Jones and Dwyer (2014) showed that a location bias could play a relevant role in explaining previous results of perceptual learning studies using complex visual stimuli. They suggested that better discrimination after exposure could be based on the location, rather than the content, of the unique features. To further explore this possibility, we attempted to replicate the results of Lavis et al. (2011, exp 2), which showed that additional exposure to the unique elements resulted in better discrimination than simple intermixed exposure. We manipulated the location of the unique elements during the additional exposure. In one experiment, they were located in the same position as that when presented together with the common element, as described by Lavis et al. (2011, exp 2). In another experiment, the unique elements were located in the center of the screen, regardless of where they were located together with the common element. Our results showed that additional exposure only improved discrimination when the unique elements were presented in the same position as the one where they were presented together with the common element. This supports the claims of James and Dwyer (2014), and runs counter to an interpretation in terms of a better memory representation.

Supported by research project PSI2012-31641 (MINECO, Spain).

Differential representation in intermixed and blocked pre-exposure

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To account for perceptual learning transfer, Artigas and Prados (2014) suggested that stimuli are differentially represented during intermixed and blocked pre-exposure to AX and BX. Intermixed exposure would lead to the establishment of elemental representations of each element, as well as relatively weak associations between the unique (A and B) and the common (X) elements. In contrast, blocked exposure would result in the establishment of configural representations of the compound stimuli (AX and BX), together with strong associations between the unique and the common elements. Therefore, we can expect any response conditioned to one of the elements A or X to better generalize to the other one (X or A respectively) after blocked than intermixed pre-exposure. Moreover, as a consequence of intermixed exposure, the elemental representations of the stimuli would be affected by loss of salience and associability. Consequently, the ability of each element (A, B or X) to gain control upon a conditioned response can be predicted to diminish after intermixed pre-exposure. Both predictions have been assessed in several experiments, lending support for the *differential representation hypothesis*.

Supported by a grant (Ref: PSI2011-26850) from the Spanish Ministerio de Ciencia e Innovación to the authors.

Human latent inhibition and the density of predictive relationships in the context in which the target stimulus occurs

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In two experiments, participants were exposed to a variety of actions performed by a fictitious person, Mr. X, across three days of his life. Participants also received information about the outcomes that followed the actions performed by Mr. X. Some of his actions were always followed by the same outcome; other actions brought a different outcome on each occasion; and some other actions were not followed by any outcome. On Day 3, Mr. X. performed an action (the target action) that was followed by a novel outcome (the target outcome: feeling dizzy). For participants in the control (CTRL) condition, the target action that preceded the appearance of this outcome was also novel. However, for participants in the latent inhibition (LI) condition, Mr. X had previously performed the target action on repeated occasions during days 2 and 3, without it producing any outcome. All the participants were then tested on their ability to retrieve the action performed by Mr. X prior to feeling dizzy. In Experiment 1, we found worse retrieval of the target action (indicating a weaker target action-outcome association) in the LI than in the CTRL condition. In Experiment 2, we varied the proportion of non-target actions that brought outcomes during initial training. We found that the size of the LI effect was greater the bigger this proportion. We explain these results in terms of the Hall-Rodriguez account of LI. A high density of predictive relationships will have ensured strong activation of the expectancy that some outcome will occur the first time that the target action was presented. This would facilitate the formation of the critical association in the CTRL condition, and would

have also facilitated the formation of a target action-no event association during training in the LI condition, thus enhancing the difference between these two conditions (i.e., enhancing the LI effect).

D1 and D2 dopaminergic receptor involvement in recovery of a CS with a latent inhibition procedure

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Latent inhibition (LI) is a learning process observed when the acquisition of a CR (or CS-US association) to a stimulus paired with a reinforcer is retarded if the same stimulus has previously been pre-exposed in the absence of the reinforcer. Recent studies suggest that both the striatal dopaminergic innervation, and the dopaminergic activity of the nucleus accumbens, are essential neural substrates for its expression. The present study analyzed the involvement of D1 and D2 receptors in recovery processes. We used a protocol that restores the salience of the preexposed stimulus. In Phase 1 all animals were pre-exposed serially: Light (L) / Tone (T) / Food. In a second phase, we increased the salience of the stimulus L to change its predictive validity. After that, L was associated with a shock. This manipulation resulted in an increase of aversive conditioning to L relative to control animals (without increasing salience). Recovery phase showed different effects of drugs. D1 blocking increased the CS-shock associations, while the blocking of D2 receptors decreased this association. These results show the different involvement of dopaminergic system in the retrieval processes of LI, and they are consistent with retrieval theories of LI.

This research was supported by Project: PSI2012-32445. Ministerio de Economía y Competitividad, Spain.

TALK SESSION 3: Neural correlates of learning

Role of the posterior piriform cortex of rats in flavor recognition memory

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Flavor is defined as the quality produced by the combined sensation of taste and smell. When smell is experienced along with taste, it becomes interoceptive information of biological relevance related to an ingested substance. Flavor recognition memory is the ability to assess the familiarity of a previous ingested flavor that was not followed by negative consequences. Convergence between taste and smell has been demonstrated at different levels, including areas of the olfactory cortex such as the Piriform Cortex (PirCx). As the posterior PirCx (pPirCx) has been proposed to be a multisensory integration area, we applied c-Fos immunohistochemistry as an index of neural activity of this area. Twenty-one male adult Wistar rats were exposed to a cider vinegar solution (3%) in 15min daily sessions for the first, second and sixth time. The results showed an attenuated neophobic response to the flavor as it became familiar. We also found an increased c-Fos expression in some portions of the pPirCx after six exposures in comparison with one or two exposures. This suggests the presence of neural plasticity and the pPirCx relevance in flavor recognition memory.

Supported by PSIC2011-23702 and PSI2014-57643-P (MINECO. Spain).

Dorsal striatum and prefrontal cortex involvement in CS processing in latent inhibition

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Previous studies in our lab have shown that latent inhibition (LI) could be understood as the extension of two processes controlled by dorsal and ventral striatum. Thus, we could attribute two clearly differentiated phases in the expression of LI. Diaz et al (2014) analyzed the LI and dorsal striatum activity establishing two types of CS exposition. A group was exposed to a long presentation of the future CS without consequences, and the other to a short one. A short exposition to the future CS involves the use of controlled processing strategies. These strategies allow the subject to learn about the characteristics of the stimuli and the relationship to the possible consequences. However, it is likely that a long-term exposure to future CS determines the shift from a controlled to an automatic processing. That is, once the associative relationship between the stimuli and their consequences is established, subjects would use an automatic processing strategy. Prefrontal cortex has been included in controlled processing strategies, and we studied if this structure could be involved in the habituation to a stimulus without consequences. Result showed a clear involvement of infralimbic prefrontal cortex. Lesion to the frontal infralimbic areas produced a released in the LI. This effect of competition between different systems (including dorsal and ventral striatum) indicates that they compete during learning, and that the damage or blocking to one system could facilitate the performance of the other.

This research was supported by Project: PSI2012-32445. Ministerio de Economía y Competitividad. Spain.

Spatial learning in rat: brain circuits mapped with cytochrome oxidase histochemistry

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How does the brain processes spatial information and which neural circuits and learning strategies are used to do so? Our aim was to assess the behavioural performance and the contributions of different brain regions on different spatial tasks performed by Wistar rats. Cytochrome oxidase (CO) histochemistry was used to map sustained regional changes in neuronal energy metabolism associated with spatial learning. We assess egocentric route learning in the Cincinnati water maze in two conditions: one where both distal and proximal visual cues were available (CWM-light) and another where visual cues were eliminated by testing in complete darkness (CWM-dark). Allocentric spatial learning was also evaluated using a working memory schedule in the Morris water maze. Results show different brain networks for egocentric and allocentric spatial learning. CWM-light showed involvement of the orbitofrontal cortex and medial septum, whereas CWM-dark revealed three different networks involving the prefrontal cortex, ventral striatum, hippocampus and amygdala nuclei. The study shows that brain activation differs in these two conditions of route learning. Regarding allocentric spatial learning, septal and intermediate hippocampal zones contribute at different moments to process spatial information. CO histochemistry can be used as a marker of memory systems involved in egocentric and allocentric spatial learning.

Supported by Project Grants of the Spanish Ministry of Economy and Competitiveness: PSI2010-19348 and PSI2013-45924-P, and Alfonso Martín Escudero Foundation to NA.

Representation of 3d space is shaped by episodic memory traces

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The role of certain populations of cells within the hippocampal formation in topographical tasks has been well documented in two-dimensional environments. However, how the brain encodes the three-dimensional features of space remains poorly understood. We performed single-unit recordings in freely moving rats as they explored environments with different profiles within the vertical axis. Our results are in line with previous reports suggesting that the hippocampus does not encode the space in a genuine three dimensional fashion, but instead, the spatial representation is shaped by other prominent and non-spatial components of the environment. Ultimately, this leads to a broader understanding of the hippocampal function, which might link both spatial and episodic traces of memory.

This study was supported by Project PSI2012-32445. Ministerio de Economía y Competitividad. Spain.

Prenatal sex-hormone exposure, aggression and dominance in men and women

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Evolutionary psychologists and biologists have shown that some morphological features are related to surprising behavioral differences. One example of this is the length of the index finger as compared with the ring finger, which is considered to be a morphological index of prenatal exposure to testosterone in animals and humans. We have compared here this finger-length ratio, aggression and dominance in men and women, and results show that men have a lower ratio than women, as well as higher physical and verbal aggression, and higher aggressive and sociable dominance. Moreover, this finger-length ratio negatively correlates with physical aggression in men but not in women.

TALK SESSION 4: Human learning

Illusions of control over undesired events: reversing the outcome-density bias

FERNANDO BLANCO AND HELENA MATUTE

Universidad de Deusto

The illusion of control is the belief that one can effectively control outcomes that are actually uncontrollable. There are some factors that modulate the illusion, such as the probability with which the participant's action occurs, $P(A)$, and the probability with which the outcome occurs, $P(O)$. If these two probabilities are high, then the illusion of control becomes stronger (cue-density bias and outcome-density bias, respectively). In our experiment, we study the illusion of control in two scenarios: one in which participants try to produce a desired outcome, and one in which they try to avoid an undesired outcome. The latter scenario has been scarcely studied in the literature. Our results show that the $P(A)$ is always positively related with the magnitude of the illusion, thus showing the known cue-density bias. However, the outcome-density bias is reversed depending on the scenario: when the outcome is desired, the higher the $P(O)$ the stronger the illusion; whereas when the outcome is undesired, the higher the $P(O)$ the weaker the illusion. Our conclusion is that, in an illusion of control paradigm, the occurrence of a desired outcome is equivalent to the nonoccurrence of an undesired outcome.

Effect of the non-contingent feedback in the risk behavior

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The aim of this research was to investigate the effect of non-contingent feedback on the decision making process in risky driving situations. For a set of risky and non-risky traffic situations, participants, as a driver, had to decide to brake or not. They were divided into three experimental conditions: control, contingent and non-contingent groups. In the contingent group, a feedback screen (-1 point) was displayed after the traffic situation in 50% of the risky situations in which the participant did not brake. In the non-contingent group, a feedback screen was displayed in 25% of all risky situations. The control group received no feedback. Contingent feedback made participants more cautious, faster, and increased risk discrimination. Non-contingent feedback led to fewer brake responses (more risky) and slower responses compared to the control and contingent groups. The results showed the serious consequences of applying feedback improperly in risk contexts, and particularly in road safety. They also suggest efficient ways to control risk taking through the use of a suitable manipulation of the feedback.

Supported by the Spanish Directorate General of Traffic SPIP2014-01341 to A. Cándido; and Spanish MICINN PSI2012-39292 grant to A. Catena.

Slowed reacquisition of a previously extinguished response: the effect of partial extinction in human contingency learning

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Extinction is a very relevant learning phenomenon from an applied and theoretical point of view. Extinction-based therapies constitute the most widespread empirically validated treatment of anxiety disorders. However, they face an important limitation, as relapse often takes place once the extinction procedure has been completed. We provide the first demonstration of relapse reduction, a slowed reacquisition, in human contingency learning after a partial extinction procedure using mild aversive stimuli. This effect was specific of the partial extinction treatment (i.e., reinforced trials were occasionally experienced during extinction; Experiment 1) and not only due to differences in uncertainty levels between the partial and a standard extinction group (Experiment 2). Experiment 3 explored conditions in which partial extinction was complete, while the slowed reacquisition effect was still obtained. Potential uses of this strategy in anxiety disorders therapies, its theoretical explanation and its current limitations are discussed.

Supported by Universidad de Málaga. Proyecto: UMA FC14-SEJ-332014. Consejería Economía, Innovación, Ciencia y Empleo, Junta de Andalucía, Spain. Proyecto: P2011-SEJ-7898. Ministerio de Economía y Competitividad, Spain. Proyectos: PSI2011-24662 y PSI2013- 47430-P.

Temporal Weighting Rule with a physical context change in human beings

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AND JAVIER VILA

Universidad Nacional Autónoma de México

According to the Temporal Weighting Rule, the integration of information will agree to the subjective relative value of the learned experiences and his temporary distance in the moment test. This idea was demonstrated in instrumental tasks with human beings, using subjective positive and negative values of the experiences learned, as well distance and recent tests (Lopez, Alvarado, Cabrera, Luna & Vila, 2013). On the other hand, in agreement with the Interference Theory (Bouton, 1993) the passage of time is considered to be like a change of context, similar to a change physical context, allowing the recovery of information originally learned. This study demonstrates the effect of a change of physical context and temporary context on the recovery of information with different subjective positive values. The values used of context were 111 and 112, IR between the training phase and the test phase 0h and 24h and of the subjective value of the experiences learned $A > B$ and $A = B$. The results showed that the participants integrate the information, considering the subjective value of learned experiences and the temporary distance, as previously demonstrated, but that they also consider the physical context at the moment of testing. These results can be explained in terms of both the TWR and the Interference Theory.

Supported by: UNAM PAPIIT IA301115. Mexico.

TALK SESSION 5: Attention and Learning

Ambiguity produced by discrimination reversal facilitates subsequent learning of a temporal discrimination in rats

JOSÉ E. CALLEJAS-AGUILERA, JOSÉ A. ALCALÁ, JOSÉ A. ARISTIZABAL,
AND JUAN M. ROSAS

Universidad de Jaén

Attentional Theory of Context Processing suggests that ambiguity in the meaning of the stimuli leads subjects to pay attention to the context so that retrieval of all the information becomes context-specific. The goal of this experimental series was to explore whether ambiguity generated in a learning situation, in addition to raising attention to the contexts, leads to a generalized increase in attention that facilitates subsequent learning. In two experiments on appetitive conditioning, rats were trained on a discrimination between two stimuli (A+, B-). In one of the groups discrimination was reversed during a second phase, while in the other it was kept the same. During the subsequent test phase, animals were exposed to a situation in which they received pellets under a Fixed Time schedule (FT30 in Experiment 1 and FT60 in Experiment 2). Temporal discrimination appeared faster in the groups that had reversal discrimination training, suggesting that ambiguity increases subjects' general attention, facilitating learning.

Supported by Grant PSI2010-15215 from the Spanish Ministry of Science and by a Grant R6/6/2014 from the Research Support Plan of the Universidad de Jaén under the sponsorship of Caja Rural de Jaén.

Interference facilitates spatial learning about new cues in rats

JOSÉ A. ALCALÁ, JOSÉ E. CALLEJAS-AGUILERA, JOSÉ A. ARISTIZABAL,
AND JUAN M. ROSAS
Universidad de Jaén

Recent results from our laboratory in both classical conditioning with rats and human predictive learning suggest that ambiguity situations lead to a general increase in attention that facilitates subsequent acquisition of new information. The present study was conducted to evaluate the generality of this effect. A spatial learning experiment in the Morris water-maze with rats was designed. Half of the rats first received training in which the cues indicated the exact position of the platform during 96 trials, while the other half received an interference treatment in which the platform was placed in the opposite quadrant of the pool after trial 49. All rats were then trained in a new spatial learning discrimination with new cues and a new position of the platform. Results of this experiment suggest that the interference treatment facilitates learning about the new landmarks.

Supported by Grant PSI2010-15215 from the Spanish Ministry of Science and by a Grant R6/6/2014 from the Research Support Plan of the Universidad de Jaén under the sponsorship of Caja Rural de Jaén.

Extinction may facilitate subsequent learning of complex discriminations in human predictive learning

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AND JUAN M. ROSAS ²

¹ *Universidad de Cádiz*

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Several learning theories about interference suggest that the ambiguity generated by extinction of a cue makes context-specific retrieval of either the extinguished cue (Bouton, 1993) or all the cues present in the situation (Rosas, Callejas-Aguilera, Ramos-Álvarez, & Abad, 2006). However, the attentional change may be a more of a general process so that, once activated, it facilitates acquisition of new learning. With the goal of testing this hypothesis we conducted an experimental series in human predictive learning in which half of the participants were exposed to extinction of a cue-outcome relationship while the other half received training on simple acquisition. Afterwards, participants received training with different cues in both positive (M-, N-, MN+) and negative patterning (L-, H-, LH+). Results of the present study suggest that extinction may improve the rate of acquisition of new learning.

Supported by Grant PSI2010-15215 from the Spanish Ministry of Science.

The context change after short acquisition training increases eye-fixations to the context in human predictive learning

JOSÉ A. ARISTIZABAL, MANUEL M. RAMOS-ÁLVAREZ, JOSÉ E. CALLEJAS-AGUILERA, AND JUAN M. ROSAS

Universidad de Jaén

It has been suggested that the context change effect found after short training on a simple acquisition in human predictive learning is due to participants paying attention to the context. This hypothesis was tested in a study in which attention to the contexts was evaluated through the study of participants' eye movements. Participants were trained in a situation in which a target cue, X, was paired with an outcome in context A, while target cue Y was paired with the absence of the outcome in context B, before testing both cues in their training context and in the alternative context. The context switch led to a decrease in predictive judgments to X and to an increase in predictive judgments to Y. Confirming the idea that participants pay attention to the contexts, eye fixations to the context were greater when the cue was presented in context different than when it was presented in the training context.

Supported by Grant PSI2010-15215 from the Spanish Ministry of Science.

Using the overshadowed cue as occasion setter determines overshadowing

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In Overshadowing, when a CS X is presented in compound with a salient CS A, this results in a weaker CR to X. The present research examined the underlying basis of overshadowing through training the overshadowed CS as an occasion setter before the compound training. In Experiment 1, human participants learned a search task where a landmark cue (L) was overshadowed by a more salient geometric cue (G). In Experiment 2, before the overshadowing training, a novel cue and L and G cues, were used as sample stimulus in a delayed matching to simple task. Experiment 3 used the same procedure but during initial training a simultaneous matching to sample task before the overshadowing training was used. Results are according with theories that considered changes in the attention to the CS (Mackintosh, 1975) and supports the idea that overshadowing depends on attention paid to the less salient CS during the matching to sample task. Therefore attention paid to an overshadowed cue during initial training changes its associability in a similar way to that expected by the notion of context dependency proposed by contextual attentional theories (Rosas et al., 2006).

Supported by UNAM PAPIIT IN301315, Mexico.

TALK SESSION 6: Behaviour modulation by psychological and physiological processes

Task-dependent contextual modulation of emotion recognition

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AND ANDREA SOLÍS-OLCE

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The influence of context on recognition of facial expressions was studied using a context-priming paradigm in which target faces showing positive or negative emotional expressions were presented together with sentences that described happy-, fear- or anger-related situations. Two variables were manipulated in a series of three experiments, 1) the congruency between the emotional content of the sentence and the emotion shown by the target face and 2) the task assigned to the participants with respect to the target face. This latter manipulation was aimed at directing the attention of the participant to the affective valence of the face (valence task), its specific emotional expression (emotion task) or its contextual congruency (explicit congruency task). The specific pattern of effects varied depending on the emotion shown by the target face and the specific task assignment. The results revealed differences in the way in which the situational context influences recognition of positive and negative emotional expressions and in the consequences of implicit and explicit processing of that context, driven by task demands. More generally, our results are consistent with a double-checking account of affective processing that assumes that stimuli are analyzed in terms of both their affective valence and their specific emotion content.

Supported by grant PSI2013-44262-P to Luis Aguado from the Spanish Ministerio de Ciencia e Innovación.

Information integration and flexibility in Episodic Like-Memory of preschoolers and young adults.

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Episodic Like-Memory (ELM) involves the recall of integrated knowledge about the What-Where-When of an event and allows organisms to integrate and use the information obtained for later use. Clayton and Dickinson (1998) demonstrated the existence of this type of memory with birds. We used a procedure derived from original studies to show information integration and flexibility of ELM in humans. The participants used a virtual task in two experiments, one with preschool children and the other with young adults, who searched-found two objects in two localizations at two different moments. One group learned that one object decreased after a long interval, the other group learned that the same object increased after a long interval, and the remaining group did not experience any change in the quantity of objects. Later, each group was divided into two subgroups that searched-found in a new situation with the same conditions. During the test, the participants chose the place containing the object in the highest quantities, according to the condition. The results showed that children and adults recalled the type of object, its location, and the time when they had searched-found. These data suggest that both populations recall the integrated information What-Where-When of an event and use it in another situation.

Supported by UNAM PAPIIT IN304513 and UNAM PAPIIT IN301315. Mexico.

Social modulation in the reacquisition of appetitive responses

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Recently Nowak, Werka & Knapska (2013) have found that after a successful extinction of fear conditioning, the presence of a fearful cage mate produces the renewal of the freezing response in mice. The present experiments explored the role of social modulation on the recovery of appetitive responses in rats. During acquisition, all rats were trained to drink a sugar solution in groups of four (Context A). Then, extinction sessions were conducted. In Experiment 1, both groups received extinction in a similar way: a single rat was exposed to empty bottles (Context B). In Experiment 2, one group received extinction as in the previous experiment, while the other group received extinction just like in acquisition, in groups of four. Finally, a reacquisition test was conducted; all rats were exposed to the sugar solution again. A slow rate of reacquisition was found when rats received acquisition in Group (A), extinction alone (B) and test alone (ABB group). Furthermore, similar results were found when rats received all phases in Group (AAA group). Results indicated rapid reacquisition when rats were tested in group only if they were extinguished alone (ABA group). The present data suggests a parallelism between social and physical contexts.

Cognitive and neurophysiological factors characterizing the risky decision making process in driving

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MALDONADO, SABINA BALTRUSCHA, CARMEN GERVILLA, CAROLINA
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Risk behavior is the main contributing factor in road accidents. The decision-making process leading to the execution of this type of behavior is influenced by numerous situational and personal factors. This research aimed to search for a cognitive, behavioral and physiological pattern that characterizes the profile of the risky driver. We explored the relationship between the general attitude toward risk in different domains (Dospert), impulsivity (UPPS), sensation seeking (SSS), and the behavior pattern in simulated driving situations. Moreover, an electroencephalographic recording was performed in a resting state and during the simulated driving task in search of a new measure of risk propensity. The results showed a relationship between the personality traits, the neural activity and a driving behavior characterized by risky behavior. The possibility of identifying risky population profiles, even prior to obtaining a driving license, would allow for the design of more effective intervention programs in the training and re-education of drivers.

Supported by the Spanish Directorate General of Traffic SPIP2014-01341 to A. Cándido; and Spanish MICINN PSI2012-39292 grant to A. Catena.

Testing Prepulse inhibition in a context associated with MK-801 counteract the effect of the drug

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Prepulse Inhibition (PPI) refers to the reduction of the startle response observed when a low-intensity stimulus (prepulse) preceded 30-500 ms to an intense stimulus (pulse). One interpretation of this phenomenon considers that the prepulse activates a neuronal process that attenuates the startle response that guarantees adequate processing of the stimuli. PPI is reduced in schizophrenic patients, which has led to numerous studies that have focused on the drugs that disrupt or restore PPI. Specifically, both dopaminergic activation and blockade of NMDA receptors reproduces the PPI disruption observed in schizophrenics, and dopamine antagonists restore PPI. In a previous study we found that when registering PPI in a context that had been repeatedly associated with a dopamine agonist (amphetamine) PPI was reduced in saline-treated rats. In this paper we describe a similar study, but using MK-801, an antagonist of NMDA receptors. In the first experiment we observed PPI impairment after the administration of different MK-801 doses. In Experiment 2, we observed that testing PPI in the context previously associated with the drug had no effect on PPI when animals received saline, but PPI was restored when the animals received MK-801. These results support the idea that the mechanisms responsible for the attenuation of PPI by NMDA receptors blockade are independent of dopaminergic activity.

This research was supported by Project PSI2012-32077. Ministerio de Economía y Competitividad. Spain.

TALK SESSION 7: Polydipsia

Scheduled-induced drinking and temporal adjustment in fixed interval schedules

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Universidad Nacional de Educación a Distancia, Spain

When exposed to a fixed interval schedule, organisms receive a reinforcer when they make a response after a determined time has elapsed. This schedule usually produces a response pattern that consists of a pause after the previous reinforcer, followed by an accelerated response rate until the next reinforcer is delivered. Fixed interval schedules have been studied mostly in steady-state, and little is known as to what variables affect the acquisition of its response pattern. The temporal adjustment in fixed interval schedules is evaluated with some timing measures, such as post-reinforcement pause, quarter-life and running rate. The goal of this study was to evaluate if schedule-induced drinking improved temporal adjustment in rats. Six rats were exposed to a FI 30 s during 30 sessions, half of the rats had access to water in the experimental chamber, hence the possibility to engage in schedule-induced drinking, whereas rats in the other group had no access. The three measures listed above were evaluated, and rats with access to water had a better adjustment than rats with no access.

Supported by research project PSI2011-29399. Spain.

Methylphenidate modulates motivational and motor characteristics of schedule-induced polydipsia in an animal model of ADHD

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Spontaneously Hypertensive rats (SHR), Wistar Kyoto (WKY) and Wistar rats were submitted to acquisition of schedule-induced polydipsia (SIP) using a multiple Fixed Time (FT) food schedule with components of 30 and 90 seconds. Thereafter animals were exposed to chronic Methylphenidate (MPH) for 6 consecutive sessions in which 2.5 mg/kg were administered before each SIP session. A sensitization test was also conducted four days after drug treatment. Analysis of SIP performance on the first, third, sixth and sensitization sessions, were carried out using the Bi-Exponential Refractory Model (BERM) to describe the possible changes related to the drug treatment in terms of the parameters that describe behavior in bouts of responses. General results showed similar baseline results in all animals regarding FT 30 s. Apparently, MPH treatment had no effect in SHR and produced a marked decrease in WKY rats. In FT 90 s, SIP was successfully maintained in SHR but barely developed in Wistar and WKY rats. Further, SHR showed a decrease in the latency to initiate the SIP episodes, and results in Wistars were parallel to SHR, but with lower rates of responding. BERM estimations provided an itemized description of these changes throughout SIP episodes.

Supported by research grant PSI2011-29399 from the Spanish Government (Ministerio de Economía y Competitividad, Secretaría de Estado de Investigación, Desarrollo e Innovación).

Resistance to change of schedule-induced drinking under pharmacological disruption

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Schedule-induced drinking (SID) is characterized by a pattern of excessive water intake that develops when animals are exposed to intermittent food reinforcement schedules. The main controversy is whether SID and other adjunctive behaviors satisfy the same learning laws as other operant behaviors. Behavioral momentum theory (BMT) proposes that the strength of operant behaviors can be measured as its response rate and its resistance to change (RTC) when a context disturbance condition occurs. Response rate and RTC are separable aspects of operant behaviors. According to BMT, response rate would be governed by the response-reinforcer contingency while RTC would be determined by a molar Pavlovian stimulus-reinforcer relation. Disruptions to ongoing behavior by manipulating the motivational level to obtain the reinforcer have generally supported the predictions of behavioral momentum. Tests with pharmacological disruptors, however, have yielded mixed results. The objective of these experiments is to observe if the effect of pharmacological disruption on SID is similar to the effect of motivational disruptors, such as the degree of food deprivation or the administration of free food at the time of test. For this purpose, we used different doses of drugs with impact on the dopaminergic system (amphetamine, cocaine and haloperidol) on baseline responding maintained by different food magnitudes, and in general it was obtained that the resistance to change depends on reinforcer magnitude, similar to results that introduced motivational disruptors.

Competition among adjunctive behaviours and its relation to inter-food interval length

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16 male naïve Wistar rats were exposed to intermittent food schedules to measure the development of schedule-induced wheel-running (SIWR) using fixed time (FT) 30, 60, 120, 240 and 480 sec schedules counterbalanced across animals according to a Latin square design. Rats were also exposed to a massed-food control condition. Subsequently, 8 rats had free access to a wheel in their home cages while the remaining 8 rats had access to a water bottle in the operant chambers, and the procedure with repeated exposure to different FT schedules was again undertaken. Animals with access to water in the experimental chambers were evaluated latter without concurrent access to the running wheel under (FT 60 and 120 sec schedule). Activity was induced in the range of 30-240 sec with a gradation as a function of inter-food interval length. The introduction of massed food resulted in an immediate reduction in wheel running. Furthermore, activity was reduced when animals had unlimited access to the wheel (particularly at short inter-food intervals) as well as by the presence of water in the chambers. Water and running competes for expression as a function of the temporal location of both behaviours.

SESSION 8: New Perspectives in Associative Learning

Losses and gains: Inhibitory predictions and choice

BERNARD BALLEINE

Brain and Mind Research Institute, University of Sydney

In motivational terms, stimuli that predict the loss or absence of reward are often classed with those associated with aversive events and, indeed, in studies of associative learning, the former have occasionally been reported to block learning about the later. In decision-making, although it is well known that stimuli that predict a specific reward can excite or bias the choice of actions that gain access to that reward, it is not known what effect stimuli that predict the absence of a specific reward have on such choices. We assessed this question on both rats and in human subjects comparing the influence of excitatory and inhibitory predictors of specific outcomes on choice between actions that also produced those outcomes. We found consistent evidence that stimuli predicting that a particular outcome will not occur biased choice towards actions that also predicted the absence of that outcome. These experiments provide evidence for the integration of inhibitory stimulus-outcome associations with inhibitory action-outcome associations and, therefore, of symmetrical excitatory and inhibitory influences on choice between goal-directed actions.

Cue interactions: association or decision?

IGNACIO LOY, BEATRIZ ÁLVAREZ, FÉLIX ACEBES, AND
CLARA MUÑIZ-DIEZ

Universidad de Oviedo

Many associative learning phenomena imply training with an element (A) and a compound of two stimuli (AX), producing cue interactions. The aim of this work was to analyse the interactions between cues by varying the level of the reinforcement contingency. Two experiments in magazine training with rats employed four groups and a tone as the elemental cue and a tone plus a click as the compound cue. In the first experiment, the tone was reinforced for all the groups, and the compound was presented with different reinforcement contingencies for each group (100%, 66%, 33% and 0%). The general design was A+/AX+. The two extreme values represent augmentation/blocking (A+/AX+) and second order conditioning/conditioned inhibition designs (A+/AX-). The second experiment employed the same contingencies of reinforcement for the compound but the element was never reinforced, being the general design A-/AX+. The two extreme values represent mediated extinction/recovery from overshadowing (A-/AX+) and non-reinforced presentations (A-/AX-). The results obtained were analysed by means of the Signal Detection Theory, which allows for a more comprehensive understanding of the cue interactions.

A double error model of classical conditioning: integrating associatively mediated effects

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A general real-time error-correction model of classical conditioning will be presented. The model incorporates error-correction learning akin to that of the Temporal Difference model. Additionally it integrates associative activation of stimulus representations, stimuli memory traces and probabilistic element sampling akin similar to those found in the SOP model. The model postulates that both the predictability of an outcome and cues predicting said outcome modulate the direction and extent of learning. Therefore for instance a familiar cue will tend to have less associability towards a novel reinforcer than a novel cue. It moreover explicitly assumes the formation of associations between non-reinforcing cues when their presentations coincide. These neutral associations subsequently influence reinforced learning between both present and associatively-cued stimuli. Recently, the model has been extended to work with compound and configural stimuli through mechanisms unique to its learning framework. Its ontology allows for it to account for ‘silent learning’, mediated conditioning phenomena, pre-exposure effects, and discriminative learning in a novel yet parsimonious manner. Results from a set of simulations of a representative sample of learning phenomena will be presented and discussed within the framework of different learning models and theories in the field.

Towards a Learning-Timing Model

ANDRÉ LUZARDO, ESTHER MONDRAGÓN, AND
EDUARDO ALONSO
City University London

Temporal difference (TD) has asserted itself as the model of choice for modelling associative learning in both humans and machines. It can reproduce a number of learning phenomena observed in classical conditioning experiments, and its basic error correction principle has garnered neurophysiological support. However, it has encountered serious difficulties when dealing with the temporal aspects of associative learning. It cannot easily accommodate certain important features of the timing of responses and effects of temporal variables on learning, although it has been able to, with varied degrees of success, explain at least some of these properties. Interval timing models have been developed quite independently from associative learning models, and have been able to explain the timing of responses reasonably well. The Timing Drift-Diffusion Model (TDDM) is one of such efforts. It has been developed recently based on two well established psychological theories: Scalar Expectancy Theory, which offers a basic information processing framework for timing, and the Drift-Diffusion Model, a neurophysiologically plausible mechanism responsible for decision making. In this talk we will explore ways in which TD can be coupled with TDDM to generate a learning-timing model, and test its predictions on some learning and timing phenomena.

Inhibition of delay using SOP revisited

JOAQUÍN MORÍS

Universitat de Barcelona / Universidad de Barcelona

In the course of delay conditioning, a conditioned stimulus acquires the capacity to generate excitatory conditioned responses. However, if the conditioned stimulus has a long duration, its initial part can become inhibitory, in what has been called inhibition of delay. The study of this phenomenon provides very interesting information about the fine-grained details of conditioned response timing and the representation of stimuli. It has been claimed that recent versions of the SOP model can predict inhibition of delay and several of its most important properties (Vogel, Brandon & Wagner, 2003). In this presentation, I will discuss under what circumstances this can happen, the role of the different parameters of the model, followed by a general proposal for reporting model simulations in associative learning.

Associative inhibition: Implications for impulsivity and psychopathy

ROBIN A. MURPHY

University of Oxford

Impulsivity can be characterised as a reflection of a cognitive impoverishment related to poor inhibition. For instance, the repetitive and impulsive nature of anti-social behaviour in psychopaths has been attributed to punishment insensitivity and a failure of inhibition (e.g., Gray, 1970). Another theory suggests that it is the type of association that is impaired in psychopathy (ie., intact stimulus-response associations, but impaired stimulus-reinforcement associations; Moul, Killcross, & Dadds, 2012). We use an associative Go/NoGo task to separately assess inhibition and cognitive flexibility. Our measure of inhibition involves a prediction first described by associative theories like the Rescorla Wagner (1972) model that predicts enhanced learning in the presence of inhibitors (e.g., super conditioning). Forensic and community psychopaths demonstrated super learning and flexibility in learning about cues for outcomes. We discuss the results in relation to current theories of psychopathy.

TALK SESSION 9: Attention, emotion, and associative learning

Depression in a dementia model? Tg2576 mice display lower lick cluster sizes in response to palatable sucrose

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While memory loss is the most recognised symptom of Alzheimer's disease, patients also display other symptoms – including affective changes linked to depression. Although affective changes have a critical influence on patient life quality, they are under-researched compared to memory symptoms and have received little attention in the pre-clinical literature. To address this issue, we used 11 month old Tg2576 mice (which express the human “Swedish” APP gene mutation linked to early-onset Alzheimer's disease) and examined the microstructure of licking behaviour in response to 4% and 16% sucrose solutions. The mean size of licking clusters – which indexes hedonic responses – was lower in Tg2576 mice than wild-type controls, despite a (non-significant) tendency for Tg2576 mice to consume more. Moreover, Tg2576 mice did not show the typical increase in lick cluster size between 4% and 16% sucrose. That is, Tg2576 mice displayed lower levels of positive hedonic reactions overall and greatly attenuated responses to normative increases in solution value. This pattern of results is consistent with the attenuated hedonic reactions to positive stimuli/events (anhedonia) in human depression. Future research will examine how this analogue of anhedonia relates to the cognitive and neurobiological impairments caused by amyloid pathology in Tg2576 mice.

Disruption of the learned predictiveness effect in individuals with high divergent thinking ability

UNAI LIBERAL, GABRIEL RODRÍGUEZ, AND GUMERSINDA ALONSO

Universidad del País Vasco / Euskal Herriko Unibertsitatea

A learned predictiveness (LP) task usually consists of two training stages. In Stage 1 half of the cues are established as accurate predictors of their outcomes, and the other half are established as poorer predictors. In Stage 2, all cues are equally predictive of a new outcome. On test, participants rate the likelihood that the cues would produce Stage 2 outcomes. It has been consistently found that participants rate the accurate predictors higher than poorer predictors. We report an experiment investigating the relationship between this LP effect and divergent thinking ability. A sample of undergraduate students performed a LP task and also completed measures of divergent thinking adapted from Torrance (1968). We observed that better performance on the divergent thinking task was associated with smaller, or null, evidence of the bias characterizing the LP effect. These results are discussed in terms of two alternative (or complementary) accounts: the attentional style of individuals with high divergent thinking abilities and/or their ability to do not use the relatively simple rule that the individuals with low, or moderate, divergent thinking abilities apply in the test of the LP task.

Supported by grants from the Spanish Ministerio de Economía y Competitividad (Grant No. PSI2011-2431) and Gobierno Vasco (Grant No. IT-694-13).

Evaluative conditioning and analysis of expectancies (CNV)

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Evaluative conditioning (EC) occurs if the pairing of an affectively neutral stimulus (CS) with a positive or negative unconditioned stimulus (US) results in a change in the evaluative tone of the CS in the same direction of the US. Several studies suggest that EC is resistant to extinction. That is why EC is defined as a kind of referential learning without the generation of expectancies. This experiment investigated the influence of unreinforced post-acquisition CS presentations on EC effects using two measurements, affective judgments and a type of brain wave (contingent negative variation: CNV) that are associated with expectancy processes.

The effect of experience and instructions on learned attentional biases

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It has been shown that selective attention is allocated to the best available predictor of an outcome, which is known as *learned predictiveness*. Mitchell et al. (2012) have shown that instructions about the ‘relevance’ of each stimulus can influence (and even reverse) the learned predictiveness attentional bias, suggesting that propositional reasoning plays a crucial role in this phenomenon. Our experiment further explores the effects of instructions on this learned attentional bias. As a difference from previous work, we measured attentional capture through spatial cueing effects, which have been found to rely on rapid attentional processes (Le Pelley et al., 2013). Participants responded faster to events presented in the spatial location cued by stimuli that had previously been trained as predictive through trial-by-trial learning. However, verbal instructions regarding relevance failed to speed up participants’ responses or to modulate the effect of learned predictiveness on spatial cueing. These results suggest that predictive stimuli produce an attentional bias that is not (always) under voluntary control.

Variation of incentive salience processing during ontogenic development

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Experimental procedures in which signals are related to rewards and the way in which the subjects respond to them could be a key in the study of the disorders of impulse control. Individuals make choices and prioritize goals using complex processes in which they attach value to the rewards they receive in relation to the previous stimuli. In an autoshaping procedure phase A (ad-libitum) -B (deprivation) -A (ad-libitum), in which we associate a CS with the arrival of an US we found that the variation of the incentive salience was different in several age groups (4-5/ 6-7/8-9 weeks old). This result suggests that there are differences in the maturation process with regard to the analysis of the stimuli according to the age range. Recent studies have shown that autoshaping in rats and its application in human models might be crucial for the analysis of biological markers of impulsivity and very useful for the effective administration of pharmacological and behavioral treatments.

This research was supported by Project: PSI2012-32445. Ministerio de Economía y Competitividad. Spain.

Absence of derived stimuli relations in pigeons despite obtaining high levels of efficiency in a double conditional discrimination using a single-key “go-no go” procedure

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Eight pigeons were subject to a conditional discrimination “go-no go” procedure similar to those used by Frank and Wasserman (2005) and Urcuioli (2008) for the formation of functional stimuli classes. Unlike these authors, who used a single conditional discrimination to form two stimuli classes of two stimuli each one (class 1: A1 and A2, Class 2: B1 and B2), we use two conditional discriminations to form two classes with three stimuli each class (class 1: A1, B1 and C1, class 2: A2, B2 and C2). Half of our subjects were trained in a standard linear procedure (A → B → C) and the other half in a “many-to-one” procedure (A → C, B → C). After three consecutive sessions with a index of discrimination higher than 0.9, a series of training sessions including test trials were scheduled in order to test all possible derived stimuli relations in each functional class (symmetry, transitivity and equivalence). Although during test sessions the discrimination index remained high for the trained conditional relations, there was no evidence that animals derived untrained conditional relations between stimuli included in the same class. These results contradict some recent findings published in the literature on formation of functional classes of stimuli.

Sesión de pósteres 1

Poster Session 1



Universidad de Sevilla

The role of mental representation in quantity discrimination by fish

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Universidad de Oviedo

Human and non-human animals have been shown to be sensitive to quantitative differences between sets of items. In higher order vertebrates, including our own species, the assumption is that the comparison of sets is made using mental representation of the compared items, i.e. memory. Here, a new procedure is applied in studying discrimination of small number of items (conspecific shoals) in angelfish (*Pterophyllum scalare*), in which a component of short term working memory was introduced in the task. After a pre-test period of full visual access to the contrasted shoals, all fish but one in each stimulus shoal were hidden behind opaque barriers and test fish had to make a choice while seeing a single fish of each stimulus shoal. The results showed that angelfish are also capable of distinguishing between shoals differing in numerical and/or quantitative attributes using the memory of the size and location of the two shoals previously seen. Our findings suggest the existence of qualitative similarities across even distantly related species, and imply the possibility of an ancient evolutionary origin of mental representation of numerical or quantity attributes.

This research was supported by Grant PSI2013-40768-P from the Ministerio de Economía y Competitividad (Spain).

Exploration of a novel object in late adolescence predicts sensation/novelty-seeking behavior in adulthood

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The sensation/novelty seeking (SS) behavioral trait refers to the exploration/preference for a novel environment. SS increases during late adolescence and is associated with neurobehavioral disorders. Roman High- and Low-Avoidance (RHA-I, RLA-I) rats were selected for good/poor avoidance performance, respectively, but also show differences in SS (RHA-I>RLA-I) in adulthood. We hypothesize that these differences are already present in late adolescence and that they predicts adult SS. To test these hypotheses, 36 male RHA-I and 36 RLA-I adolescent rats (52-59 days old) were exposed to a novel object exploration test (D.V.: contact latency, contact time, contact frequency). Strain differences were observed in this test (RHA-I>RLA-I) and were in agreement with those observed in SS indexes registered in adulthood (83-105 days of age): Head-dipping (Hole-Board), time and visits to a novel-arm (Y-maze), and latency to emerge (Light-Dark box). Factor analysis (RHA+RLA) revealed two clusters: (1) Contact latency, novel-arm visits, and emergence latency; and (2) Contact time, novel-arm visits and time. Contact time predicted novel arm time (RHA+RLA-I, RHA-I only), whereas contact

latency, latency to emerge and head-dipping jointly predicted novel arm visits (RLA-I only). Therefore, strain SS differences are already present in adolescence, and adolescent SS predicts adult SS, as expected for a genetically-influenced temperamental trait.

Supported by Junta de Andalucía (HUM-642), Ministerio de Economía y Competitividad (PSI2010-15787 and PSI2013-41872-P), and Fundació la MARATÓ TV3 (092630/31). Spain.

Conjoint development of hyperactivity and anorexia in rats

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Activity-based anorexia (ABA) is a procedure that consists of limiting access to food for a short period of time and giving access to an activity wheel for the rest of the day. This procedure results in rapid weight loss and an increase in wheel running. Traditionally, studies with this procedure have focused on analyzing the relationship between diet and weight loss, giving less attention to wheel-running activity. The goal of this study was to analyze the running pattern throughout an ABA procedure. Eight female Wistar rats were exposed to an ABA procedure and it was found that during the first sessions rats run in the activity wheel less than during the last sessions and that the activity tended to increase after access to food, stop in the middle of the session, and increase again just before the next period of food, developing what is called an anticipatory running. This result suggests that the pattern of running is controlled by the delivery of food, thus making it plausible to compare this behaviour with other patterns of behaviour that are maintained under intermittent feeding conditions.

Supported by research project PSI2011-29399. Spain.

Easy-to-hard effect: An application against electronic fraud

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Phishing is an electronic fraud aimed at acquiring sensitive information from Internet users by posing as a trustworthy company. To make the fraud unnoticed, scammers typically use e-mails with links to fake sites that accurately mimic real ones. However, these spoofed sites are not always a perfect copy of the legitimate version. Subtle discrepancies related to page layout, picture quality, or typography are some of the common cases. With the appropriate perceptual training, these discrepancies may become noticeable. A visual perceptual training based on the easy-to-hard effect was tested in this context. Participants were asked to categorize screen shots of a bank website as original or fake. Results showed better accuracy for classifying the images when participants were trained with progressively more difficult discriminations than when training involved only the highest level of difficulty (easy-to-hard effect). Implications for the design of perceptual training programs to prevent electronic fraud are discussed.

Motivational control of extinction of flavour preference conditioning: A within- subject design

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The motivational state of the subject appears to influence the content of learned flavour preferences (Harris et al., 2000). In the present study, the effect of extinction on conditioned flavour preference was examined in thirsty rats (Experiments 1a & 1b) and rats that were hungry as well as thirsty (Experiment 2). In each experiment, rats received pairings of two separate flavours (almond and vanilla) with sucrose. Subsequently, one of the flavours was presented alone for six trials allowing the possibility of extinction. Preference was then assessed through a two-bottle test with choice between the extinguished flavour (Fe) and the non-extinguished flavour (Fne). The identity of the extinguished flavour was counterbalanced across subjects. Hungry rats preferred a flavour that had not undergone extinction to one that had (and in further tests showed a preference for Fne over water but not for Fe over water). The rats that were not hungry showed a decline in consumption over the extinction trials, but there was no sign of a preference for one or other of the flavours in the two-bottle tests. The results suggest that extinction may affect the association between the flavour and the nutrient when rats are hungry, but not when they are only thirsty.

Funding: PSI2012-33552 (MINECO). Spain.

Positive affect induced by pictures of beloved faces increase Prepulse inhibition in women, but not in men.

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The presentation of a certain intensity stimulation causes a startle response that is intended to prepare the body to deal with a situation potentially relevant. This response is not immutable, but changes with the experience and is modulated by various circumstances that affect the body, so that tends to be reduced to a positive affective state and increased when the affective state is negative. Other circumstance that affects the intensity of the alert response is related to the type of stimuli that appear together that induces the aforementioned response: If between 50 - 300 ms before the presentation of an intense stimulation (referred to in the scientific literature “pulse”) presents a weaker stimulus (“Prepulse”) is consistently observed a reduction in the response of alert that would occur before the pulse alone. This phenomenon, which is known as Prepulse inhibition (PPI) seems to be determined by putting up a series of neural processes that temporarily inhibit the surrounding stimuli processing until it concludes the analysis of the foreplay. In this paper we analyze the effect of the induction of affective States on alert and IPP responses. Usually, the induction of affective States is usually done using aversive, phase or neutral nature images selected from the International Affective Picture Sytem. In this study, simultaneously to the registration of the alert and the IPP response, we present a picture of the face of a people beloved by each participant to induce a positive affection against a picture of a mutilated face or a neutral face. The results showed no difference in what refers to the responses of alert, while if

it appeared an interaction between the intensity of the IPP, the affective state and the sex of the participants: the IPP increased before the presentation of faces of familiar people, but only in the sample of women. These results are interpreted considering that positive affective state produced an increase in attention to the pre-pulse who was responsible for the increase in IPP.

This research was supported by Project: PSI2012-32077. Ministerio de Economía y Competitividad. Spain.

Studying habit acquisition with an avoidance learning task

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The study of habit acquisition and expression is considered relevant to improve our understanding of mental disorders characterised by the presence of compulsive or incontrollable behaviours. Most studies on habit learning, both in animals and in humans, are based on positive reinforcement paradigms. However, the compulsions and habits involved in some mental disorders may be better understood as avoidance behaviours, which involve some peculiarities such as anxiety states that have been shown to promote habitual responses. Consequently, we studied habit acquisition by using a free-operant discriminated avoidance procedure. Participants learned to avoid an aversive noise presented either to the right or to the left ear by pressing two different keys. After a devaluation phase where participants could reduce the volume of the noise presented to one of the ears, participants went through a test phase identical to the avoidance learning phase except for the fact that the noise was never administered. Habit acquisition was inferred by comparing the rate of responses to the stimulus signalling the devalued reinforcer and to the stimulus signalling the non-devalued reinforcer. Habitual responses would entail the absence of differences between the referred conditions. Finally, we discuss the theoretical and clinical implications of the results obtained.

Cortisol awakening response and emotion in Carlos Soria's Kanchenjunga climbing expedition 2013

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Carlos Soria is a 76-year old mountaineer born in Spain, and all over the world, the only one who has been capable of conquering, with an age above 60 years, eleven out of the fourteen eight-thousands of the earth. These achievements are part of a fascinating and ambitious adventure into the limits of human resistance to extreme environmental conditions at advanced ages, the ultimate goal of which is to successfully fulfill, before his 80s, the ascent to all of these world's highest mountains. We compared here the cortisol awakening response, which is thought of as an abrupt psychologically-driven rise in cortisol in anticipation of the demands of the upcoming day, in his climbing team at high altitude (more than 5000 m) and a control group at sea level in the Sunshine Coast. Results show that, relative to resting days, the foreigner mountaineer group has a bigger cortisol awakening response in those days - implying the ascension of a novel and difficult track. Moreover, this cortisol awakening response positively correlates with fear-based emotions and anticipation of a hard day (from $\rho = 0.30$ to 0.52).

Availability of alcohol and a discontinuous procedure did not affect the development of activity-based anorexia in rats

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The model of activity-based anorexia (ABA) consists of placing a rat under food restriction (e.g., 23h), access to a running wheel during the time of food restriction and water available all the time. Typically, these conditions produce in a few days a gradual increase in activity, progressive reduction of body weight, and a decrease in food consumption originating from the phenomenon known as activity-based anorexia in rats. Initially, the purpose of this experiment was to study the ABA phenomenon by replacing availability of alcohol instead of water. The rationale was that alcohol provides additional calories to food and thus might mitigate the effects of the ABA model. To that end, eight male *Wistar* rats were exposed for five days to free availability of food and water for 24 hours without access to wheel activity (baseline). Subsequently, for seven days the subjects had access to a running wheel for 23 hours and 1-hour access to food. A solution of water and alcohol (10% v/v) was the liquid available during the experimental phase. After five days of recovery, the experiment was terminated. Body weight, food intake, alcohol and running wheel activity were recorded daily. However, an equipment breakdown forced us to suspend the experiment on the fourth day of the experimental phase. We maintained all experimental conditions, except that access to the running wheel activity was interrupted. Three days later the equipment was arranged and normal procedural conditions were reinstated. Contrary to our expectations, the results showed that despite having been interrupted, the activity-based anorexia model was replicated. With the exception of interruption days, food intake

was reduced, body weight decreased, alcohol consumption was variable, and increased activity in the running wheel was observed after interruption. These findings confirm that this model contributes towards an exploration of the variables related to the attenuation or facilitation of the generation of animal activity-based anorexia.

Oculomotor responses to cues related to rewarding and aversive food attributes in adolescents, young adults and adults

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Although adolescents display enhanced reactivity to reward (e.g., sex or drugs) and lower sensitivity to aversive stimuli (e.g., negative effects of alcohol) relative to adults, developmental studies focusing on food-related reactivity are scarce. Moreover, the adolescent reward system does not demonstrate a unitary response during reward processing, but rather early hypoactivity to anticipatory signals and later hyperactivity in consummatory actions. Therefore, in order to get a better understanding of adolescent anticipatory behaviour towards food, we examined the oculomotor responses to rewarding/ aversive food attributes with eye tracking technology using a two-competing pictures paradigm (which implies the free visual exploration of two images); and compare them among healthy adolescents (n=10; 13-18yo), young adults (n=16; 20-23yo) and adults (n=12; 25-30yo). To exclude the possibility of low-level confounds, five categories (neutral, distaste, food danger, good taste, and caloric content) of well-controlled pictures standardised in terms of colour, size, brightness, contrast, spatial frequencies, and complexity were randomly presented. The results indicated higher initial fixation on caloric food-related pictures and shorter gaze duration to food danger-related pictures in adolescents compared to adults. These findings seem to provide support for an adolescent normative imbalance between a hyperactive reward system and limited harm-avoidant and regulatory circuitries.

This work was supported in part by the Swiss Government under the program “Swiss Government Excellence Scholarships for Foreign Scholars” (2013-2014).

Extinction of human spatial learning through a discrimination reversal learning procedure

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The usefulness of a discrimination reversal learning procedure for extinguishing human spatial learning was assessed. A virtual square pool was designed and a landmark was suspended in the center of each of its quadrants. During the Discrimination phase, three groups were trained to find a hidden platform whose location was indicated by a particular landmark. Then, the DIS group performed a test, the DIS2 group repeated the same phase before testing, and the REV group was exposed to a Reversal phase in which a platform was placed in a new position in the maze in order to extinguish the original learning. Thereafter, this group was tested. During the Discrimination phase for all groups, the probability of initial approach to the reinforced landmark increased. However, for the REV group, the same variable decreased during the Reversal phase. In contrast to the DIS and DIS2 groups, during testing the REV group navigated a bigger distance, spent less time in the originally reinforced quadrant, in the first platform position area, and decreased the probability of initial approach to that area. The extinction of human spatial learning by this procedure and its similarities with respect to those results obtained with rodents are further discussed.

This research was supported by a Consejo Nacional de Ciencia y Tecnología (CONACYT) grant, given to the first author. Mexico.

Extinction of spatial learning in humans using a virtual water maze

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Extinction of human spatial learning was assessed using a virtual water maze. It consisted of a square pool with a landmark suspended in each corner. Three groups were exposed to a pretest, followed by an Acquisition phase in which a platform was hidden in the center of a particular quadrant of the maze. Then, a group did a post-test, another group was exposed to an Extinction phase without the platform before testing, and a further group had to wait the same time as the duration of the extinction trials before testing. The Acquisition phase occurred without between-group differences. The distance navigated in the maze did not differ either between tests or between groups. The time spent in the reinforced quadrant was different between tests but not between groups. The time spent in the platform location and the number of subjects crossing over did not differ between groups during the pretest. Nevertheless, both variables presented low values during post-test in the extinction group. The differences between the extinction sensitivity of several variables for human spatial learning are discussed and the results are compared with those obtained in rodent studies of extinction in spatial learning.

This research was supported by an Instituto Politécnico Nacional (IPN) grant, given to the last author. Mexico.

Context-dependent learning in preweanling rats using an instrumental conditioning paradigm

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Contextual learning during early ontogeny is a topic that has generated controversy in recent decades. Some authors consider that learning is context-independent at this stage, the deficit being attributed to immaturity of the hippocampal system at this age. However, ecological research adapted to infant capabilities shows the opposite. Contextual learning during infancy has primarily been addressed using Pavlovian conditioning. The present work aims to study this problem using an instrumental learning paradigm (nose-poking). Preweanling rats were conditioned during postnatal days (PDs) 16-17, using chocolate milk as the reinforcer. Animals were tested on an extinction trial at PD18, either in a different context or in the same context used during training. Infants tested in the same context had a higher instrumental response rate than the alternative group during the initial minutes of the test. In addition, latency to respond was lower in the first group compared to the later one. This pattern of results seems to support the hypothesis that learning during early stages of development might be context-dependent, and that this context-dependency can also be observed in an instrumental learning procedure.

Funding: PICT-2011 013, SECyT-UNC 2014-2015, (CONICET, Argentina) and PSI2012-33552 (MINECO, Spain).

Perceptual learning with an appetitive conditioning procedure in rats

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The majority of perceptual learning experiments with rats have used flavors as stimuli in a conditioned taste aversion paradigm. In spite of its potential to be of use in the study of perceptual learning, to our knowledge, no one has yet reported an effect of perceptual learning using a conditioned taste preference procedure. In this study, we attempted to find the basic intermixed/blocked (I/B) effect using such a procedure. In the first experiment, we attempted to demonstrate simple conditioning and discrimination in a within-subjects design. In a second experiment, we tried to obtain the I/B effect with a between-groups design. In these two experiments, rats were hungry only during the test, and quinine and sucrose were used as the common element and US respectively. The state of hunger and thirst during the test leads to low consumption, hindering interpretation of the results. To solve this, we tried to replicate the same designs using saccharin as the common element and maltodextrin as the US, with rats that were hungry throughout the whole of the procedure. Possible applications of this procedure are discussed.

Supported by research project PSI2012-31641 (MINECO, Spain).

Open source associative learning models online using Shiny and R

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One fundamental aspect of the scientific endeavour is reproducibility. Only when it is possible to systematically generate the same results using the same tools, is its validity confirmed. However, as the complexity of the tools used increases, this becomes more difficult. For example, different theoretical models of associative learning have been proposed, for which no standard implementation exists. Having open source implementations of learning models would increase their usefulness as well as allow for an easier and more transparent way of testing their predictions. Several open source implementations of associative models using Shiny are described. Shiny is a package developed to publish online applications created using the statistical programming language R. Their advantages, future lines of development, as well as its usefulness in research and teaching are discussed.

The effect of instructions on perceptual learning using complex visual stimuli in humans

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Studies of perceptual learning in humans usually guide participants through instructions to look for differences between the to-be-discriminated stimuli. However, the results obtained with this procedure could be reflecting other processes beyond perceptual learning, such as discrimination learning via self-supervision. We conducted a typical perceptual learning experiment with three groups in which the instructions were manipulated. In the first group, participants were asked to look for differences. In the second group, instructions only required the participants to look at the stimuli, but did not explicitly ask to look for differences. In the third condition, participants were given bogus instructions about a non-related task that required them to look at the stimuli. The intermixed/blocked effect was only observed in the first group. These results were confirmed using a general linear model as well as Bayesian contrasts, both with d' and accuracy data. The results highlight the importance of instructions in previous perceptual learning experiments using complex visual stimuli.

Supported by research project PSI2012-31641 (MINECO, Spain).

Sesión de Pósteres 2

Poster Session 2



Universidad de Sevilla

Different sensibility to dopamine agonist and antagonist receptors across the maturate development

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The present study is a longitudinal analysis of prepulse inhibition (PPI) expression in a group of Wistar rats. The aim was to study with auditory stimuli if PPI is sensitive to different developmental states of the prefrontal cortex. Specifically the study examined the effects of administration of amphetamine and haloperidol (dopaminergic agonists and antagonists respectively) in infant, adolescent and adult stages. The results showed that all groups had PPI. However, dopaminergic drugs exclusively showed effects on PPI in the group of adult rats. Our results support the evidence that the maturation of the prefrontal cortex is necessary for the proper processing of stimuli and that a deficit in its sensorimotor development might lead to serious sensorimotor disorders.

This research was supported by Project: PSI2012-32445. Ministerio de Economía y Competitividad. Spain.

Removing and adding components of a context affects generalization of instrumental responses

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Using a fear conditioning paradigm, González, Quinn and Fanselow (2003) found that after training in one context, rats showed an almost complete transfer of the freezing response when testing occurred in the original context plus a new element (e. g., odor). However, they reported a generalization decrement when one element of the original context was removed (e. g., light). The present series of experiments test whether the results of González et al. (2003) could be found in an appetitive instrumental procedure with rats. In Experiment 1 and 2 rats were trained to press a lever for food in a distinctive context. Then, transfer of the lever pressing was tested in a context with added or removed components. In Experiment 3, a similar generalization test was conducted after rats received acquisition and extinction in a particular context. The overall pattern of results is consistent with previous findings and suggests some parallels between contextual effects on Pavlovian and instrumental learning.

Flavor exposure and context-switch effects

ALEXIS MARTÍNEZ RAMÍREZ, RODOLFO BERNAL-GAMBOA,
JAVIER VILA, AND JAVIER NIETO

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One experiment used a conditioned taste aversion paradigm with rats to explore whether the times of exposure to a flavor in one context affects later conditioning in a different context. During the first phase, all rats received free access to solution X in Context A. Groups 3A and 3B received three trials while groups 12A and 12B drank solution X on twelve trials. Then, all rats received one conditioning trial - immediately after consumption of X all rats received an injection of lithium chloride (LiCl). Rats in groups 3A and 12A received the injection in context A, while groups 3B and 12B were exposed to this trial in context B. Finally, groups "A" and "B" were tested in the same context that was used for conditioning. Results indicated that extensive exposure to solution X favors latent inhibition even when exposure took place in a different context. Implications for attentional theories are discussed.

Social foraging: identifying different antagonistic patterns in groups of pigeons

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In studies about social foraging, in which groups of subjects are simultaneously exposed to searching and consumption of food, it has been observed that some members into the group show a searching, letting available and consumption of food pattern (producing) whereas other members show a following to producers and consumption of food when it is available (scrounging). In this interaction between producers and scroungers, antagonistic responses can occur. The present work had three purposes: 1) To identify if antagonistic responses occur in groups of pigeons exposed to a social foraging setting with restricted resources; 2) To analyze the distribution of this response among sessions; 3) To identify if the antagonistic responses are correlated with the searching and consumption pattern showed by members of the group. The pigeons ($n=5$) were simultaneously exposed for five sessions to a wooden platform with 12 deposits, only four deposits contained food patches; the location of the patches was varied through three trials in the session; all subjects could have access to patch of food by piercing a seal that covered the deposits. The data show the occurrence of multiple antagonistic attacks with responses such as pecking the body of another subject and movement of the fin on the body of another subject. These antagonistic responses increased through the sessions, and the antagonistic attacks received by a subject were positively correlated with the exploitation of patches made available by it. A further correlation was observed between the initiation of an antagonistic attack and a higher rate of visits to patches. Additionally, the antagonistic attacks interfered with the production responses.

Evaluation of craving to nicotine in college students

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Addiction is the compulsive use of a substance that is socially considered as a chronic disease, and from a psychological point of view refers to the behavioral responses of search and compulsive consumption (Robbinson and Berridge, 1993). (Robbinson & Berridge, 1993). Recent literature on addiction has focused on identifying psychological mechanisms of consumption and addiction. Cognitive models emphasize activation and context effects upon subjects in order to explain craving (Tiffany, 1990). In the present study craving induced by nicotine was assessed in university undergraduates. Images containing objects and persons related to smoking cigarettes as well as neutral images were randomly presented. Desire pictographic scale was used to measure the degree of craving. (Muñoz, Viedma-del-Jesus, Fernández-Santaella, Peralta-Ramírez, Cepeda-Benito. & Vila, 2009). Results showed significant differences between smokers and no-smoker samples in terms of degree of craving generated by pictures that were consistent with craving reactions to cues that are related to drug use. An explanation based on associative models is proposed. This research intended to start and consolidate a collective of scientists from the CICS UST- IPN addressing studies on addictions.

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Brief analysis empirical-conceptual on social foraging

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The purpose of this work is to present an overview of research on social foraging in the laboratory setting within the rate-maximizing model. The different methods designed to evaluate the strategies of searching and consumption of food of several experimental subjects such as house sparrows, pigeons, spice finches and rats, will be described. The effects on the use of different strategies among members within a group will be demonstrated when variables related to the properties of food are manipulated (for example: spatial distribution, density, magnitude) and when variables related to group composition are varied (for example: number of members or different skills among members). Finally, the goodness and limitations of the rate-maximizing model for explaining the effects on strategies among members of the group in the study of social foraging in the laboratory setting will be analyzed.

Spontaneous recovery: recency of outcome and magnitude of reinforcement

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Rescorla (2004) showed in animals that Spontaneous Recovery (SR) depends on the interval between training and extinction. If two experiences are acquired successively (initially A and after B) and extinguished at the same time, the SR will be higher for the most recent experience reinforced. We conducted an experiment to study if SR also depends on outcome magnitude. University students participated in two conditions, one similar to Rescorla (condition $A=B$) and another with a different reinforcement magnitude in each experience (condition $A>B$). The participants found fictional money in cans through a virtual task; first they acquired one experience (A) after another (B) and subsequently, an extinction procedure for both was implemented. A final test occurred after 24 hours of training and participants chose the preferred location content. The results showed that in the condition $A=B$ preference was higher for the more recently reinforced experience, as in the Rescorla experiment, while in condition $A>B$ the participants chose the experience with more reinforcement. The results in both conditions are in accord with the Temporal Weighting Rule: if two experiences have the same magnitude of reinforcement the more recent experience is weighted, but if each experience has a different magnitude of reinforcement the experience with the most reinforcement is weighted.

Research was funded by UNAM PAPIIT IN304513 and UNAM PAPIIT IN301315. Mexico.

What, where and when in preschoolers: recency vs. outcome

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Episodic Like-Memory (ELM) involves the integrated recovery of What-Where-When (WWW). In foraging animals, the Temporal Weighting Rule (TWR) considers that information retrieval occurs from spatial and temporal sources, such as ELM. This model predicts recovery based on the magnitude of the outcome and the time of the moment-to-remember. We conducted an experiment that shows the integrated recovery of WWW from a task of TWR that included two new conditions ($A < B$ 0h y $A < B$ 24h). Participants searched-found an object in a container (A) and later another object in a different container (B). The magnitude of the outcome (number of objects) in both experiences varied according to the condition and the time of the test after training: $A = B$ 0h, $A = B$ 24h, $A > B$ 0h, $A > B$ 24h, $A < B$ 0h y $A < B$ 24h. The preference was higher for the more recently reinforced experience in conditions $A = B$ 0h, $A > B$ 0h, $A < B$ 0h; in conditions $A > B$ 24h and $A < B$ 24h the participants preferred the experience that was more highly reinforced and in condition $A = B$ 24h they chose similarly both experiences. The results are interpreted from the TWR and indicate that participants performed a dynamic average to choose the more convenient WWW.

Research was funded by UNAM PAPIIT IN304513 and UNAM PAPIIT IN301315. Mexico.

Order of presentation of the experiences learned by human beings in the Rule of Temporary Weighting

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The Rule of Temporary Weighting (RPT) can be a possible explanation for phenomena of information recovery because it predicts that the individual will behave in accord with the value of recency and subjective value of the learned experiences (Devenport and Devenport, 1994). Recently, this idea has been demonstrated in human beings with an instrumental task of choice, with positive and negative consequences (Lopez, Alvarado and Vila 2011). The present experiment was designed to observe the effect of the order in which the trials were presented, when the options of response have major or minor subjective value ($A > B$; $A < B$), when they are nearby or distant in time to the phase of test (RI 0 and 24h) on the recency effect, with a task of choice of positive consequences. The results showed that the participants chose the option recently reinforced, independently of if the subjective value was major or minor in the recent test, but when the test was distant they chose the first reinforced option with more subjective value; independent of the options if one option had major subjective value during the second phase. These results are identical to predictions based on the RPT, where the integration of information depends on the temporal distance and subjective value of the learned experiences.

Role of context in the extinction paradigm in proweanling rats

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Although it is currently accepted that the extinction effect reflects new context-dependent learning, this is not so clear during infancy. Some studies did not find recovery of the extinguished CR before postnatal day (PD) 21. The authors concluded that extinction during infancy erases the CS-US association. However, we have recently reported evidence of renewal, rapid reacquisition, reinstatement, and spontaneous recovery of an extinguished CR in preweanling rats. The present study analyzed the possibility of recovering an extinguished fear CR with a reinstatement procedure, on PD17 (Experiment 1-4) and on PD24 (Experiment 5). At the same time, we explored the role of context salience as a procedural variable that may affect extinction during the preweanling period. Results showed that preweanling rats expressed a previously extinguished CR after a single experience with an unsignaled US (Experiments 2 and 4a). Experiment 5 demonstrated the reinstatement effect on PD24 in a standard context. Furthermore, this result was only found when subjects were trained and tested in salient contexts, but not in standard ones (Experiments 3 and 4b). These results are in agreement with previous findings showing that the extinction effect during infancy shares features with extinction learning in adult organisms.

Funding: SECyT y CONICET. Argentina.

Inattentional blindness and perceptual learning: Learning to be blind to the common stimulus features

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Inattentional blindness (IB) is the failure to notice unexpected events in a visual scene when attention is focused elsewhere. Three experiments used the IB procedure as an “attention tracker” to assess the attentional changes that may occur during preexposure to a pair of relatively similar stimuli (e.g., AX and BX). Participants received intermixed presentations of two visual stimuli that contained several common (X) and unique (A or B) features. On the critical trial after exposure, stimulus AX was presented but included an unexpected visual event (a change in the size of a stimulus feature or the replacement of this feature by a new shape). In Experiment 1, the unexpected event was detected more frequently when it involved an A-unique than an X-common feature (the IB effect was greater for the common than for the unique features). Experiment 2 demonstrated that the ability of the unique feature to capture attention was only evident after relatively long preexposure to AX and BX. Experiment 3 demonstrated that the differential IB effect found in Experiment 1 was also evident when the preexposure combined intermixed presentations of AX, BX, A, and B in order to equate the number of presentations of the unique and common features and the interval between their presentations. These results provide support for the notion that the critical factor modulating the ability of the stimulus features to capture attention is their learned condition of being unique or common.

This research was supported by grants from the Spanish Ministerio de Economía y Competitividad (Grant No. PSI2011-2431) and Gobierno Vasco (Grant No. IT-694-13), Spain.

Extinction of spatial learning in humans using a virtual water maze

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Extinction of human spatial learning was assessed using a virtual water maze. It consisted of a square pool with a landmark suspended in each corner. Three groups were exposed to a pretest, followed by an Acquisition phase in which a platform was hidden in the center of a particular quadrant of the maze. Then, a group did a post-test, whilst another group was exposed to an Extinction phase without the platform before testing, and a further group had to wait the same time as the duration of the extinction trials before testing. The Acquisition phase occurred without between-group differences. The distance navigated in the maze did not differ between either tests or between groups. The time spent in the reinforced quadrant was different between tests but not between groups. The time spent in the platform location and the number of crossing over it did not differ between groups during the pretest. Nevertheless, both variables presented low values during post-test in the extinction group. The differences in extinction sensitivity of several variables for human spatial learning are discussed and the results are compared with those obtained in rodent studies of extinction in spatial learning.

This research was supported by an Instituto Politécnico Nacional (IPN) grant, given to the last author. Mexico.

Extinction of human spatial learning through a discrimination reversal learning procedure

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The usefulness of a discrimination reversal learning procedure for extinguishing human spatial learning was assessed. A virtual square pool was designed and a landmark was suspended in the center of each of its quadrants. During the Discrimination phase, three groups were trained to find a hidden platform whose location was indicated by a particular landmark. Then, the DIS group did a test, the DIS2 group repeated the same phase before testing, and the REV group was exposed to a Reversal phase in which a platform was placed in a new position in the maze in order to extinguish the original learning. Thereafter, this group was tested. During the Discrimination phase for all groups, the probability of initial approach to the reinforced landmark increased. However, for the REV group the same variable decreased during the Reversal phase. In contrast to the DIS and DIS2 groups, during testing the REV group navigated a bigger distance, spent less time in the originally reinforced quadrant, in the first platform position area, and decreased the probability of initial approach to that area. The extinction of human spatial learning by this procedure and its similarities with respect to those results obtained with rodents are further discussed.

This research was supported by a Consejo Nacional de Ciencia y Tecnología (CONACYT) grant, given to the first author. Mexico.

Schedule-induced polydipsia as a model of vulnerability to schizophrenia

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Psychogenic polydipsia - compulsive non-regulatory fluid consumption - is present in 6-20% of psychiatric patients with disorders related to compulsivity symptoms, such as OCD, ADHD, and schizophrenia. In the present study, we investigated the relationship between schizophrenia-like symptoms and biomarkers with a compulsive drinking behaviour phenotype in rats. Rats selected for low (LD) versus high drinking (HD) behaviour on schedule-induced polydipsia (SIP), were tested in a Latent Inhibition task, using tone and electrical foot shock, and in a spatial Reversal Learning task. We also analysed the myelin basic protein in different brain areas of HD and LD rats. The HD rats, characterized by compulsive drinking behaviour on SIP, showed a decreased latent inhibition effect, indicated by an attenuated response to the inhibitory effect of tone pre-exposure, compared to the LD group. The HD rats demonstrated behavioural inflexibility on the Spatial Reversal Learning task, indicated by the increased number of trials needed to reach the criterion, incorrect responses, and a significant number of perseverative errors during the reversal phase, compared to LD rats. However, there were no differences in the number of learning errors between HD and LD rats. Moreover, HD rats showed less myelination in the centre of the corpus callosum,

striatum, and amygdala compared to LD rats. These findings strengthen the validity of HD rats selected by SIP as a possible phenotype of compulsive neuropsychiatric disorders, evidenced by the existence of other symptoms and biological markers related to schizophrenia and OCD i.e. reduced latent inhibition effect, behavioural inflexibility, and reduced brain myelination. Future studies could help to elucidate the mechanisms underlying the compulsive phenotype of HD rats and its relationship with a vulnerability to schizophrenia.

This study was funded by a grant from the Ministerio Economía y Competitividad, Spanish Government (PSI2012-31660).

Feedback on a numerical task designed to induce cognitive reflection increases utilitarian responses in moral dilemmas in high-performance participants

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Previous research has linked cognitive reflection to utilitarian decisions in the moral domain. We aimed to expand this work by testing whether feedback-induced reflectiveness increases utilitarian decisions on moral dilemmas (e.g., sacrificing one life to save five other lives). To examine this relationship, participants were given one of two different numerical tasks (Cognitive Reflection Test, CRT; or Berlin Numeracy Test, BNT), before performing a moral dilemmas task. The CRT tests a person's ability to inhibit intuition, while the BNT consists of probability questions. We manipulated whether participants received feedback concerning their performance for each of the items on the relevant test. We found that the average utilitarian rate was higher among participants who scored high in the CRT after receiving feedback. However, no such difference was evident in the case of the BNT, with or without feedback. This pattern of results suggests that feedback leads to increased reflection in the CRT group, suggesting that reflectiveness may be induced and can affect moral decision-making.

Negative automaintenance in pigeons with a discriminative a+/b+/c- procedure

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Seven pigeons were exposed to a negative automaintenance procedure (NA). In the NA procedure, trials in which no pecks occur end with reinforcement but pecks to the illuminated key immediately turn it off and end the trial without reinforcement. Therefore in NA two contingencies concur: a Pavlovian CS-US contingency, producing signal-centered activity and an instrumental R-no US contingency, reducing signal-centered activity. It has been observed that NA results in reduced but maintained response frequency. In this work, the effect of NA is assessed with a discriminative A+/B+/C- procedure for more than 1500 trials with each of the stimuli. Several objectives were evaluated. First, we explored whether the omission contingency partially or completely eliminated pecking responses (there is empirical evidence for both outcomes). Second, we examined if the pattern of responses was cyclic rather than steady (key pecking in NA degrades the CS-US contingency, discouraging further key pecking, and once key pecking is reduced or eliminated, the key-light CS reemerges as a signal to be tracked, and this cycle of extinction and reconditioning may continue). And finally, we observed with a video system the response form when pecking is omitted.

This work was supported by a grant from Spanish Ministerio de Economía y Competitividad (PSI2012-32077).

Aversive Taste Conditioning in Juvenile and Adult Rats

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In this work we present results from an aversive taste conditioning study across different aged rats: P30, P40, P50, P80 - from early adolescence to adulthood. We compared two different doses of LiCl . Our results show different ranks of conditioning from early age to adulthood, presenting an increasing profile. Early ages presented a low degree of both taste conditioning and neophobia in comparison to adulthood. Thus, different ages presented different degrees of latent inhibition in aversive taste conditioning. These underlying differences of the degree of learning throughout rat development could explain the controversial data in the literature concerning the phenomenon of latent inhibition in the taste aversion conditioning paradigm.

XXVII Congreso Internacional de la Sociedad Española de Psicología Comparada

**Universidad de Sevilla,
del 9 al 11 de septiembre de 2015**

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