XXXV Congreso Internacional de la Sociedad Española de Psicología Comparada. 1-3 de octubre, 2025, San Sebastián, España

35th International Congress of the Spanish Society for Comparative Psychology. October 1-3, 2025, San Sebastian, Spain

EHU

Euskal Herriko Unibertsitatea
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Program Outline

Wednesday October 1st	8:30	9:00	REGISTRATION
	9:00	9:30	RECEPTION
	9:30	10:30	OPENING ADDRESS How does the brain integrate experiences that are separated in time? Nathan Holmes (University of New South Wales)
	10:30	11:30	Session 1: Issues Of Time
	11:30	12:30	Poster Session 1
	12:30	14:30	INVITED SYMPOSIUM: Associative Learning Going Forward
	14:30	16:00	LUNCH
	16:00	17:00	Session 2: Perceptual Learning, Representation, and Attention
	17:00	18:00	Focus Session 1: New Insights About Sensitization
	19:45		SOCIAL EVENT Reception in the Council House of San Sebastian
Thursday, October 2nd	9:00	10:00	INVITED ADDRESS Taste learning and brain plasticity. Milagros Gallo (University of Granada)
	10:00	11:00	Session 3: Extinction And Behavioral Persistence
	11:00	12:00	Poster Session 2
	12:00	1:00	Session 4: Causal, Categorical, And Illusory Learning
	13:00	14:00	Focus Session 2: Habit Learning
	14:00	15:30	LUNCH
	15:30	16:30	Session 5: Learning In, And About, Humans
	16:30	17:30	Session 6: Stressors & Development
	19:45		SOCIAL EVENT Traditional Basque Menu at Saizar Sagardotegia
Friday, October 3rd	9:00	10:00	INVITED ADDRESS The role of noradrenaline in updating of previous learning following changes in reward. Laura Corbit (University of Toronto)
	10:00	11:00	Session 7: Computational Approaches
	11:00	12:00	Poster Session 3
	12:00	13:00	Session 8: Learning Across Species
	13:00	14:00	Focus Session 3: Avoidance
	14:00	15:30	LUNCH
	15:30	16:00	WALK TO AULA MAGNA IN THE PSYCHOLOGY BUILDING OF UPV/EHU
	16:00	17:00	Tributes In Memoriam: Professors José Javier Campos Bueno and Francisco José López Gutiérrez
	17:00	18:00	SEPC meeting
	21:00		SOCIAL EVENT Gala Dinner at the Bistró of the Hotel de Londres y de Inglaterra

Wednesday, October 1, 2025

08:30 - 09:00:
REGISTRATION

SEPC registration

All Members Registered or Registering

Registration and information packets will be available at the meeting venue in Miramar Palace. (Maps on final page)

09:00 - 09:30:
OPENING RECEPTION

Opening reception

SEPC Officers and Supporting Affiliates

The presentation of the Congress and supporting organizations will take place in the Council House of San Sebastian. (Additional maps on final page)

More maps are located at the end of the program

09:30 - 10:30:
Opening Address

How does the brain integrate experiences that are separated in time?

Nathan Holmes, PhD, University of New South Wales

In this talk, I will present the results of a study that addresses the question above. The study used an array of sensory preconditioning protocols in rats. In these protocols, rats integrate an A-B association (e.g., tone-light) formed in stage 1 with a B-shock association (e.g., light-shock) formed in stage 2 to generate fear responses (freezing) when tested with A alone in stage 3. This integration could occur through chaining of the A-B and B-shock associations during testing with A (e.g., A-B-shock); or through formation of a mediated A-shock association during conditioning of B. Following previous work, we distinguished between these alternatives by blocking NMDA receptors (using micro-infusions of the antagonist, D-AP5) in a specific region of the medial temporal lobe, the perirhinal cortex (PRh), during stage 2 of the various protocols. We found that after just a few A-B pairings in stage 1, the D-AP5 infusion disrupted freezing to A but not B, consistent with integration through mediated learning; whereas after many A-B pairings in stage 1, the D-AP5 infusion no longer disrupted freezing to A or B, consistent with a shift in the mechanism of integration to chaining at test. Importantly, this shift only occurred when rats received the stage 1 information in a particular order (A-B rather than B-A pairings); and did not occur when the interval between stages 1 and 2 was increased from 24 hours (standard) to 14 days. Thus, the way that rats integrate experiences separated in time depends on their number, the ordering of specific stimulus elements, and the interval of time between the to-be-integrated experiences. These findings are discussed with respect to theories of integration and information processing in the medial temporal lobe.

10:30 - 11:30: SESSION 1
ISSUES OF TIME

Chair: Juan Manuel Rosas (University of Jaén)

This session explores how animals and humans process temporal information in decision-making tasks, focusing on timing, reward assignment, and control mechanisms in reversal and suboptimal choice paradigms.

Amplifying the credit assignment problem: can starlings parse the ephemeral reward task?

Guilherme Hoffmann, MsC (Aveiro University), Armando Machado, PhD (Aveiro University), Marco Vasconcelos, PhD (Aveiro University)

In the ephemeral reward task, subjects choose between two options, A and B. Choosing A yields an immediate reward and ends the trial. Choosing B also yields an immediate reward, but also makes A reappear alone, enabling a second reward before the trial ends. Surprisingly, many species fail to prefer the optimal option B (two rewards) over A (one reward), possibly due to a credit-assignment problem: the second reward may be difficult to associate with the now-absent B stimulus. Starlings, however, eventually solve this task after extensive training. The present study tested the credit-assignment hypothesis in starlings by modifying the task to disrupt their ability to associate

the second reward with the initial option. In this modified task, choosing B still produced the first reward, but after that, instead of A being presented alone, both A and B reappeared, though only A was rewarded. Since B was not rewarded at this second stage, we expected the association between B and the second reward to weaken. We found that most starlings quickly learned to choose A in the second stage, but remained indifferent during the initial choice, displaying strong side biases. Introducing single-option trials eliminated this bias and significantly increased optimal choice. These findings suggest that (1) starlings are able to discriminate between the two stages of each trial, and (2) although a second discrimination disrupts credit assignment to the initial choice, it does not fully prevent it.

Rethinking information-seeking behavior in the suboptimal choice task

Susana Vieira, MsC (Aveiro University), Armando Machado, PhD (Aveiro University), Marco Vasconcelos, PhD (Aveiro University)

Research has shown that starlings and pigeons sometimes exhibit suboptimal behavior by prioritizing information over food. When given a choice between Informative and Non-informative options, they consistently prefer the Informative option, even when it pays off with a lower probability (20% vs. 50%). The Informative option presents on 20% of the trials a stimulus that is always followed by food 10-s later (S+), and on 80% of the trials a stimulus that is never followed by food 10-s later (S-). In contrast, the Non-informative option presents S1 or S2 and each stimulus is followed 10-s later by food on 50% of the trials. To examine the value of the conditional stimuli (S+, S-, S1, and S2) in suboptimal choice, we conducted two experiments. In the first, starlings had to peck a response key to observe the stimuli. In the second, only S- and S2 were observable by pecking the key. Results showed that in the first experiment, preference for the Informative, suboptimal option remained strong. Moreover, the birds observed at a high rate in both options. In contrast, in the second experiment, when access to information was restricted most birds shifted their preference to the Non-informative option and pecked the observing key mostly in that option. Regardless, results were less clear at a group level, with preference for the suboptimal choice emerging in some birds. These findings suggest that the information-seeking hypothesis alone might not fully explain suboptimal choice, as the S- stimulus in the second experiment was informative yet actively avoided most of the time. Moreover, the individual differences in choice and observing response suggest the birds may trade-off information and nutrition benefits to different extents.

Scalar timing of schedule-induced drinking

Álvaro Mateos Romero, MS (UNED), Sergio Ramos Solís, MS (UNED), Marlon Palomino González, MS (UNED), Gabriela E. López Tolsa Gómez, PhD (UNED), Ricardo Pellón Suárez de Puga, PhD (UNED)

Two experiments are presented in which the temporal location of schedule-induced drinking in rats is shifted within the inter-reinforcement interval. The aim of the experiments is to test the scalar property – the proportional location of behaviours according to the interval duration – of schedule-induced drinking. Induced drinking is characterised by the presence of elevated water intake at the beginning of the interval and its development despite non-contingent reinforcer delivery. Many characteristics common to operant behaviour, however, have been demonstrated, being the scalar property an exception. In the first experiment, an attempt was made to displace schedule-induced drinking by applying lick-contingent unsignalled and signalled food delays during the early

portions of each inter-food interval. Results were not fully satisfactory. In the second experiment, drinking was prevented during those early portions of inter-reinforcement intervals. During subsequent phases, drinking was allowed and again prevented during those early portions, following a reversed BABA design. It was found that licking was proportionally displaced as a function of the length of the time of prevention but tended to occur at the beginning of the interval when it was not prevented. This proportional change seems to accommodate the scalar property, as drinking is organized around water accessibility periods, even when they were not at the beginning of inter-reinforcement intervals. Results suggest that behavior is reinforced to occur at specific moments in the time domain, thus sometimes an apparent absence of time control is observed. Keywords: schedule-induced drinking, scalar property, time schedules, rats.

Starlings in the midsession reversal task. temporal control under partial reinforcement.

Alejandra Salinas, MSc (University of Aveiro), Marco Vasconcelos, PhD (University of Aveiro), Armando Machado, PhD (University of Aveiro)

To investigate how animals adjust their behavior to changing reinforcement contingencies, we exposed starlings to a MidSession Reversal (MSR) task: For 96 trials, the birds chose between two options, S1 and S2, with choices of S1 rewarded during the first 48 trials and choices of S2 rewarded during the last 48 trials. Previous studies have shown that birds learn to choose S1 during the first trials, reverse their preference from S1 to S2 around midsession, and choose S2 during the last trials. They also have suggested that the preference reversal is cued either by local cues (choice outcomes as in a win-stay/lose-shift strategy) or global cues (time elapsed since the beginning of the session). The present study attempted to reduce the role of local cues to determine whether temporal cues would be strengthened. Twelve starlings were trained in an MSR task in which correct choices (of S1 up to trial 48, of S2 after trial 48) were rewarded with probability 0.33, and then they were tested with either shorter or longer intertrial intervals. Results showed the birds learned the task even with significantly lower reinforcement. Moreover, in the test sessions, they evinced strong temporal control. However, variability within and between subjects remained: If some starlings appeared to rely exclusively on temporal cues, others appeared to rely on choice outcomes cues (win-stay/lose shift strategy), and a few others behaved as if counting trials from session onset. The acquisition of stimulus control and how multiple cues jointly affect behavior remain to be elucidated.

Starlings in the midsession reversal task: unraveling temporal control by training and testing with equal reinforcement rate

Armando Machado, PhD (University of Aveiro)Alejandra Salinas, MS, (University of Aveiro)Marco Vasconcelos, PhD, (University of Aveiro)

A convenient framework to examine how animals adapt to changing contingencies, in particular the cues they use to anticipate the change, is the MidSession Reversal task. In discrete trial sessions, they learn a simultaneous discrimination involving two stimuli, S1 and S2. Choices of S1 are correct and reinforceable during the first half of a session, and choices of S2 are correct and reinforceable during the second half of a session. That is, contingencies reverse at midsession. We investigated whether preference reverses from S1 to S2 based on temporal cues (time-into-the-session), numerical cues (trial number), or response-outcome cues (reward and non-reward). Twelve starlings were trained on a new MSR task with variable intertrial intervals (ITI) and with reward probability of 1/3

for correct choices. Once the birds learned to reverse preference from S1 to S2 close to midsession, we tested them with a different ITI (half as long or twice as long), but with reinforcement rate held constant from training to testing. By reducing generalization decrement from training to testing we attempted to identify the cue(s) they used to switch preference. Results revealed that several birds switched based on time into the session. However, other birds relied on outcome cues, while others exhibited mixed strategies. These findings suggest that when trial density changes but the time rate of reinforcement remains constant, starlings increasingly rely on elapsed time to guide their preference reversal.

11:30 - 12:30:
POSTER SESSION 1

1: Acute stress attenuates the extinction of instrumental avoidance Acute stress attenuates the extinction of instrumental avoidance

Borja Nevado Bargados, MS (Universidad del Pais Vasco), Courteney T. L. Fisher, PhD (University of Nottingham), Gonzalo P. Urcelay, PhD (University of Nottingham)

Abstract: "This study assessed the effect of acute stress on extinction of avoidance learning. Forty-eight participants were assigned to either a control or acute stress groups (Stress participants learned that they had to prepare an unpleasant speech as in Sayette et al., 2001). Skin Conductance Responses (measured throughout the experiment) and State-Trait Anxiety Inventory (STAI, beginning vs. end) scores were taken to measure stress induction success. During the avoidance task participants were exposed to 3 different stimuli (10 trials each), 2 CS+ predicted the arrival of an annoying 95dB sound during conditioning (Unconditional Stimulus; US), and a CS- that was never associated with the US. Participants could avoid said sound by pressing "space" on their keyboard during the presence of the CSs+. During extinction, one of the CS+, and the CS- were presented again, 20 trials each, however the CS+ no longer predicted US arrival (untold to participants). Last, a test phase was introduced in which each stimulus was presented 2 times. Results showed that participants learned the contingencies during all phases of the experiment, and during training Stress participants tended to avoid at a lower rate than their Control counterparts. There was a significant difference between groups during extinction, in that there was an effect of extinction in the Control but not the Stress Group, but this effect did not persist during test. Finally, STAI scores and SCR differences between groups were not detected, suggesting that stress manipulation was either not effective or, at least, weak. "

2: Attention Toward Emotionally Conditioned Stimuli in the Dot-Probe Paradigm: The Role of CS–US Contingency

Lenin Moreno-Ríos, MS (University of Málaga), Alberto Megías-Robles, PhD (University of Málaga), David Luque, PhD (University of Málaga).

Abstract: Attention can be modulated by learned associations between stimuli and emotionally relevant consequences. In this context, the Dot-probe paradigm has been adapted to study how previously neutral stimuli acquire attentional control after being aversively conditioned. Most previous studies have employed perfect CS-US contingencies (the US follows the CS in 100% of the conditioning trials). Additionally, there has been an almost exclusive use of faces as emotional stimuli. These aspects seriously limit the generalizability of previous results. With the aim of addressing these limitations, we designed two studies using emotional scenes as USs. In the first study (n = 22), a classical Dot-probe task was employed to validate our protocol and identify those images that strongly bias attention. As expected, significantly shorter reaction times were obtained in trials congruent with the appearance of the emotional image compared to incongruent trials. In the second study (n = 33), we used the images that most strongly biased attention in the first study. The contingency of two CSs was manipulated to evaluate its effect on attention, such that one CS was associated with the appearance of the aversive image in 85.6% of the trials and with the neutral image in 14.4%, while the other CS was equally associated with both types of stimuli (50%). The stimulus with the higher CS-US contingency attracted significantly more attention, although this effect was observed only in the first half of the task, suggesting possible extinction or habituation effects. These results highlight the modulatory role of CS-US contingencies in attentional orienting and underscore the importance of accounting for temporal factors when analyzing these biases.

3: Changes in reinforcement magnitude result in changes in attention towards a compound stimuli

Roberto Jiménez-Castillo, PhD student (UNAM), Juan Pablo Martínez-Andrade, Bachelors Degree (UNAM), Hania Silva, PhD Student (UNAM), Javier Vila PhD (UNAM)

Abstract: A rise in prediction error occurs when there is a discrepancy between what is expected to happen and what occurs. Previous studies have found that increases in prediction error can alter attentional processes, including how contextual information is used or how attention is distributed across stimuli (Jiménez-Castillo et al., 2025; Ogallar et al., 2019). However, extinction is not the only condition that can produce a rise in prediction error; as a discrepancy-based mechanism, a reduction in the magnitude of the reinforcer can also produce this effect. This study explored the behavioral effects of decreasing reinforcer magnitude on prediction error and attention. Specifically, this manipulation may influence attentional phenomena such as overshadowing, in which one element of a compound stimulus receives more attention than another (Pavlov, 1927). Forty-eight participants were assigned to three groups and then completed a task in which they were required to respond to a specific. Reinforcement for his response had either a 1.0 or a 0.25 reinforcer value. In a later phase of the experiment, one of the groups received a reinforcer of reduced magnitude (1.0 to 0.25 reinforcer value) while the other groups remained constant (1.0 to 1.0 and 0.25 to 0.25, respectively). Additionally, all groups were trained with a compound stimulus (AX), whose individual components were presented separately during a test phase. Results showed that when the reinforcer magnitude remained constant, overshadowing was observed: component A elicited more responses than X. In contrast, when the reinforcer magnitude was reduced, both components elicited similar response levels, indicating an attenuation of overshadowing. These findings suggest that a decrease in reinforcer value can enhance prediction error and alter how attention is allocated among available stimuli. Attentional responses were measured both behaviorally and via eye-tracking.

4: Context-Related Behavioral Losses Are Linked to Increased Attention to Context and Cue in Virtual Reality

Paula S. Acero, MS (University of Jaén), Daniel Sierra-Gijón, MS (University of Jaén), Sofía M. Rosas-Aguado, BS (University of Jaén), Belén Gallardo, BS (University of Jaén), José E. Callejas-Aguilera, PhD (University of Jaén)

Abstract: Previous research suggests that interference treatments can alter attention allocation due to prediction error—the mismatch between expected and actual outcomes. This mechanism has been proposed to explain the context change effect observed in a well-established predictor (cue P) following the extinction of a separate cue (cue X), a phenomenon known as EMACS (Extinction Makes Acquisition Context-Specific). However, this explanation is potentially circular, as it relies on attention change to both explain and demonstrate the effect. To address this issue, the present study used eye-tracking as an independent behavioral index and indirect measure of attention. Participants engaged in a virtual reality task in which they acted as archaeologists searching for hidden treasures in naturalistic environments (e.g., forest or desert). The presence and location of the treasure on each trial were signaled by specific discriminative cues. Participants were required to learn when the treasure was available and then locate it. The experiment followed a 2 (Group: Extinction vs. No Extinction) × 2 (Test Context: Same vs. Different) EMACS design. Contrary to predictions, the extinction manipulation did not affect performance on either behavioral or attentional measures during testing. To further examine the link between attention and context-related behavior, participants were re-grouped based on whether they showed a change in time spent in the different versus same context during the test phase, irrespective of extinction treatment. Those who exhibited behavioral context sensitivity during the test also directed more attention to both the cue and the context in the last training trial. These findings suggest a relationship between context-switch effects on performance and attentional allocation to contextual and predictive cues. This research was funded by grant PID2023-149399NB-C21 from the Spanish Ministry of Science, Innovation and Universities.

5: Contextual Specificity and Habituation in an Invertebrate Model (Dendrobaena veneta) Under Psychoactive Substances: DOI and Methamphetamine

Roberto Álvarez, PhD (Universidad de Almería-CIBIS), Ana Belén Martínez, MS (Universidad de Almería), José David Moya (Universidad de Almería), Paula Ulloa (Universidad de Almería), Álvaro López-Villegas (Universidad de Almería) , Manuela Olmedo, MS (Universidad de Almería), Margarita Moreno, PhD (Universidad de Almería-CIBIS)

Abstract: Abstract The present study explores habituation and contextual specificity in the earthworm Dendrobaena veneta as an invertebrate model under the influence of psychoactive substances (DOI and methamphetamine). Three experiments were conducted, the first examined the dose-dependent effects of both DOI and methamphetamine on the locomotor response to tactile stimulation under an experimental paradigm, showing that methamphetamine sustainably alters the response, while DOI produces more transient effects. The second experiment analyzed habituation to a light stimulus, observing dose-dependent interference, especially with methamphetamine. The third experiment demonstrated context specificity in habituation, using drug absence or drug presence as

distinct contexts. A change of context reactivated the previously habituated response, supporting Wagner's SOP model of the modulatory role of context. These findings show that D. veneta discriminates contextual cues and that its associative learning is influenced by both internal and external variables, validating its use in comparative psychology as an alternative model to investigate basic processes of behavioral plasticity and the psychopharmacological effects of different types of psychoactive substances Key words: Dendrobaena veneta, earthworm, habituation, associative learning, contextual specificity, DOI, methamphetamine, invertebrates.

6: Effect of an extinction cue on ABA renewal of instrumental responding in humans

A. Matías Gámez, PhD (Universidad de Córdoba, Spain), Juan Bravo, Student (Universidad de Córdoba, Spain), Rodolfo Bernal-Gamboa, PhD (Universidad Nacional Autónoma de México)

Abstract: The number of studies investigating the effects of extinction cues (ecues) on the recovery of previously extinguished responses has increased in recent years. However, in human instrumental conditioning, this effect has yet to be tested in ABA and ABC renewal paradigms. To address this gap, we conducted an experiment in which two groups of participants were tasked with shooting to destroy tanks and planes in two contexts (A: R1–O1; B: R2–O2). In a subsequent extinction phase, participants in both groups could perform each response in the alternate context, but neither response produced the destruction of the corresponding enemy (B: R1–; A: R2–). Additionally, during all extinction trials in context B, an ecue (a blue rectangle) was presented. In the test phase, participants were allowed to perform R1 and R2 in the original acquisition contexts. For the ABAcue group, the ecue was presented in context A, whereas the ABA group received a novel cue in that context. The results showed a higher response rate for R1 in the ABA group compared to the ABAcue group. Moreover, within-group comparisons revealed that only in the ABAcue group was the response rate for R2 (whose context lacked the ecue) significantly higher than that for R1.

7: Modification of Driving Behavior Through an Emotional Content-Based Intervention

María Ángeles Ramos-Moreno, PhD (University of Málaga), Lenin Moreno-Ríos, MS (University of Málaga), Alberto Megías-Robles, PhD (University of Málaga).

Abstract: Decision-making while driving is dependent on risk perception, which is strongly influenced by both contextual and emotional factors. To enhance drivers' awareness of potential hazards, road safety interventions often employ mass media campaigns featuring emotionally charged depictions of traffic accidents. Despite their prevalence, the effectiveness of fear-based interventions remains controversial, as empirical findings are mixed and inconclusive. The present study experimentally investigated how exposure to crash-related audiovisual content affects drivers' subjective risk perception across various driving scenarios. A total of 56 drivers participated (mean age = 21.04; 36 women), randomly assigned in equal numbers to an experimental group and a control group. Participants in the experimental group were exposed to videos depicting traffic crashes, whereas those in the control group viewed emotionally neutral content. Subjective risk perception was assessed before and after video exposure by having participants rate the perceived risk of several driving scenarios. A repeated-measures ANOVA was conducted on perceived risk ratings, with Group (experimental vs. control), Time (pre vs. post), and Scenario Risk Level (low, medium, high) as within- and between-subjects factors. The analysis revealed significant main effects of Group ($p < .01$), Time ($p < .05$) and Risk Level ($p < .001$), as well as a significant Group × Time interaction ($p < .05$). In the experimental group, perceived risk ratings increased significantly following exposure to the videos ($p < .05$), whereas no significant change was observed in the control group ($p > .05$). These findings suggest that exposure to crash-related audiovisual content can significantly increase drivers' perceived risk in traffic scenarios.

8: Examining the effect of expected and unexpected uncertainty on cue processing during human associative learning

Clara Muniz-Diez, PhD (Lancaster University), Sandra Lagator, PhD (University of Nottingham), Mark Haselgrove, PhD (University of Nottingham), Tom Beesley, PhD (Lancaster University)

Abstract: In humans, there is evidence that uncertain cues receive more attention than certain cues (Beesley et al., 2015). However, this higher attention does not translate to better learning with these cues (Easdale et al., 2019; Torrent-Rodas et al., 2023). This finding is problematic for the view that higher attention promotes better cue processing. Here we present a series of experiments in which the recognition memory of the cues is tested as a proxy for cue processing (using a forced-choice recognition memory test), after training with the discrimination AX-O1, AY-O1, BX-O2, BY-O2. This design allows us to manipulate both predictiveness and uncertainty within the same experiment: cues A and B are predictive of the outcome, whereas cues X and Y are non predictive. Uncertainty is manipulated by varying, between subjects, the contingency of predictive cues with their respective outcomes: $p = 1$ for subjects that received certain training and $p = .8$ for uncertain training. Furthermore, the expectancy of uncertainty is manipulated by varying the moment in training that the uncertain contingencies are

introduced. Here we present the results of this manipulation and discuss them in the light of attentional theories of associative learning.

9: Neural signature of spatial memory in the hippocampus of homing pigeons

Marie Ziegler, Guillermo Hidalgo Gadea, John Tuff, Masahiro Inda, Roland Pusch, Tobias Otto, Jonas Rose, Onur Güntürkün, Noemi Rook (Ruhr-University Bochum: All authors)

Abstract: Spatial cognition is a field of research that investigates the basis of human and animal navigation and orientation. Many animals possess excellent spatial abilities like homing and migration that can be found across the animal kingdom. The hippocampus is an essential brain area for memory formation and spatial cognition in both mammals and birds, which has been shown physiologically in the form of place and head-direction cells as well as functionally through for example ablation studies. However, in contrast to mammals, the precise pattern of hippocampal spatial processing is still rather unknown for birds, especially pigeons. To gain deeper insights into the neuronal signature of spatial memory in pigeons, we conducted a spatial discrimination task (experimental group) and a feature-based discrimination task (control group) in a hexagonal area to investigate learning behavior as well as the underlying neuronal activation patterns using immediate early genes. Moreover, we quantified nitric oxide and doublecortin in both groups, which are two other neurochemical markers that have been associated with spatial learning in mammals. Overall, we found task-related differences in the speed of learning the respective tasks furthermore DeepLabCut analysis revealed differences in locomotion strategies. Additionally, we found differences in hippocampal expression profiles of ZENK and DCX between the experimental (spatial discrimination) and control (feature-based discrimination) groups but only in specific hippocampal subdivisions. It can thus be concluded that spatial learning is processed in specific subareas of the pigeon hippocampus as well as that it leads to an increase of neuronal recruitment.

10: Impact of a retention interval on the renewal and reinstatement of instrumental behaviors in a choice procedure with differential outcomes

Livia Sánchez Carrasco PhD, (Universidad Nacional Autónoma de México)

Abstract: To evaluate the effect of outcome representation on renewal and outcome-selective reinstatement, we designed an experiment in which we introduced a retention interval at two distinct points during the acquisition phase (recency and primacy). In the recency group, on the fifth day of the acquisition phase, we introduced a retention interval of 6 days. While in the primacy group, we insert the retention interval at the end of the acquisition phase. Thirty-two Wistar rats were used and trained in a choice procedure. We used a reinforcement schedule that distributed reinforcements probabilistically between two response levers. During the acquisition phase, the percentage of reinforcers delivered for Response 1 was 90%, while Response 2 received the remaining 10%. Each of the responses was paired in a counterbalanced manner with either a pellet or cherry-flavored liquid sucrose as the outcome. Response 1 was extinguished during the extinction phase, while the other was reinforced under a VI 240 s schedule. Afterward, subjects were exposed to acquisition and extinction contexts during the test sessions while the extinction conditions were maintained. In the restatement test, subjects were reexposed in two different sessions to the two outcomes used during the acquisition phase. The effect of the retention interval on the recovery of instrumental behavior was evaluated.

11: Investigating Prediction Error in Human Fear Learning: Asymmetrical Effects of the Presence and Omission of Aversive Stimulation

Amin Jahani, MSc (Philipps-Universität Marburg) & Metin Üngör, PhD (Philipps-Universität Marburg)

Abstract: The ability to predict dangerous events is fundamental for survival in an ever-changing environment. Influential theories of associative learning adopt a so-called common error term to calculate prediction errors that drive learning. Common error term models predict that stimuli that occur together when followed by another event (e.g., aversive stimulation) will undergo equal changes in associative strengths. In each of two human fear learning experiments, participants learned about a compound stimulus consisting of two elements: one previously paired with an aversive outcome and the other with its absence. In Experiment 1, in which the compound stimulus was followed by the aversive outcome, we observed equal changes in associative strengths for the two elements, in accordance with common error term models. However, in Experiment 2, in which the compound stimulus was not followed by aversive stimulation, our results revealed unequal changes in associative strengths, with a larger change being observed for the element with a higher individual prediction error. We discuss our findings in the context of models that incorporate a hybrid approach to error term computation, combining common and individual errors. We also consider alternative theories that propose changes in the amount of attention paid to cues as a result of learning.

12: The discrepancy between associative strengths of single stimuli as a predictor of the magnitude of the latent inhibition effect

Juan José Hidalgo, PhD student (UNED), Sergio Ramos, PhD student (UNED), Cristina Orgaz, PhD (UNED), Pedro R. Montoro, PhD (UNED) and Ricardo Pellón, PhD (UNED)

Abstract: Latent inhibition is a phenomenon first described by Lubow and Moore (1959), which shows that prior exposure to a stimulus delays subsequent conditioned responding involving that stimulus. One of the current models that tries to explain the phenomenon is the Hall-Rodriguez model (Hall & Rodriguez, 2010), that combines attentional and associative processes. The model attributes to the preexposed stimulus some inhibitory characteristics, which explain latent inhibition as a decrease in the expression of an excitatory association and a deficit in acquiring associative strength. This research tests one of the hypotheses inferred form the model, namely, that a preexposed stimulus paired with an excitatory stimulus (Group 1) should acquire greater inhibitory weight than if paired with a neutral stimulus (Group 2), resulting therefore in a greater delay in subsequent learned acquisition and response expression in the former condition (i.e. increasing the latent inhibition effect). A control Group 3 should receive no preexposure phase. This is tested in an experimental task with rats, with visual (light) and auditory stimuli (tone), in which magazine entries were measured and compared between the three groups which have gone through the previously mentioned conditions. Results showed no significant differences between magazine entries of the three groups. However, the trends were in the opposite direction to those predicted from the theory. Despite this, it cannot be concluded that the model fails in its predictions. For this reason, further studies should be carried out in order to compare the different methodologies used in the study of the latent inhibition phenomenon and to establish strict controls on the conditions and stimuli used.

13: The effects of working memory load on attention and associative learning under uncertainty

Michelle Kan, MSc (Lancaster University), Tom Beesley, PhD (Lancaster University), Amy Atkinson, PhD (Lancaster University), Mark Hurlstone, PhD (Lancaster University)

Abstract: Previous research has found that in a stable associative learning environment, humans selectively attend to reliable cues whilst suppressing attention towards unreliable cues. However, in an uncertain and unpredictable learning environment, heightened attention towards both reliable and unreliable cues has been observed (e.g., Beesley, Nguyen, Pearson, & Le Pelley, 2015). It has been suggested that the latter attentional behaviour reflects information-seeking whereby people attempt to reduce the uncertainty experienced. However, studies have found that this heightened attention does not appear to facilitate learning, demonstrating an incomplete explanation for this behaviour. Previous research found that uncertainty monitoring can place considerable demands on working memory resources (e.g., Coutinho et al., 2015). Therefore, it may be important to consider the role of working memory. Attentional Load Theory (e.g., Lavie, 2004) suggests that high working memory load can lead to poor attentional control (i.e., greater distractor interference; slower target detection). However, it is currently unclear how the availability of learners' working memory resources interacts with the uncertainty of a learning environment to affect attention and learning. In a dual-task eye-tracking experiment, load was manipulated within-subjects with a secondary task. Participants were asked to perform either a short-term memory (digit-recall) or a working-memory task (serial-subtraction) during the primary associative learning task. To manipulate uncertainty, participants were presented with either deterministic (certain) or probabilistic (uncertain) associative relationships. *I will present preliminary behavioural and eye-gaze data that provide insights into how working memory load affects attention and learning under uncertainty.

14: The role of context in invertebrate learning

Gonzalo P. Urcelay, PhD (University of Nottingham), Roberto Álvarez, PhD (Universidad de Almería), Ignacio Loy, PhD (Universidad de Oviedo), Judit Muñiz-Moreno, PhD (Universidad de Oviedo), Jose Prados, PhD (University of Derby), Concepción Paredes-Olay, PhD (Universidad de Jaén),

Abstract: Over the last decades, research on associative learning has revealed that contextual cues play a key role in learning. In Pavlovian conditioning, for example, context refers to the set of environmental (i.e., external) and internal cues present during conditioning that are distinct from both the conditioned stimulus (CS) and the unconditioned stimulus (US). Contexts can influence learning and memory processes by modulating, signalling, or directly participating in the associative structure that results from the learning episode. The context can, therefore, be used by animals in a conditioning experiment in the same way as any discrete stimuli typically used as CSs (lights or tones). This is obvious in phenomena like long-term habituation or latent inhibition. Alternatively, contexts can also act as a modulator, either by controlling the expression of CS-US associations acquired within that context—that is, as an occasion setter—or as a memory retrieval cue as suggested by interference paradigms in extinction learning. A potentially different role of contextual cues is observed in navigation, where landmarks or directional cues guide spatial learning. The multiple roles the contextual cues can adopt indicate the context is an

omnipresent element in learning situations whose role is shaped by the specific conditions under which learning occurs. From a comparative perspective, little is known about the distribution of these functions across phylogeny, in particular in invertebrate species. The goal of this project is to extend the investigation of the roles of context to invertebrate species, to better understand the role it has played in the evolution of adaptive behaviour across phylogeny. The work we present here provides a review of studies involving invertebrate phyla (arthropods, molluscs, porifera, cnidarians, platyhelminths, and nematodes), in which contexts are directly or indirectly implicated in some capacity during learning.

12:30 - 14:30:
INVITED SYMPOSIUM: Associative Learning Going Forward

Introduction

James Byron Nelson (University of the Basque Country UPV/EHU)

Scotomas, Necker Cubes, and Associative Learning

Peter Balsam, PhD (Barnard College & Columbia University)

Individuals construe situations differently. The same individual can construe the same situation in different ways at different times. Our formal theories typically assume that there is one "true" way in which experiences are construed. In the case of associative learning theories, it is assumed that animals construe the world as a series of discrete events (e.g. A conditioned stimulus is paired with an unconditioned stimulus). Other theories assume that the temporal structure of experience guides behavior (e.g. Conditioned responding is based on rates of reward). Our experiments demonstrate that subjects do not always construe the world in the same way as experimenters and theorists. Additionally, how subjects construe an associative learning experiment is flexible and dependent on experience.

What type of behaviour is it? Evaluating the contribution of multiple learned associations to behavioural control.

Laura Corbit, PhD (University of Toronto)

Much research has attempted to classify behaviour into categories (S-S vs. S-R, goal-directed vs. habitual) and then explore which brain regions support different types of learning. While this has contributed significantly to our understanding of the types of associations that are learned and favored under different conditions, tests that identify one, versus another type of association are often interpreted in an all or none fashion (the behaviour is goal-directed) even when effects are incomplete. Whether implicitly, or explicitly there is an idea that when multiple associations are learned, they compete for behavioural control (e.g., actions vs. habits, acquisition vs. extinction memories) yet how this competition occurs and determines what behaviour is expressed is not well understood. In this talk I will discuss evidence for multiple associations that contribute to goal-directed and habitual performance, complexities in interpreting insensitivity to outcome devaluation, additional ways of measuring habit strength, and how neuroscience approaches may complement behavioural tests for assessing the

contribution of multiple parallel or competing processes and identifying strengths as well as deficits in different systems.

Processing of innate and learned sources of danger in the basolateral amygdala complex and prelimbic cortex.

Nathan Holmes, PhD (University of New South Wales)

Rats quickly learn to fear a stimulus (e.g., a light) that signals brief but painful foot-shock. The acquisition of this so-called first-order conditioned fear requires neuronal activity in the basolateral amygdala complex (BLA) and its consolidation requires de novo protein synthesis in the BLA. Rats also learn to fear new associates of a first-order conditioned stimulus such as a sound paired with the already-conditioned light. The acquisition of this so-called second-order conditioned fear also requires activity in the BLA but its consolidation occurs independently of protein synthesis in this region of the brain. Here, we investigated whether the protein synthesis-requirement for consolidation of second-order fear resides in a part of the circuitry that retrieves/expresses first-order fear, the prelimbic cortex (PL). We did so following evidence provided by Rescorla and others that, while first-order fear is typically taken to reflect an S-S association of some sort between the presented stimuli, second-order fear reflects an S-R association between the new stimulus and fear state/responses evoked by the animal. In each experiment, rats received light-shock pairings in stage 1 to establish first-order fear of the light (measured in freezing) and sound-light pairings in stage 2 to establish second-order fear of the sound. Using pharmacological manipulations, the initial experiments showed that acquisition of second-order fear to the sound is disrupted by a PL infusion of the NMDA receptor antagonist, DAP5. Subsequent experiments then showed that the consolidation of this fear is disrupted by chemogenetic inactivation of projections from BLA-to-PL or PL-to-BLA; and a PL infusion of the protein synthesis inhibitor, cycloheximide. Together, these results show that the consolidation of second-order fear depends on PL-BLA communication and requires de novo protein synthesis in the PL. More importantly, the results show that the neural substrates of second-order fear differ from those of the more commonly studied first-order fear. These differences will be discussed with respect to theories of learning and memory.

Some Empirical and Theoretical Challenges for Associative Theories

Andrew Delamater, PhD (City University of New York)

Current advances in AI impressively have shown how far complex connectionist networks can go towards producing a wealth of information in a matter of just a few moments. Associative theorists have, mostly implicitly, operated with the presumption that elaborated associative networks could, in principle, provide a realistic model of how the mind and brain works in both simple and rather complex learning situations. Current associative theories, however, have fallen short in several research domains towards helping some behavioral scientists, comparative psychologists, and neuroscientists understand why our models can help move these disciplines forward. For example, comparative psychologists often attempt to show that "it's more than just associative," neuroscientists often don't see a need for psychology-level analyses at all opting for purely bottom-up approaches instead, and some behavioral scientists feel connectionist models miss important aspects of information processing. In this talk I'd like to sample a few different research domains (on time, number, action/habit learning, and, possibly also, category learning) illustrating the kinds of empirical and theoretical challenges these pose for

14

associative modeling, while at the same time I suggest that if we can find adequate solutions to these challenges, they can have strong implications for future advancements in these various disciplines.

Discussion and Questions

14:30 - 16:00:
LUNCH

Lunch

Lunch in the Hotel Costa Vasca

Lunch in the Hotel Costa Vasca begins at 14:30. Sessions resume at 16:00 in Miramar Palace.

16:00 - 17:00: SESSION 2
PERCEPTUAL LEARNING, REPRESENTATION, AND ATTENTION

Chair: Isabela de Brugada (University of Granada)

This group of talks investigates the formation, accuracy, and modulation of internal representations, with an emphasis on salience, uncertainty, compulsive behavior, and associative learning mechanisms.

Effectiveness and loss of salience of unique elements after extensive intermixed pre-exposure to ax and bx in taste aversion.

Celia Gordón, PhD (Universitat de Barcelona) Antonio A. Artigas, PhD (Universitat de Barcelona)

In a first experiment after the extended pre-exposure to AX and BX in an Intermixed or Blocked schedule, Intermixed group showed conditioning resistance, or, in other words, a latent inhibition effect when the unique (A) or common (X) element was conditioned. In a second experiment, several groups of rats were given different pre-exposure lengths to AX and BX under the same two conditions. After pre-exposure all rats were given a taste aversion conditioning with a new compound AN, formed by the unique element A and a new flavor N. Then a test of preference with A and N was presented. The results showed a higher percentage consumption of A in the intermixed than in the blocked group, but only between the long pre-exposure conditions. We discuss the results by suggesting that differential representations of the stimuli are formed throughout the long conditions: well-formed elemental representations of A, B, and X, during the Intermixed pre-exposure; and configurational-like representations of the AX and BX compounds during the Blocked pre-exposure. As a consequence, we expect that the unique element A will show a lack of salience larger in the Intermixed than in the Blocked group. We discuss the results from this approach.

Examining the acquisition of new associations following conditions of uncertainty

Tom Beesley (Lancaster University), Clara Muniz-Diez (Lancaster University), Mark Haselgrove (University of Nottingham), Sandra Lagator (University of Nottingham)

It is well established that uncertainty (learning probabilistic associations) promotes high levels of attention to cues during human associative learning (e.g., Beesley et al., 2015; Torrents-Rodas et al., 2023). Despite evidence that this leads to an enhancement of the processing of stimuli under uncertainty, there is little evidence that uncertainty leads to a higher "associability" for cues, with the learning of new associations often occurring at a slower rate following a period of uncertainty (e.g., Easdale et al. 2019). In the current experiment we explored a novel design in which participants could learn the relevance of a previously non-predictive cue following training conditions that varied in their certainty/uncertainty. We found that associations for the previously non-predictive cues were acquired at a faster rate for those participants that had experienced uncertain conditions. The results are discussed in the context of predictions from formal models of associative learning.

Investigating the role of 5-ht2a receptor activation in compulsive drinking, cognitive flexibility, and decision-making in rats

Álvaro López-Villegas, PhD candidate (Universidad de Almería);Nerea Ríos-Nieto, MS (Universidad de Almería);Manuela Olmedo-Córdoba, PhD candidate (Universidad de Almería);José Miguel Rosales-Pérez, BSc candidate (Universidad de Almería);Elena Martín-González, PhD in Psychology (Universidad de Castellón);Margarita Moreno-Montoya, Full Professor (Universidad de Almería).

Compulsivity is common in psychiatric disorders, linked to reduced cognitive flexibility and impaired decision-making; understanding serotonergic $5\text{-HT}_2\text{A}$ receptor mechanisms is vital for targeted therapies. Objectives: We evaluated DOI (2,5-dimethoxy-4-iodoamphetamine), a $5\text{-HT}_2\text{A}$ agonist, on compulsivity, cognitive flexibility, and decision-making in rats. Methods: In Experiment 1, rats (N = 48) underwent Schedule-Induced Polydipsia over 20 days to classify high- and low-drinkers; on day 21 they received DOI (2 or 8 mg/kg) with behavioral assessments at 2, 24, 48, 72, 96, and 120 h post-injection. In Experiment 2, lower DOI doses (0.25, 0.5, 1 mg/kg) were tested in Probabilistic Reversal Learning, with subjects stratified post hoc by perseverative errors. In Experiment 3, the same dosing regimen was used in a rat Gambling Task, classifying animals as risk-averse or risk-prone; sample sizes ranged from 18 to 48. Results: DOI modulated compulsive drinking, improved cognitive flexibility, and altered risk-based decision-making in a dose- and phenotype-dependent manner. Conclusion: These findings highlight the complex modulation of compulsivity, flexibility, and decision-making by $5\text{-HT}_2\text{A}$ receptor activation and underscore the need to optimize dosing parameters and behavioral contexts for psychedelic-based therapies.

Mechanisms underlying the accuracy of stimulus representations: within-event learning and outcome mediation.

Mark Haselgrove, PhD (University of Nottingham), Sandra Lagator, PhD (University of Nottingham), Clara Muñiz-Diez, PhD (Lancaster University), Tom Beesley PhD, (Lancaster University.

Valid predictors of an outcome attract more attention than stimuli which are nonpredictive (Le Pelley, Beesley & Griffiths, 2011; Mackintosh, 1975). Two experiments with human participants investigated whether predictive validity resulted in the establishment of a more accurate stimulus representation, in which accuracy was defined and measured as the strength of associations between different elements of a compound stimulus (Hebb, 1949; McLaren & Mackintosh, 2000). In Experiment 1, pairs of stimuli were established as outcome predictive (always followed by the same outcome) and presented in conjunction with nonpredictive pairs of stimuli (equally likely to be followed by two different outcomes). Subsequent test trials revealed that recognition for the pairings of the predictive stimuli was more accurate than the nonpredictive stimuli. Experiment 2 reproduced this effect, and also demonstrated that the superior performance to the predictive stimuli over the nonpredictive stimuli was only evident when, at test, the choice stimuli had predicted different outcomes during training. These results are interpreted as the consequence of two pathways to accurate stimulus representation: direct (within-compound associations) and indirect (mediated through the activation of the outcome) and are discussed in the context of attentional and non-attentional theories of associative learning.

Saliencia diferencial de los elementos únicos (a vs. c) según las condiciones de preexposición a los compuestos xa, xb, yc, en una tarea acustica con humanos. [Differential salience of unique elements (a vs. c) due to different preexposure conditions to compound stimuli xa, xb, yc. in an acoustic task with humans]

Antonio A Artigas, PhD (Universitat de Barcelona; Institut Neurociències UB), Pedro J Ramos, PhD (Universitat de Barcelona; Institut Neurociències UB), Jose Prados, PhD (University of Derby)

Siguiendo con una serie de experimentos donde participantes humanos son preexpuestos alternadamente a tres estímulos acústicos compuestos (dos de los cuales, XA y XB, comparten la característica común X, y un tercero YC no), después de una tarea de categorización con dos estímulos acústicos novedosos (cada uno asociado a una de dos categorías ficticias: Azul o Blanca), los participantes realizan una prueba de sumación en la que los componentes únicos A o C se presentan junto con los estímulos de aprendizaje de categorización. En dos nuevos experimentos donde los estímulos que forman los compuestos (XA, XB, YC) se presentan simultáneamente y durante la fase de prueba los estímulos en el ensayo de sumación se presentan secuencialmente, observamos que, si la duración de la fase de preexposición era relativamente corta, la saliencia del elemento único A es mayor que la del único C, pero al extender la duración de la fase preexposición observamos el efecto contrario, una menor saliencia de A en comparación a C. Discutimos estos hallazgos a partir de la hipótesis de la representación diferencial del aprendizaje perceptivo propuesta en nuestro laboratorio (ver Ballesta et al., 2021).

17:00 - 18:00: FOCUS SESSION 1
NEW INSIGHTS ABOUT SENSITIZATION

These talks explore the processes of sensitization, from Pavlovian conditioning to neurobiological substrates like the thalamus and long-term memory mechanisms in simple organisms.

Pavlovian sensitization

Michael S Fanselow, PhD. (University of California, Los Angeles)

Traditionally, Pavlovian conditioning is said to consist of an association between a neutral stimulus (CS) and a biologically impactful one (US) that leads to a novel response to the CS (CR). Experimental approaches require the use of control groups to rule out sensitization to ensure that the novel response is a true CR. Recently, Domjan and I (2024) argued that a significant portion of the responding to CSs is not a specific response, but a form of sensitization termed Pavlovian Sensitization. This form of sensitization depends on associative learning between CS and US. However, the CS activates a sensitized state that is specific to the functional behavior system appropriate to the US. For example, defensive behavior in the case of a threatening US. In that CS-induced sensitized state, any stimulus will activate functionally appropriate responses from that behavior system regardless of prior experience with the eliciting stimulus. Most demonstrations of Pavlovian sensitization test a novel stimulus in the presence of the CS. For example, in Domjan's work a contextual CS associated with reproductive activity of quail will promote the quail's mounting of a partial model of a quail's body. I will discuss several examples of this form of sensitization primarily from the defensive behavior system. However, I will also suggest that what has often been presented in the literature as a traditional CR is actually a sensitized response to the CS. For example, an auditory CS associated with shock will promote both a traditional CR (freezing) and a darting response that is a sensitized response to the CS. I conclude that behavior reflects a complex interaction between traditional CRs, Pavlovian sensitization and habituation and much of the adaptive importance of Pavlovian conditioning stems from this interaction. This interaction also has important implications for the choice of control groups in conditioning experiments.

Paraventricular thalamus hyperactivity mediates stress-induced sensitization of unlearned fear but not stress-enhanced fear learning (sefl)

(ONLINE) Kenji Nishimura (University of Texas at Austin), Denisse Paredes (University of Texas at Austin), Dhruv Aggarwal (University of Texas at Austin), Michael Drew(University of Texas at Austin)

Exposure to footshock stress can sensitize future fear learning, as is modeled in the Stress-enhanced fear learning (SEFL) paradigm, as well as unlearned fear responses. Much research on fear sensitization has focused on SEFL. Less is known about the neural mechanisms through which unlearned fear becomes sensitized. Here, investigated the neural mechanisms for sensitization of unlearned fear responses using a paradigm we termed Stress Enhanced Fear Responding (SEFR). In this model, mice exposed to a single session of footshock stress exhibit enhanced freezing to a novel tone stimulus. To investigate brain regions that might mediate SEFR, we first used cfos mapping to identify neural activity changes associated with stress-induced enhancement of unlearned fear. Our cfos screen

identified several limbic regions that were persistently hyperactive after footshock stress. Within those regions, only cfos expression in paraventricular thalamus (PVT) correlated with behavioral expression of SEFR. Next, using fiber photometry, we confirmed that PVT responses to the novel tone in our SEFR paradigm were enhanced in stressed mice. Using a chemogenetic approach to inhibit PVT neuronal activity, we found that the PVT activity was necessary during stress to induce SEFR and was also necessary for subsequent behavioral expression of SEFR. Conversely, chemogenetic excitation of the PVT in stress-naive mice was sufficient to recapitulate SEFR. Interestingly, PVT inhibition or stimulation did not affect acquisition or expression of SEFL. In conclusion, our results indicate that sensitization of fear learning (SEFL) and sensitization of unlearned fear (SEFR) have distinct neural mechanisms. Our results further identify PVT hyperactivity as a mechanism for stress-induced sensitization of unlearned fear.

Testing dual process theory

Catharine Rankin PhD (University of British Columbia), Alex Yu, MS (University of British Columbia)

The Dual-Process Theory (DPT) by Groves & Thompson (1970) is a theory that posits the nature of, and relationship between the non-associative forms of learning, habituation, dishabituation and sensitization. The DPT takes the position that habituation occurs in specific stimulus-response pathways, while sensitization affects the entire organism. Our lab challenges this with research on Caenorhabditis elegans, utilizing its gene expression tools and mapped connectome. The development of the multi-worm tracker enabled the study of habituation in >500 worm strains with nervous system gene mutations, revealing that three response components—probability, duration, and speed—are differentially influenced by these mutations. This led to the hypothesis that habituation mechanisms are not universal across the entire S-R pathway, but rather specific to each response component. Supporting this, our findings show that genes cmk-1 and ogt-1 mediate habituation duration and speed independently. We have also explored sensitization and dishabituation mechanisms in over 50 strains of worms with mutations in a variety of neuropeptide and catecholamine genes and have found that mutations in some genes selectively eliminate sensitization or dishabituation of specific components (probability, duration, speed) of the response. This supports the position that sensitization and dishabituation are not the same process. We also have evidence that dishabituation or sensitization can occur in a single component of the response rather than organism wide. Thus, some of our data supports the DPT and some of our data is not consistent with the theory. Based on our work sensitization does not always appear to be an organism-wide phenomenon and we may need to consider more than one type of sensitization; i. e. a circuit specific response component form of sensitization or dishabituation as well as an organism-wide sensitization.

What makes an experience unforgettable? extensive training diminishes forgetting of sensitization in aplysia while narrowing the transcriptional response to learning

Robert J. Calin-Jageman, PhD (Dominican University) & Irina E. Calin-Jageman (Dominican University)

Forgetting remains a key puzzle in the neurobiology of memory. One mysterious aspect of forgetting is its selectivity: most long-term memories are "forgotten", becoming less accessible over time; extensive training, though, can produce long-term memories that are readily accessible for a lifetime. What is the molecular basis by

which some memories become resistant to forgetting? To explore this issue, we have tracked changes in neuronal gene expression following forgettable and unforgettable forms of long-term sensitization in Aplysia californica. We re-confirmed a robust training effect in this learning paradigm: a 1-day training protocol produced a long-term sensitization memory fully forgotten within 1 week; a 4-day training protocol produced long-term sensitization memory stably expressed for weeks. We then used microarray and qPCR to characterize transcriptional states 1, 5 and 7 days after training. Surprisingly, we found that extensive training is associated with a narrowing of the transcriptional response: the first round of training produced clear regulation of over 1,000 transcripts, but by the fourth round of training most of these had significantly declined and only 80 transcripts remained clearly regulated. In addition, both forgettable and unforgettable forms of sensitization produced relatively few lasting transcriptional changes, with only a few transcripts clearly regulated more than 5 days after training. Our results raise multiple intriguing possibilities about the nature of forgetting, including the possibility that initial learning activates a mixture of both encoding and forgetting processes, with extensive training serving primarily to de-active forgetting.

Discussion

20 Min Discussion

Questions and discussion of the session.

07:45 -
SOCIAL EVENT

Reception at the San Sebastian Council House

All registered attendants and their accompanying persons.

(see map at the end of the program)

Thursday, October 2, 2025

09:00 - 10:00:
INVITED ADDRESS

Taste learning and brain plasticity

Milagros Gallo, PhD (University of Granda)

Since the discovery of conditioned taste aversion, taste learning has decisively contributed to advancing the learning theory and improving the understanding of the processes involved in learning phenomena. At present, taste learning offers a window into the interaction between cognitive, emotional and reward brain networks. From

a developmental perspective, taste learning also offers an excellent opportunity to study experience-dependent brain plasticity over the life span.

For the last decade, research in our lab has focused on taste neophobia and its attenuation because it is an important factor determining taste likes and dislikes that critically influence diet selection contributing to health or disease. Recognizing a taste as familiar and safe depends on a complex interplay of brain circuits involved in memory, emotion, and reward. Lesion, inmunohistochemical, pharmacological and pharmacogenetic studies indicate the relevant role of the perirhinal cortex (PRC), medial prefrontal cortex (mPFC), basolateral amygdala(BLA) and accumbens nucleus (NAcb) as well as hippocampal (HC) modulation. Studies performed in adolescent, adult and aged rats by applying exposures to a cider vinegar solution will be reviewed. The results indicate that both adolescence and aging are marked by pronounced functional reorganization of a dopaminergic corticolimbic network that relays on reciprocal inhibitory interactions between the reward system and the amygdala. As a result, we found altered brain activity patterns inconsistent with the conventional views of adolescence and aging. This might impact on the current hypothesis on late developmental plasticity. In addition, recent results using EWAS identify changes in microRNA expression that yield new light on the epigenetic mechanisms mediating the long-term brain and behavioral impact of typical adolescent behaviors such as alcohol consumption. In all, recognizing a taste as familiar and safe relies in the interplay of the brain circuits involved in memory, emotion, and reward evolving as the result of plastic adaptations.

10:00 – 11:00: SESSION 3
EXTINCTION AND BEHAVIORAL PERSISTENCE

Chair: James Byron Nelson (University of the Basque Country (UPV/EHU))

This session addresses how extinction learning operates under different biological and contextual conditions, with implications for addiction, development, and sex differences.

Could lactate represent a novel therapeutic strategy to enhance extinction processes and prevent relapse in cocaine addiction?

Elisa Marín-Sampietro, PhD student (Universitat Jaume I) Pau Llopis Baterno, MS (Universitat Jaume I), Carlos Alba Hernández, MS (Universitat Jaume I), Sonia Sales-Julián, MS (Universitat Jaume I), Raúl Pastor, PhD (Universitat Jaume I), Marta Miquel, PhD, Margarita Moreno, PhD, (Universidad de Almeria) (Universitat Jaume I), Pilar Flores PhD (Universidad Almeria), Laura Font, PhD (Universitat Jaume I)

Addiction is a neurobiological disorder marked by compulsive drug use, loss of control, and relapse. Drugs of abuse induce persistent neuroplastic changes, leading to the formation of pathological memories influencing behavior and adaptive decision-making. Environmental cues linked to drug use trigger craving by activating these memories. Lactate produced by astrocytes and transferred to neurons is a key mediator of synaptic plasticity underlying long-term memory formation. Enhancing cue extinction learning has a therapeutic value to reduce drug-seeking behavior. The fronto-cerebellar circuit, including the infra-limbic cortex and cerebellum, plays a

crucial role in drug seeking and extinction. Our objective is to investigate whether intracranial administration of L-lactate into the infralimbic cortex facilitates extinction and prevents relapse in a voluntary cocaine self-administration paradigm. The study also aims to analyze the expression of perineuronal nets (PNNs) and c-Fos expression in the dorsal cerebellar vermis (lobule VIII). Male Sprague-Dawley rats were implanted with intravenous catheters and later received infralimbic cortex cannulas for L-lactate delivery during extinction. Following a short-access cocaine self-administration protocol, rats underwent extinction sessions with automated L-lactate infusions at the end of each session. Drug-seeking behavior was tested without cocaine at 24 hours, 8 days, and 15 days after the last cocaine exposure. The behavioral results showed that, unlike controls, L-lactate-treated rats did not reduce lever pressing during extinction. Moreover, significant group differences emerged in drug-seeking tests conducted immediately and 15 days post-extinction. These findings suggest that L-lactate in the infralimbic cortex impairs extinction memory formation, maintaining drug-seeking behavior. Ongoing analyses are assessing c-Fos expression and PNN density in lobule VIII to explore the underlying neurobiological mechanisms.

Enhancing Pavlovian extinction through novelty: Experimental evidence clearer in female rats

Paula Nogueiras, MS (Universidad del País Vasco), Gabriel Rodríguez, PhD (Universidad del País Vasco), Fernando Rodríguez-San Juan PhD (Universidad del País Vasco), Unai Liberal, PhD (Universidad del País Vasco)

We present two experiments with rats, one using the conditioned taste aversion and the other with appetitive conditioning, to examine whether the presence of novelty during extinction of pavlovian conditioned responses can enhance learning by amplifying prediction error signals. This hypothesis derives from our theoretical model (Hall and Rodríguez, 2010), which assumes that the presentation of a novel stimulus induces the expectation that an event will occur. Under conditions of nonreinforced exposure, where no relevant outcome occurs after the presentation of the stimuli, this initial expectation will be contradicted by experience, generating a prediction error that drives inhibitory learning. In previous research, we demonstrated that the presentation of novel stimuli during preexposure can enhance latent inhibition, endowing the preexposed stimulus with net inhibitory properties. We now extend this rationale to extinction, predicting that the presentation of novel stimuli can similarly enhance inhibitory learning after conditioning. At the last SEPC meeting, we presented preliminary results that were inconclusive. After refining methodological parameters, we have now obtained some evidence supporting the hypothesis. However, the effect was clearer in the case of female rats. While females exposed to novelty showed faster extinction in both the aversive and appetitive procedures, males only showed the effect in the conditioned taste aversion procedure. Keywords: Extinction; Inhibitory learning; Prediction error. This research was supported by grants from the University of the Basque Country (EHU-N23/32) and Gobierno Vasco (IT-1501-22).

The risks of patient classification systems: even professionals have difficulties detecting errors.

Aranzazu Vinas, PhD (Universidad de Deusto), Fernando Blanco, PhD (Universidad de Granada), Helena Matute, PhD (Universidad de Deusto)

Patient classification systems (PCS) are designed to support clinical decision-making. However, they may sometimes rely on incorrect, outdated, or insufficient data. This means that health professionals are supposed to override these errors using their experience. To confirm this, we conducted two experiments where participants

interacted with a PCS which incorrectly classified fictitious patients as more or less sensitive to a treatment. Participants had the opportunity to administer the treatment to a series of patients and use the feedback to learn that the PCS was wrong and that all the patients were equally sensitive. Experiment 1 used a general sample and Experiment 2 a sample of medical doctors. The results showed that both the participants in the general sample and the doctors generally trusted the PCS recommendation, to some extent, neglecting the information they collected during the task. These situations can lead to uneven resource allocation and incorrect perceptions of treatment effectiveness. Our findings have implications for healthcare professionals and patients and highlight the importance of critically evaluating patient classification systems.

Sexual dimorphism in compulsive alcohol drinking: impact on decision-making and social processes in a preclinical model

Manuela Olmedo-Córdoba, PhD (University of Almería), José Juan León Postdoc (University of Almería), Álvaro López-Villegas PhD (University of Almería), Elena Martín-González Postdoc (University of Almería) & Margarita Moreno-Montoya Catedrática (University of Almería)Affiliation. Department of Psychology, Clinical and Experimental Neuroscience Research Group Research Group CTS280 and CIBIS, University of Almería, Almería, Spain

Compulsivity, defined as the inability to inhibit a persistent behavior, is increasingly recognized as a vulnerability factor for alcohol use disorder, manifesting as compulsive alcohol drinking; however, the social domains and decision-making associated with this phenotype remain poorly understood. The aim of this study was to identify a vulnerable phenotype characterized by a compulsive alcohol drinking pattern and to systematically evaluate its behavioral alterations within the cognitive systems and social processes, considering sex as a modulatory factor. Male and female Wistar rats were exposed to Schedule-Induced Polydipsia (SIP), initially with water and then with alcohol. We then assessed social domains with the social dominance tube test (SDTT) and the 3-chambered test (3CT), and decision-making with the rodent Gambling Task (rGT). Cluster analysis of consumption on SIP identified four phenotypes (Low-Compulsive, Alcohol Compulsive, Water Compulsive, and High Compulsive) with sex-specific distributions: males predominated in alcohol-prone profiles, females in non-alcohol profiles. High Compulsive group uniquely exhibited social subordination and a conservative, punishment-sensitive choice strategy, whereas the Compulsive Alcohol group showed no such deficits. Notably, ethanol exposure attenuated the female advantage in sociability, indicating that alcohol per se disrupts innate social motivation. In conclusion, compulsivity stands out as a vulnerability factor in the development of alcohol use disorder, with sexual dimorphism in its development. Building on this insight, identifying phenotypes based on compulsivity level and ethanol intake reveals social or cognitive specific deficits. Support from: PID2022-139286NB-I00 PGC, MCIN/AEI/10.13039/ 501100011033, Government of Spain & FEDER Funds; PND-2022l024 PNSD, MISAN; SUBV23/00027, MIC, DGOJ, Gobierno de España; and PPIT-UAL, JA-ERDF 2021-2027. Objective RSO1.1. Programme: 54.A. Supported by CTEICU, JA, PAIDI (2020).

Attenuating renewal of instrumental responses in children: the effects of extinction cues and multiple-context extinction

(ONLINE) Rosalia Baiamonte, PhD Student (Universidad de Córdoba, Spain), A. Matías Gámez, PhD (Universidad de Córdoba, Spain)

The present study addresses a persistent challenge in the field of education: the reemergence of previously extinguished behaviors. To assess the effectiveness of specific behavioral strategies—previously validated in adult populations—in reducing the renewal of instrumental behaviors, two experiments were conducted with a sample of primary school children. An instrumental task was embedded within a video game, in which participants were required to identify which of eight colored circles produced a reward (points accompanied by a smiling face). Experiment 1 examined the effect of an extinction cue on AAB renewal, while Experiment 2 explored the effectiveness of extinction across multiple contexts in mitigating ABA renewal. The findings may offer valuable insights for the development of more effective behavioral interventions in educational settings.

11:00 - 12:00:
POSTER SESSION 2

1: Autism Traits and Associative Learning in a Virtual Reality Analogue of the Morris water-maze

Miguel A. Castillo-Anguita, MS (University of Jaén), Paula S. Acero, MS (University of Jaén), José E. Callejas-Aguilera, PhD (University of Jaén), Juan M. Rosas, PhD (University of Jaén)

Abstract: This study examined individual differences in information processing within a subclinical population, with a particular focus on participants' position along the autism spectrum. Specifically, we investigated the relationship between scores on the Autism-Spectrum Quotient (AQ) and performance in an explicit learning task conducted in a virtual reality environment. The task was conceptually similar to the Morris water-maze used in rodents. Participants assumed the role of archaeologists searching for hidden treasures in an arena set within naturalistic environments, such as a forest or a desert. The presence and location of the treasure in each trial were by distinct discriminative stimuli. Participants were required to learn when the treasure was available and locate it accordingly. The results revealed a significant positive correlation between AQ scores and learning performance, suggesting that individuals with higher levels of autistic traits may exhibit enhanced abilities in tasks involving detail discrimination and rule-based learning. Additionally, higher scores on the Social Skills Difficulties subscale of the AQ were positively correlated with correct responses, suggesting that social challenges may not impair performance in structured learning tasks. These findings have important implications for the development of educational and therapeutic interventions across the Autism Spectrum. This research was funded by grant PID2023-149399NB-C21 from the Spanish Ministry of Science, Innovation and Universities.

2: Biological and Parental Influences on Childhood Aggression: A Moderated Moderation Analysis of Sex, Testosterone, and Maternal Control

Nora del Puerto-Golzarri, PhD (Universidad del País Vasco), Eider Pascual-Sagastizabal, PhD (Universidad del País Vasco), Ania Daguerre, Ms (Universidad del País Vasco), José Manuel Muñoz, PhD (Universidad de Cádiz), María Rosario Carreras, PhD (Universidad de Cádiz), Rosa María Ruiz-Ortiz, PhD (Universidad de Cádiz), Aitziber Azurmendi, PhD (Universidad del País Vasco)

Abstract: Aggressive behavior in childhood, which shows consistent sex differences, has been associated with both biological factors and family dynamics, yet their interactive effects remain poorly understood. The aim of this study was to explore whether sex and testosterone jointly moderate the effect of maternal behavioral control on physical aggressive behavior. To this end, the sample group comprised 212 nine-year-old children (96 boys and 116 girls) from Spain. Physical aggressive behavior was assessed using the "Direct and Indirect Aggression Scale" (DIAS), which is a peer-estimation instrument. Parental control was measured through the

"Escala de Estilo Parental" (EEP), which provides an estimate of children's perception of the behavioral and psychological control strategies employed by their parents. Finally, to measure testosterone levels, 3 saliva samples were collected at 8.30 pm which were analyzed by ELISA. To evaluate the potential impact of the behavioral control moderated by sex and testosterone, a moderated moderation analyses was conducted using the PROCESS macro (Model 3). The results revealed that boys with high testosterone levels were less physically aggressive when they perceived more behavioral control from their mothers. In contrast, girls with high testosterone levels were more physically aggressive when they perceived more behavioral control from their mothers. These findings suggest that children with the same biological profiles and the same family contexts may exhibit different behavioral outcomes depending on sex. The results point out the importance of studying biological characteristics that may influence aggressive behavior while considering possible sex differences.

3: Comparing cognitive performance in physical tasks between goats (Capra aegagrus hircus) and aoudads (Ammotragus lervia): a domestic vs. wild caprine study

Iker Loidi Vadillo, PhD (Universitat de Barcelona), Jordi Galbany, Lecturer (Universitat de Barcelona), Álvaro L. Caicoya, Postdoc (Research Institute for Farm Animal Biology), Alina Schaffer, Postdoc (University of Leipzig, Institute of Biology), Pilar Padilla Solé, Chief Mammal Technician (Barcelona Zoo), Federica Amici, Lecturer (University of Leipzig, Max Planck Institute).

Abstract: According to the domestication hypothesis (DOM), artificial selection processes may have a negative effect on the development of cognitive abilities in domesticated animals, as they face fewer ecological and social challenges than their wild relatives. However, domesticated animals may be better at understanding human cues since they rely on people for important resources. This study assessed the basic physical cognitive abilities of the aoudad (wild; n = 5) and the goat (domestic; n = 6) across six experimental conditions designed to measure object permanence, short-term memory and causal inference (including inference by exclusion). In the object permanence test, subjects watched two trays, only one containing food, and were allowed to choose after both were covered. Short-term memory was assessed by introducing a 30 or 60-second delay before the choice. Inference ability was tested in two conditions: one where the baited container was shaken prior to the choice, producing sound, and another where the empty container was shaken silently. The latter required subjects to infer the food's location by exclusion, understanding that no sound meant the food was in the other container. An olfactory control confirmed that subjects were not relying on smell. Both species passed object permanence tests and showed similar performance in memory and sound-cue inference tasks. However, only goats succeeded significantly in the most complex task requiring inference by exclusion. This suggests goats may have enhanced inferential skills or greater responsiveness to social cues, partially supporting DOM's prediction that domestication favors certain social cognitive abilities. Overall, goats and aoudads performed similarly on basic physical tasks, but goats showed greater cognitive flexibility in complex social or inferential contexts.

4: Contrasting Patterns of Behavioural and Neurofunctional Inhibition in ADHD and OCD: Insights from Performance on the Stop-Signal Task

Rocío Rodriguez-Herrera, PhD Student (University of Almeria), José Juan León, PhD (University of Malaga), Pilar Fernández-Martín, PhD (University of Islas Baleares), Ana Sánchez-Kuhn, PhD (University of Almeria), Marcos Sánchez-López (University of Almeria), Miguel Soto-Ontoso (Torrecárdenas University Hospital) and Pilar Flores PhD (University of Almeria)

Abstract: Behavioural inhibition (BI) is defined as the ability to suppress unwarranted behaviours, which is known to be impaired in both obsessive-compulsive disorder (OCD) and attention-deficit/hyperactivity disorder (ADHD). The stop-signal task (SST) is widely used to assess response inhibition by measuring the ability to halt an already initiated action. While the stop-signal reaction time (SSRT) remains the primary measure, growing evidence suggests that other variables may provide richer insights into disorder-specific inhibitory profiles. This study examined BI in adults with ADHD, OCD and healthy controls using an adaptive SST alongside resting-state functional connectivity measured via fNIRS. Behaviourally, we did not find credible group differences in SSRT. However, OCD participants showed slower go reaction times, greater post-error slowing, and more omission errors; consistent with heightened error sensitivity and cognitive hypercontrol. In contrast, ADHD participants responded faster, exhibited reduced post-error adaptation, and made more commission errors, reflecting impulsivity and attentional dysregulation. Connectivity analyses revealed distinct network dynamics across groups. In healthy controls, increased connectivity between the left dorsolateral prefrontal cortex (DLPFC) and left posterior parietal cortex (pPC) was associated with fewer omission errors, suggesting efficient engagement of the frontoparietal network. In ADHD, greater connectivity between the left DLPFC and right pPC was linked to more omissions, possibly indicating a compensatory shift towards increased cognitive control. These findings highlight distinct neurocognitive mechanisms underlying BI in OCD and ADHD, reflecting the archetypal profiles of impulsive and compulsive disorders, and emphasize the value of SST-derived metrics. Funding: Ministry of Science, Innovation and Universities (grant number

5: Early-Life Rearing Conditions and Maternal Separation: Effects on Maternal Behavior in Rodents

Mirari Gaztañaga, PhD (Euskal Herriko Unibertsitatea); Estibaliz Muñoz Leache, MS (Euskal Herriko Unibertsitatea); M. Gabriela Chotro, PhD (Euskal Herriko Unibertsitatea)

Abstract: Early life is a critical period for neurobehavioral development, during which parental care plays a fundamental role. Parenting strategies may vary from single-parent, to biparental, or alloparental care (the latter provided by non-parent individuals). In biparental species, paternal care has been shown to enhance offspring survival and reduce maternal stress, while alloparental care supports offspring development by relieving the caregiving burden on the primary caregiver. Rearing conditions during early life can act as either protective or stress-inducing factors. Evidence from both human and animal studies indicates that disruptions in maternal care—such as prolonged maternal separation—are associated with increased maternal anxiety and impaired caregiving behavior. The combination of caregiving type and early-life stressors, such as maternal separation, significantly affects emotional and behavioral outcomes in both offspring and dams. Studies with rodents suggest that greater social support during rearing is associated with improved emotional regulation. Considering these two factors, the aim of the present study was to characterize maternal behavior under different caregiving conditions (single-parent, biparental, or alloparental) and in response to anxiety-inducing situations, modeled through daily maternal separation (0, 15, or 180 minutes); from postnatal day (PND) 2 to 10. On PNDs 3, 6, 9, 12 maternal behavior was recorded for 45 min. Both self-directed and pup-directed behaviors were assessed: nest occupancy, general activity, and nursing. The results indicate that single mothers showed significantly higher levels of general activity compared to biparental and alloparental conditions. Additionally, single mothers took longer to complete the nest and initiate nursing after the reunion. These results indicate that monoparental dams display poorer maternal care behaviors than those in biparental or alloparental conditions.

6: LAS FASES DEL CICLO MENSTRUAL Y SU POSIBLE RELACIÓN CON LOS NIVELES DE ANSIEDAD

Lucía Mayoral, MS (Universidad Europea de Valencia), Eneko Antón (Universidad Nebrija y Universidad de Mondragón).

Abstract: The available evidence to date continues to seek agreement on the relationship between the phases of the menstrual cycle and anxiety levels. Some studies have begun to attribute this lack of consensus to deficiencies in the methodologies employed. The aim of the present research is to provide additional evidence to this field by addressing such limitations and, furthermore, to study the possible influence of Trait-Anxiety on this relationship. To this end, weekly measurements of State-Anxiety levels and the phase of the menstrual cycle were taken over a period of 12 weeks, along with a single measure of Trait-Anxiety. Anxiety as a trait and as a state were quantified using the State-Trait Anxiety Inventory (STAI). A total sample of 60 Spanish women aged 19 to 38 was obtained. According to the results, there appear to be differences in State-Anxiety levels between menstrual cycle phases, but these only become evident once the variability derived from Trait-Anxiety is controlled for. Furthermore, individuals with different levels of Trait-Anxiety seem to experience diverse levels of State-Anxiety in each phase of the cycle, with high Trait-Anxiety being associated with higher State-Anxiety scores in all phases, becoming more pronounced during the luteal phase.

7: Evidence of contextual dependence of habituation in the pupa of Tenebrio molitor

Rodolfo Bernal-Gamboa (Universidad Nacional Autónoma de México), Jesús García-Salazar (Universidad Nacional Autónoma de México), A. Matías Gámez (Universidad de Córdoba)

Abstract: Contextual dependency of habituation has been proposed as the eleventh behavioral characteristic of habituation. However, its study has been limited to only a few species. Thus, the objective of the present experiment was to explore through a within-subjects design the contextual dependence of habituation in pupae of the mealworm (Tenebrio molitor). The experiment consisted of four experimental phases. The first two phases were conducted in Context A for all pupae, while phases 3 and 4 were conducted in Contexts B and C, respectively. Group L-V received exposure to continuous light in the first two phases; while they received vibration stimulation in the last two phases. On the other hand, pupae in the V-L group received vibration stimulation in phases 1 and 2; while in phases 3 and 4, they were exposed to continuous light. A decrease in responding was observed as a result of the repeated presentation of light and vibration; that is, the habituation presented by the two groups was similar. However, the most relevant finding was that during phase 4 (which involved a context change), all pupae showed an increase in the habituated response. This increase did not occur in phase 2 (where there was no context change). Since the above was observed in both groups, these results indicate that a change in contextual stimuli increases the number of responses regardless of whether the stimulation was light or vibration. The theoretical implications of these findings are discussed.

8: Neural Correlates of Cognitive and Affective Processes in Risky Decision-Making Within a Driving Context

Alberto Megías-Robles, PhD (University of Málaga), Lenin Moreno-Ríos, MS (University of Málaga), Miguel Ángel Torres, PhD (University of Granada), Raquel Megías-Robles, MS (University of Granada), Alicia Martínez-Estrella, MS (University of Granada), María Ángeles Ramos-Moreno, PhD (University of Málaga).

Abstract: This research investigated the neural mechanisms underlying risky decision-making through the use of electroencephalography (EEG). We conducted the study in an ecologically valid context that closely resembles everyday life, specifically, driving a vehicle. Two key components of risk-related behavior were compared: risk perception (evaluating whether a situation is risky) and decision making (taking action, such as braking, to avoid the risk), across both risky and non-risky scenarios. Our findings revealed distinct behavioral and neural differences between risk perception and decision making. Decision making was generally associated with more automatic processing and a stronger influence of heuristic and affective mechanisms. At the neural level, decision making, compared to risk perception, elicited greater activation in frontal electrodes, but only during risky driving situations. Additionally, risky situations (as opposed to non-risky ones) showed increased activation in centro-parietal electrodes, suggesting a subjective emotional evaluation of the risk. These results offer new insights into the neural basis of risky behavior and highlight how the divergence between perceiving and acting on risk may be related to differences in how risk is processed in the brain.

9: Exploring the Combined Effects of Renewal and Response-Dependent Reinstatement in Rats

Tere A. Mason (Universidad Nacional Autónoma de México), A. Matías Gámez (Universidad de Córdoba), Michael P. Kranak (Oakland University), Ryan T. Kimball (University of St. Joseph), Rodolfo Bernal-Gamboa (Universidad Nacional Autónoma de México)

Abstract: Renewal occurs due to a change in context, but in the absence of a change in contingencies. Recently, it has been suggested that renewal can also coincide with the accidental delivery of reinforcers. This unplanned administration of reinforcers for the target behavior after an extinction procedure may favor the reappearance of the extinguished response (i.e., response-dependent reinstatement). There is little literature on the combined effects of renewal and response-dependent reinstatement. Therefore, the aim of the present experiments was to compare renewal with the combined effects of renewal plus response-dependent reinstatement. We explored the combined effects using ABC renewal (Experiment 1) and AAB renewal (Experiment 2). All rats were trained to press a lever for food in Context A. Subsequently, the previously trained response was extinguished for all rats. Extinction took place in Context B in Experiment 1 while it was conducted in Context A in Experiment 2. Finally, all the rats were tested in Context C (Experiment 1) or Context B (Experiment 2). Rats in the Renewal groups were exposed to a session similar to those used during extinction; whereas the Combined groups received response-contingent reinforcement for a brief period. Our results indicate higher levels of renewal during combined renewal plus response-dependent reinstatement tests compared to renewal alone. The possible applied implications of the results are discussed.

10: Regional Brain Metabolomic Signatures in Rats Exhibiting Compulsive Drinking Behavior

Elena Martín-González, PhD (University of Almería and Jaume I University) Ana I. Tristán, PhD (University of Almería) Manuela Olmedo-Córdoba, PhD Student (University of Almería) Ana C. Abreu, PhD (University of Almería) Ángeles Prados-Pardo, PhD (University of Almería) Santiago Mora, PhD (University of St Andrews) Ignacio Fernández, PhD (University of Almería) Margarita Moreno, PhD (University of Almería)

Abstract: Introduction: Compulsive behaviors are repetitive, stereotyped actions governed by rigid rules, often intended to reduce perceived threats. Such behaviors are present in various mental health conditions, including obsessive-compulsive disorder, depression, and schizophrenia, where metabolomic alterations have been suggested as early biomarkers. Objective: This study investigated individual variability in the brain metabolomic profiles of rats selected for their compulsive drinking behavior. Methods: Male Wistar rats were exposed to schedule-induced polydipsia (SIP) and classified as high drinkers (HDs) or low drinkers (LDs). Nuclear magnetic resonance spectroscopy was used to analyze metabolomic levels in the frontal cortex, hippocampus, and cerebellum. Four groups were formed based on drinking level and SIP-exposure: LD without re-exposure (LD-NRE), LD with re-exposure (LD-RE), HD without re-exposure (HD-NRE), and HD with re-exposure (HD-RE). Results: In the frontal cortex, succinate levels were higher in HD-RE than in LD-RE. In the cerebellum, formate levels decreased, while sterols increased in HD-NRE compared to LD-NRE. In the hippocampus, alanine levels were increased in HD-RE compared to LD-RE, whereas formate increased; and amino acids and derivatives such as uracil, tyrosine, histidine, pyroglutamate, and isoleucine levels were lower in HD-NRE compared to LD-NRE. Conclusions: These findings highlight metabolomic screening as a promising approach for identifying diagnostic and treatment-monitoring

11: Single cell correlates of multitasking in higher associative areas of the pigeon brain

Tuff, J.M., Maldarelli, G., Alouane, A., Packheiser, J., Pusch, R., Rook, N. and Güntürkün, O. (Ruhr University Bochum: All Authors)

Abstract: Multitasking can be described as a form of goal-directed behaviour that relies on the integration and sequential execution of several different tasks for successful completion of an overarching goal. It has been shown that the parallel activation of multiple tasks leads to less efficient behaviour compared to doing tasks one after another. In humans, a widespread network of frontal and basal ganglia areas have been associated with this type of behaviour. However, it is still unknown how multitasking manifests itself on cellular level. Pigeons are able to show this type of behaviour and exhibit a network of higher associative and striatal areas that are activated during multitasking with the nidopallium caudolaterale (NCL) and the nidopallium intermedium medialis pars laterale (NIMl) being highly relevant. In this study, we investigated single cell correlates of multitasking in these areas while the animals perform a STOP-CHANGE task. We found activity patterns that correspond to different task demands of this experimental paradigm. In particular, we found differential activity patterns between phases of sequential and parallel task activation, which might explain the effects on behavioural efficiency.

12: The Gut-Brain Axis: Exploring Oral Administration of Bioactive Compounds for Cognitive Enhancement

Fernando Gámiz, PhD (Universidad de Granada), Marina Santiago-Torrente, MS (Universidad de Granada), Alicia Ruiz Rodriguez (Universidad de Granada), Milagros Gallo, PhD (Universidad de Granada), Antonio Suárez, PhD (Universidad de Granada).

Abstract: The gut-brain axis describes the complex, bidirectional relationship between the gut microbiota and the nervous system. However, the specific mechanisms through which gut microbiota influence cognitive abilities are often underexplored. Animal models are crucial for investigating these mechanisms. Previous research has linked a particular microbiota profile to improved cognitive development scores in children. Additionally, fecal transplantation of this microbiota, associated with histidine and its metabolites, has shown beneficial effects in mice. This study aimed to evaluate the efficacy of oral administration for these bioactive compounds. We employed a double-blind experimental design with C57BL/6J mice assigned to four groups: a control group and three groups orally administered one of the three compounds of interest. To assess behavioral and cognitive impacts, we used three standardized tests: Open Field Test (exploration and anxiety-like behavior), Novel Object Recognition Test (recognition memory), and Rotarod (motor learning and coordination). In contrast to the positive outcomes of intraperitoneal administration reported in previous studies, oral administration did not produce statistically significant differences in the Novel Object Recognition and Rotarod tests. Interestingly, significant inter-group differences were found in the Open Field Test. While this study did not reveal generalized cognitive improvements via the oral route, its significance lies in exploring a novel administration pathway for compounds with potential to enhance cognitive performance, thereby advancing our understanding of the gut-brain axis. These findings highlight the complexities of bioavailability and the impact of oral administration for these compounds. Further research, including optimizing dosage, treatment duration, and sample size, is needed to fully elucidate their therapeutic potential. Supported by project PID2020-114269GB-I00 (MCIN/AEI/10.13039/501100011033).

13: Default Mode Network (DMN) in Individuals with ADHD: An Umbrella Review

Egoitz Carral Trucios, (UPV/EHU Universidad del Pais Vasco), Eider Pascual Sagastizabal (UPV/EHU Universidad del Pais Vasco), Naiara Arriola Garicano (UPV/EHU Universidad del Pais Vasco).

Abstract: The default mode network (DMN) is one of the largest of the human brain. Its activity is heightened during resting states and is associated with emotional processing, self-referential mental activity, and the retrieval of past experiences. Regarding the attention deficit/hyperactivity disorder (ADHD), a theory known as the default mode interference hypothesis suggests that the inability to deactivate this network and switch to a task-positive state may contribute to the disorder's symptomatology. To assess the empirical support for this hypothesis, an umbrella review was conducted following PRISMA and JBI guidelines. The review protocol was preregistered in PROSPERO (CRD420251010097). A systematic search was conducted in the databases Web of Science, Scopus, PsycINFO, and PubMed, which, after a screening process, led to the inclusion of 11 studies. The results of this review showed substantial support for the hypothesis, since both structural and functional alterations have been found in various regions of the DMN. However, contradictory findings were also identified, highlighting the need for further research.

14: VLAB: An Online, Mobile-Compatible Platform for Avoidance Learning Research

Carlos Vega, MS (University of Jaén), José E. Callejas-Aguilera, PhD (University of Jaén), Juan M. Rosas, PhD (University of Jaén)

Abstract: To investigate associative learning under ecologically valid conditions, we developed a fully online avoidance learning task that participants could complete using their own mobile phones in natural environments. The task was designed as a traditional arcade-style game, in which participants controlled a ship by holding and moving their finger across the phone screen to destroy as many incoming attackers as possible. Periodically, a mothership appeared that caused participants to lose most of their accumulated points unless their ship was positioned in one of the designated safe zones before its arrival. Discriminative stimuli, presented at the top of the screen, signaled the impending arrival of the mothership, allowing participants to anticipate and avoid the loss. The aim of this initial study was to assess the reliability of the task in measuring basic associative processes. Participants were trained with cue X followed by an outcome in Context A, and cue Y presented without the outcome in Context B. Two levels of training were implemented: 4 and 12 trials per target cue. During training, participants learned to hide in the presence of cue X but continued playing when other cues were presented. At test, cues X and Y were presented either in their original training context or in a different context. A context change significantly reduced avoidance responses to cue X after four training trials, but no such effect was observed after twelve trials. No context change effect was found for cue Y. These results suggest that the task is suitable for investigating associative learning in naturalistic settings. Future research will compare performance in uncontrolled environments with performance under laboratory conditions to further evaluate the advantages and limitations of using this mobile-based task for human associative learning studies. This research was funded by grant PID2023-149399NB-C21 from the Spanish Ministry of Science, Innovation and Universities.

12:00 - 13:00: SESSION 4
CAUSAL, CATEGORICAL, AND ILLUSORY LEARNING

Chair: Jose Enrique Callejas-Aguilera (University of Jaén)

Talks in this session examine the ways in which humans and animals perceive and construct causal relationships, including illusory beliefs and the influence of cognitive load and uncertainty.

Chaining without contingency: similar effects of withholding the opportunity to lever press in chained and non-chained schedules.

Fernando Molines, MS (UNED); Ricardo Pellon, PhD (UNED)

Under the premise that chaining might occur between proximate responses independently of an explicit chaining contingency ("superstitious" chaining), the present study assessed how selectively withholding the opportunity to engage in behaviors that sequentially occur in the inter-reinforcement interval affects other responses. Considering the positioning of responses within the interval (whether they precede or follow the withheld behavior) and the proximity between response distributions (whether they are distant or close), we expected similar outcomes in conditions where responses are not explicitly chained and where they are. In the first experiment, Wistar rats were exposed to 45s trials with a lever on a fixed interval (FI) of food delivery and water concurrently available for 30 sessions, until schedule induced drinking (SID) was stable and the typical bitonic pattern of drinking developed in the first segment of the inter-reinforcement interval. During these sessions, the lever under the FI schedule was inserted for half the subjects early in the interval (15s) and later for the other half (30s). In the second experiment, the same rats were exposed to a chained program in which wheel running produced the extension of a lever immediately (Wheel running FI 15-lever pressing FI 30) or with a 15-second delay (FI 15-Fixed time 15-FI 15). Afterwards, similar test sessions were conducted where we measured the effects of removing the lever on wheel running. In both experiments, we observed a decrease in the occurrence of the first behavior only when the second behavior was absent and bigger when both responses were in closer proximity (when the lever was promptly inserted and when there was no delay between the first and second responses). These effects and the relevance of the proximity between response distributions are consistent with a "superstitious" chaining hypothesis.

Impact of uncertainty and contingency shift on individuals with obsessive-compulsive traits

Darío Puertas-López, Undergraduate Student (Universidad de Almería), José J. León, PhD(Universidad de Málaga), Rocío Rodríguez-Herrera, PhD student (Universidad de Almería),Ana Sánchez-Kuhn, PhD (Universidad Internacional de la Rioja), Pilar Fernández-Martín,PhD (Universidad de las Islas Baleares), Pilar Flores Cubos PhD (Universidad de Almería).

Cognitive flexibility is essential for decision-making in dynamic environments and isimpaired across various psychiatric conditions, with obsessive-compulsive disorder (OCD)being one of the most affected. Individuals with OCD show deficits in flexibility, leading tomaladaptive behaviors and heightened sensitivity to punishment. As OCD traits exist on acontinuum, subclinical individuals may also exhibit reduced flexibility. In this study, weemployed a modified version of the probabilistic reversal learning task (PRLT), manipulatingcontingency types (positive reinforcement vs. negative punishment) to examine the impact of uncertainty on learning. Ninety-nine undergraduate students from the University of Almería (mean age = 20.92; 56.6% female) were categorized into high (H-OCD) and low (L-OCD) obsessive-compulsive trait groups. The task included two phases differing in levels ofuncertainty and contingencies. Generalized Linear Mixed Models (GLMMs) were used toanalyze performance. We hypothesized that: (1) higher uncertainty would predict poorerperformance in the PRLT; (2) H-OCD individuals would perform worse than L-OCDindividuals; and (3) performance deficits in H-OCD would be more pronounced underpunishment conditions, regardless of uncertainty level. Results showed that uncertainty was a significant predictor of performance, while contingency type had a partial effect. H-OCDparticipants exhibited higher lose-shift rates under low-uncertainty conditions. Additionally,gender emerged as a relevant covariate. Future studies should study punishment sensibity in clinical OCD populations and determine the mechanism underlying sex differences. This research was funded by Spanish Ministry of Science and Innovation (PID2023-147063NB-I00/AEI/10.13039/501100011033) and PPIT-UAL, Junta de Andalucía-ERDF 2021-2027, Objective RSO1.1.Programme: 54.A.

Recalled events shape the formation of causal illusions and pseudoscientific beliefs

Ainoa Barreiro, PhD student (Universitat de Barcelona), Javier Rodríguez-Ferreiro, PhD (Universitat de Barcelona), Itxaso Barberia, PhD (Universitat de Barcelona)

People often rely on treatments whose efficacy has been consistently refuted by science. Previous studies indicate that causal illusions could be the cognitive bias underlying pseudoscientific beliefs. A possible factor that explains why these individuals continue to experience a causal relation in these situations is that they might have a biased recall of past information. Our study intended to examine the relation between pseudoscientific beliefs, causal illusions, and the recall of contingency information. Participants were exposed to a contingency learning task framed in a health scenario. After that, they were asked to assess the relation between the putative cause (an experimental drug) and the outcome (recovery from a disease) and to estimate the frequency of different event combinations (drug + recovery or a trials; drug + no recovery or b trials; no drug + recovery or c trials; no drug + no recovery or d trials) observed during the task. Additionally, they responded to the Pseudoscience Endorsement Scale. Results showed that causal illusions were positively correlated with the recall of a trials, and negatively correlated with the recall of b and c trials. The adherence to pseudoscience was only related to recall of fewer c trials, that is, the situations in which the putative was absent, but the outcome still occurred. Overall, our findings suggest that inaccuracies in memory could yield susceptibility to causal illusions and pseudoscientific beliefs.

The illusion of causality is reduced under conditions of low cognitive load

Manuela Moreno-Fernández, PhD (Departamento de Psicología Evolutiva y de la Educación, Universidad de Granada/Centro de Investigación Mente, Cerebro y Comportamiento, Universidad de Granada), Fernando Blanco, PhD (Departamento de

Psicología Social, Universidad de Granada/Centro de Investigación Mente, Cerebro y Comportamiento, Universidad de Granada), Helena Matute, PhD (Universidad de Deusto)

The dual system framework proposes that reasoning tasks can be solved by using either of two cognitive systems: System 1 is intuitive, and heuristic-based, while System 2 is rational and cognitively demanding. Although intuitive processes can lead to errors and biases, System 2 is usually there to correct the output of System 1. However, if there are not enough cognitive resources available for the expensive processes of System 2 to operate, then the output of System 1 remains uncorrected. Here we report two studies in which the cognitive load is manipulated to examine its impact on a common cognitive bias, the causal illusion. In Experiment 1, we presented the standard contingency learning task that usually induces causal illusion in combination with a concurrent memory load task aimed at increasing cognitive load and thus withdrawing cognitive resources from System 2. The results were not significant as all groups showed similar levels of causal illusion. In Experiment 2, we decided to reduce, rather than increase, the cognitive load associated to the contingency learning task, by changing the information presentation format. This was expected to facilitate the operation of System 2 and thus allow for correction of intuitive responses. The results showed that, indeed, this reduced cognitive load task led to more accurate judgments, which is interpreted in line with the prediction of the dual system framework.

We can reduce causal illusions: insights from a large-scale educational intervention and a six-month follow-up.

Fernando Blanco, PhD (Departamento de Psicología Social, Universidad de Granada / Centro de Investigación Cerebro, Mente y Comportamiento, Universidad de Granada), Naroa Martínez-Pereña, PhD (Universidad de Cantabria), Helena Matute, PhD (Universidad de Deusto), Itxaso Barberia, PhD (Universidad de Barcelona)

When people are presented with two unrelated events but still conclude that they are causally connected, they are exhibiting a cognitive bias known as causal illusion. Previous studies revealed that causal illusions are a pervasive and widespread bias affecting how people make causal inferences, often leading to poor decisions in a variety of domains, such as health or finance. In this research, we describe an educational intervention (a workshop revolving around the concept of experimental control) that is aimed to reduce the causal illusion. Thanks to our partnership with FECyT (Federación Española para la Ciencia y la Tecnología), the intervention was conducted on a large sample of high-school students (total N > 2000). The results indicate that the workshop is indeed effective to reduce the causal illusion (compared to a control group), showing a long-lasting effect even in a follow-up study conducted 6 months after the initial intervention. Thus, educational workshops aimed at fostering scientific thinking can be a promising avenue to prevent cognitive biases such as the causal illusion.

13:00 - 14:00: FOCUS SESSION 2
HABIT LEARNING

Focused on habit formation, this session looks at the persistence and neural substrates of habitual behaviors in clinical and preclinical populations, with attention to OCD and substance use.

Action-sequence learning, habits and automaticity in obsessive-compulsive disorder: implications for treatment

Paula Banca, PhD (University of the Basque Country), Maria Ruiz, PhD (Goldsmiths University of London), Miguel Gonzalez-Zalba, PhD (Quantum Motion Technologies), Marjan Biria, PhD (King's College London), Aleya Marzuki, PhD (University of Tübingen), Thomas Piercy (University of Cambridge), Akeem Sule, MD (University of Cambridge), Naomi Fineberg, MD (University of Hertfordshire), Trevor Robbins, PhD (University of Cambridge).

Habit learning: Habits are learned behaviours that, through repetition, become automatic and resistant to change. While often adaptive and efficient, in certain psychiatric disorders, habitual control becomes dysregulated, contributing to the emergence of compulsions. The shift from flexible action to maladaptive repetition is thought to involve three key mechanisms: enhanced habit formation, increased automaticity and impaired flexibility in shifting between goals and habits. Yet, the precise contribution of each component, and how they interact to drive compulsions, remains unclear. This study investigated these components within a unified experimental framework, using novel behavioural tasks designed to isolate and quantify each mechanism. We trained 32 patients with OCD and 35 healthy controls using a custom-designed smartphone app involving daily practice of chunked finger sequences for one month. Contrary to our hypotheses, both groups showed similar procedural learning and automaticity. After training, participants completed an arbitration task to assess switching between previously learned/habitual sequences and new goal-directed actions. No group differences in arbitration emerged when outcomes involved monetary rewards. However, a subset of OCD patients showed a stronger preference toward habitual sequences in other contexts, indicating greater intrinsic valuation of familiar actions. Notably, these individuals also demonstrated higher compulsivity and habitual tendencies, engaged more extensively with the app, and perceived symptom relief after the experiment. The tendency to assign intrinsic value to familiar actions is a key mechanism in the transition to compulsive behaviour. Our findings further emphasise the potential of smartphone-based motor habit training as a scalable tool to support habit reversal interventions in OCD. Recent clinical trial data further support the app's potential to alleviate symptoms and enhance treatment outcomes

Exploring behavioral and neurophysiological mechanisms of contingency-based cognitive flexibility

Pilar Flores Cubos (Universidad de Almería), Rocío Rodríguez-Herrera, PhD student (Universidad de Almería), José J. León, PhD (Universidad de Málaga), Isabel Carmona Lorente (Universidad de Almería) Ana Sánchez-Kuhn, PhD (Universidad Internacional de la Rioja), Christian Beste (University of Dresden)

Habit learning. Understanding the mechanisms underlying learning and cognitive flexibility is crucial to explain the transition from habitual to goal-directed behavior. This study aimed to identify the behavioral and neurophysiological mechanisms involved in contingency-based cognitive flexibility. We conducted two experiments. In the first, 49 participants completed a probabilistic reversal learning task (PRLT), consisting of one acquisition block and three reversal blocks. The first two reversal blocks used 80/20 contingencies, while the final two used 70/30 contingencies, increasing uncertainty. EEG activity was recorded throughout using a 60-channel system. Results revealed block-specific changes in EEG activity, with a significant increase in theta power from

block 3 to block 4 (the final high-uncertainty block), particularly in mid-frontal (Fz, FCz, Cz) and posterior midline (CPz, Pz) regions. These findings led to a second experiment, where theta oscillations were modulated using transcranial alternating current stimulation (tACS), given their known role in cognitive flexibility and decision-making. In this follow-up, 40 participants performed the PRLT under both tACS and sham conditions in a within-subjects design. Bayesian statistical analysis and computational modeling were employed to assess contingency-based flexibility. Results showed that optimal performance was associated with higher inverse temperature values, suggesting better outcomes when decisions were guided by expected value. Moreover, theta modulation via tACS influenced cognitive flexibility under high uncertainty. These findings emphasize the importance of learning and flexibility mechanisms in uncertain contexts and their relevance to adaptive decision-making. This research was supported by the Spanish Ministry of Science and Innovation (PID2023-147063NB-I00) and PPIT-UAL, Junta de Andalucía FEDER 2021–2027, Program: 54.A.

Habits, cocaine and the cerebellum

Marta, Miquel, PhD (Area de Psicobiología, Universitat Jaume I, Dominick Purpura Department of Neuroscience. Einstein College of Medicine. New York. USA)Patricia, Ibáñez-Marín, M.Sc (Area de Psicobiología, Universitat Jaume I)Julián Guarque-Chabrera Ph.D (Dominick Purpura Department of Neuroscience. Einstein College of Medicine. New York. USA)Elisa, Marín-Sampietro, M.Sc (Area de Psicobiología, Universitat Jaume I)

Prolonged drug experience can lead to an imbalance between flexible behaviors and automatic patterns (habits) during action selection. Consolidated drug-induced Pavlovian memory plays a key role in influencing selection towards automatized responses, which appear insensitive to outcome devaluation. Our research group has shown that cocaine-induced Pavlovian memory enhances neural activity and the expression of specialized extracellular matrix structures known as perineuronal nets (PNNs) in the posterior cerebellar cortex. More importantly, early research showed that a lesion of the Interposed cerebellar nucleus prevented the formation of habits after overtraining. In the present study, we aimed to investigate cerebellar correlates of insensitivity to devaluation in naturally rewarded behaviors after a long-lasting cocaine treatment. Before or after extended treatment in ascending cocaine doses for seven weeks, rats were trained in operant boxes to consume banana or chocolate-flavored palatable pellets in a random ratio schedule. Then, we devalued the reward by satiety and assessed sensitivity to reward devaluation under extinction. Cocaine-pretreated rats showed more insensitive responses to reward devaluation than saline controls only when we administered cocaine before instrumental training. Both groups of rats, however, showed insensitivity to outcome devaluation when animals received cocaine after instrumental training. We assessed cFos and PNN expression as cerebellar correlates of sensitivity to reward devaluation. We did not find consistent neurobiological correlates of sensitivity to reward devaluation in the cerebellum. However, we found distinctive cerebellar changes in rats who received cocaine before instrumental learning, which were not present when cocaine treatment occurred post-training. Our findings indicate that a previous learning experience can modulate the effects of drugs of abuse on the cerebellum to regulate the cerebellar output.

Lingering habits: testing the temporal stability of habits

Pablo Martínez-López, PhD student (Universidad de Málaga), Francisco Garre-Frutos, PhD student (Universidad de Granada), José J. León, PhD (Universidad de Málaga), Antonio

Vázquez-Millán, PhD student (Universidad de Málaga), Sara Molinero, PhD (Universidad de Málaga), Nogal Pérez-Velasco, MS (Universidad de Málaga), Miguel A. Vadillo, PhD (Universidad Autónoma de Madrid) & David Luque, PhD (Universidad de Málaga)

Habit learning: Habits are learned when we repeat a rewarded action numerous times and are activated even when they contradict current goals. Individual differences in the balance between goal-directed and habit processes have been linked to transdiagnostic impulsivity among other personality traits. Essentially, individual differences studies suggest a trait of habit formation and expression tendency that differs across individuals. The amount of training required to form an inflexible stimulus-response habit may vary across individuals, as well as the tendency to express it once it is learned. However, the temporal stability of individual differences in habit formation and expression has never been directly examined, leaving open the question of whether a stable 'habit trait' exists in healthy populations. In our pre-registered study, we addressed this gap by testing 76 participants in a forced-response task using a test–retest design. Participants underwent three consecutive days of training (1,000 trials per day), followed by a test on the fourth day and a retest on the fifth. The assessments were separated by a day to minimize the extinction of the acquired habit, enabling us to test whether the stability of habit expression is minimally stable. At the individual level, habitual responding during the test significantly correlated with habitual responding during the retest, providing evidence for the temporal stability of individual differences in habit expression. At the group level, we detected the expression of habits in both tests, although we observed a significant reduction in habit responding between test and retest. We discuss potential interpretations of this result pattern and its implications for understanding the stability of habits.

Discussion

20 Min Discussion

Questions and discussion of the session.

14:00 - 15:30:
LUNCH

Lunch

LUNCH

Lunch in the Hotel Costa Vasca beginning at 14:00. Sessions resume at 15:30 in Miramar Palace.

15:30 - 16:30: SESSION 5
LEARNING IN, AND ABOUT, HUMANS

Chair: Paula Balea (University of Rey Juan Carlos)

A broad session on human learning, with topics ranging from the effects of sleep and anxiety to eye-tracking artifacts, social cognition in animals, and cognitive transfer across domains.

Cognitive transfer between spatial and numerical skills: effects of mental rotation training and anxiety on arithmetic problem solving

Jose Prados, PhD (University of Derby), Miles Donaldson, BSc (University of Derby), Michael Waldron, MS (University of Derby), Fabio Parente, PhD (University of Derby), & Thomas Hunt, PhD (University of Derby)

Training in spatial skills has been proposed to enhance mathematical performance. Cheng and Mix (J Cogn Dev, 15, 2014), for instance, reported that a single session of mental rotation training with concrete (physical) materials improved arithmetic performance in young children. While these findings have been replicated in several studies, they remain contested. Hawes et al. (Trends in Neurosc & Ed, 42, 2015) found that six weeks of mental rotation training improved performance on untrained spatial but not on maths tasks. A meta-analysis exploring the transfer between spatial and maths skills highlighted the importance of potential moderating variables, though anxiety—particularly maths anxiety—has been notably absent from this discussion (Hawes et al., Dev Psychol, 58, 2022). Here we address the spatial to maths cognitive transfer using an online task examining the role of anxiety. Adult participants completed an online experiment in which trait, state and maths anxiety were first assessed. Participants then completed two arithmetic tasks, both before and after receiving training in a mental rotation task (a control group completed a verbal task). Mental rotation training led to improved arithmetic performance. Notably, participants with low maths anxiety improved following spatial training, while those with high maths anxiety—who showed a decline in arithmetic performance in the control condition—were protected from this decline by the spatial training. These findings support the cognitive transfer between spatial rotation tasks and arithmetic performance, replicating the results of Cheng and Mix with a single online mental rotation training session. The data suggest that spatial training moderates the relationship between anxiety and maths performance. We argue that individual differences in anxiety should be more systematically considered in future research on cognitive training interventions.

Do natural environments restore attentional control? evidence from the antisaccade task

Javier Gonzalez-Espinar, PhD.; Sergio Fernández-García, PhD.; Carmen Noguera, Prof.; Dolores Álvarez, PhD.; Isabel Carmona, PhD., Juan José Ortells, Prof.

Exposure to natural environments has been associated with a wide range of benefits in humans, including enhancements in cognitive performance. Among the cognitive processes potentially affected, attentional control

(AC) may be the most central. AC is often conceptualized as a domain-general capacity that enables goal-directed behavior, indirectly supporting performance in related functions such as working memory, sensory discrimination, or general intelligence. It is possible that cognitive improvements caused by nature exposure derive from specific boosting effects in AC. However, the evidence for natural improvements in AC is somewhat inconsistent, which may have to do with limitations in the tools traditionally employed for AC measurement. Recent analyses by Engle and colleagues highlight that many common tasks used to this end show poor psychometric properties, raising concerns about their validity and reliability. As a response, efforts are underway to identify and refine tasks that capture this construct more accurately. Among these, the Antisaccade task stands out as a particularly robust measure. In this task, participants must inhibit the highly automatic response to look toward a flashing visual stimulus in order to correctly identify a target appearing in the opposite visual field. Despite its apparent simplicity, the Antisaccade task loads strongly on AC at the latent level compared to its counterparts. To directly examine nature's potential influence on attentional control, we employed a within-subjects design in which all participants were exposed to both natural and urban scenes in counterbalanced orders. The Antisaccade task was administered three times: once at baseline, and again following each type of environmental exposure. This design allowed us to assess changes in attentional control after each condition, providing a more precise test of how environmental context may modulate this cognitive capacity.

Object choice-task with human cues: understanding social skills of aoudads (ammotragus lervia) when interacting with humans

Judit Lafuente, Grade student (University of Barcelona), María Céspedes, Grade student (University of Barcelona), Iker Loidi Vadillo, PhD (University of Barcelona), Álvaro L. Caicoya, Postdoc (Institute for Farm Animal Biology FBN), Federica Amici, Lecturer (University of Leipzig), Pilar Padilla Solé, chief mammalian technician (Barcelona Zoo), Jordi Galbany, lecturer (University of Barcelona).

Humans represent a crucial source of resources not only for the survival of domestic species, but also for wild individuals living in zoological parks around the world. Various domesticated species, such as dogs, goats, sheep, and horses, have demonstrated the ability to follow human gestural cues to locate hidden rewards in object-choice tasks. However, much less is known about the extent to which their wild counterparts, even those accustomed to human presence, are capable of interpreting such social signals. This study investigates the ability of a wild caprine species, the aoudad (A. lervia), to comprehend and respond to human communicative cues. We tested eight subjects housed at the Barcelona Zoo using three types of gestures, touching, pointing, and gazing, across nine experimental conditions designed not only to evaluate gesture comprehension but also to control for simpler cognitive processes. These included conditions controlling for stimulus enhancement by examining the effects of the hand used (crossed conditions) and the experimenter's position (asymmetric conditions). We used an object-choice paradigm in which an experimenter, out of the subject's view, concealed food in one of two containers and then produced a communicative signal toward the baited container. Each gesture was presented three times before being held static while the subject made its choice. An olfactory control confirmed that aoudads were not using the smell to solve the task. They performed significantly above chance only in the touching condition, while success in pointing and gazing conditions dropped to chance levels. Compared to domesticated caprine species like goats and sheep, aoudads showed lower overall responsiveness to human cues, supporting the idea that domestication, not mere exposure to humans, enhances sensitivity to human gestures.

The role of sleep in errorful learning: self-reported sleep measures and the pretesting effect

Yeray Mera, PhD (University of the Basque Country UPV/EHU), Nataliya Dianova, MS (University of the Basque Country UPV/EHU), Eugenia Marin-Garcia, PhD (University of the Basque Country UPV/EHU)

Sleep is known to support memory consolidation, but what happens when memory is initially built on incorrect responses? This study investigates whether self-reported sleep measures are related to the strengthening of memories formed through failed retrieval attempts, a phenomenon known as the Pretesting effect. This effect suggests that testing and receiving corrective feedback on unfamiliar material enhances long-term memory more than traditional errorless study. In two experiments, we compared pretesting to restudying while varying feedback and test timing. Experiment 1 used a mixed factorial design. The pretest group took an initial cued-recall test on weakly related Spanish word pairs. Half of the pairs received immediate feedback, and the rest after a one-day delay. Half were tested immediately, and the rest after a one-day delay. A read-only control group had equal study time. Experiment 2 used a fully within-subjects design. Half of the pairs were studied under pretest or read-only conditions, with feedback given either immediately or after two days. Self-reported sleep measures were examined during the days of the experiment, including total sleep duration and sleep consistency. Results replicated previous findings, showing that pretesting enhanced memory performance more than restudying. Notably, immediate feedback and immediate testing yielded the highest recall, but the benefits of pretesting persisted across all timing conditions, highlighting its durability and practical flexibility. However, neither sleep duration nor consistency correlated with memory performance or intrusion errors. Despite strong theoretical support for sleep's role in memory, in our study, sleep neither amplifies nor reduces the impact of errorful learning, possibly due to low variability in sleep within our sample. These findings suggest that errorful learning benefits are robust to variations in feedback and test timing, and appear to operate independently of self-reported sleep.

Using a desk-mounted eye-tracker to record attention may introduce unintended attentional effects, potentially leading to unexpected context-switch effects on information retrieval

Juan M. Rosas, PhD, (University of Jaén), Pedro M. Ogallar, PhD, (University of Iowa) Alejandro Aristizabal, PhD, (Fundación Universitaria Konraz Lorenz), José E. Callejas-Aguilera, PhD, (University of Jaén), Manuel M. Ramos-Álvarez, PhD, (University of Jaén).

Recent evidence suggests that attention-related phenomena may be modulated by the use of desk-mounted eye-tracking devices and attention probes. The present study comprised three experiments aimed at investigating the impact of eye-tracking on the context dependency of acquired information. Participants completed a predictive learning task requiring them to assess associations between foods consumed by various customers in different restaurants and the occurrence of gastric malaise. Experiment 1a demonstrated context-dependent acquisition after 18 training trials when attention was monitored via eye-tracking, in contrast to Experiment 1b, which replicated standard context-independence in the absence of eye-tracking. Experiment 2 employed an EMACS (Extinction Makes Acquisition Context Specific) design using a 2 (Eye-tracker) × 2 (Extinction) × 2 (Test Context) factorial structure. Results indicated that eye-tracking induced context dependency irrespective of extinction, whereas the standard EMACS pattern—context specificity contingent on extinction—was observed without eye-tracking. Analysis of dwell time revealed that attention to the contexts increased both when a new cue was

presented in a familiar context, and when a familiar cue appeared in a familiar context different from the one in which it was originally trained. These findings suggest that the use of desk-mounted eye-trackers may introduce unintended attentional effects, potentially confounds experimental outcomes and influencing interpretations of context-dependent learning. This research was funded by grant PID2023-149399NB-C21 from the Spanish Ministry of Science, Innovation and Universities.

16:30 - 17:30: SESSION 6
STRESSORS & DEVELOPMENT

Chair: Gonzalo Urcelay (University of Nottingham)

Talks examine how stress, both acute and chronic, affects development, behavior, and neurophysiology, especially in relation to anxiety, alcohol use, and sex-dependent effects.

Dopamine innervation is altered in the rat medial prefrontal cortex after methylphenidate consumption during adolescence

Antonio Pérez-Colorado, PhD student (Universidad de Sevilla), Fátima Montiel, PhD student (Universidad de Sevilla), Esperanza Quintero, PhD (Universidad de Sevilla), Juan Pedro Vargas, PhD (Universidad de Sevilla), Juan Carlos López, PhD (Universidad de Sevilla), Estrella Díaz, PhD (Universidad de Sevilla)

Adolescence is characterized by a significant reorganization of the medial prefrontal cortex (mPFC), particularly within the GABAergic inhibitory network mediated by parvalbumin (PV+) interneurons. Our previous research demonstrated that chronic methylphenidate (MPH) exposure during adolescence preferentially impairs PV+ neurons acquisition in prelimbic, with lasting effects on sustained attention behavior into adulthood, specifically during PD49-69. Given that MPH inhibits dopamine and norepinephrine reuptake blocking its receptors, we hypothesized that catecholaminergic innervation of this region, critical for executive functions, would also be influenced by the drug. To test this, we quantified changes in the fluorescence intensity of inmunoreactive axons of tyrosine hydroxylase (TH) and dopamine beta-hydroxylase (DBH) across layers I, II, III, V and VI in prelimbic, infralimbic and cingulate subregions of the mPFC. Male and female rats were classified as sign-tracker, goal-trackers or intermediate phenotype using a Pavlovian Conditioned Approach method and received 5mg/kg across different developmental stages -early (PD35-55), middle (PD42-62) and late adolescence (PD49-69). Our findings showed differences in catecholaminergic innervation across sexes, phenotypes and different layers, reflecting MPH's impact on neurodevelopment. This research was funded by MICIU/AEI/ 10.13039/501100011033 using the grant PID2023-149901NB-I00Keywords: Dopamine, adolescence, methylphenidate, tyrosine hydroxylase, prefrontal cortex

Drinking augmentation in response to illness: rats do it better

Marcial Rodríguez -Buján (Departamento de Psicología Experimental, Universidad de Granada [Campus de Ceuta])

Intake inhibition lies at the core of Conditioned Taste Aversion— all species must reject known harmful substances to prevent further intoxication. Nevertheless, animals must also have survival strategies to cope with the illness

produced by the very first ingestion of unfamiliar poisonous foods. In this regard the emetic reflex is widely considered a key mechanism for expelling toxins, but this notion is open to question given that rodents, which represent over 40% of all mammalian species, do not vomit. Therefore, from a comparative perspective, vomiting appears to be just one possible strategy for clearing the body of toxic compounds (Andrews & Horn, 2006; Garcia, 1985). It has been suggested that rats eliminate poisonous substances through urination by increasing fluid intake (Smith et al., 1970), and some experiments have also shown that they attempt to relieve gastric discomfort by overdrinking (Symonds & Hall, 2002). Our findings do support these assumptions. Following administration of lithium chloride, non-deprived rats responded immediately by overdrinking, and this was followed by a sustained increase in daily fluid intake over the next 48 hours. These effects were observed across three experiments through the intake of water, a familiar salty solution, and a novel, mildly bitter quinine solution. Finally, Experiment 4 showed that daily water intake was increased for nearly a week following administration of cisplatin—the primary chemotherapy agent known to induce nausea and vomiting in cancer patients. Given that there is evidence indicating that, when exposed to an aversive stimulus, rats increase their consumption of non-aversive fluids in anticipation of the impending illness (e.g. Domjan et al., 1980), the present results will contribute to a more comprehensive understanding of CTA in rats. In addition, clinical applications for testing antiemetics, as well as the benefits of overdrinking as an adaptive alternative to vomiting, will be discussed.

Early-life parental care and maternal separation: effects on the offspring's anxiety-like behavior and alcohol consumption, in rats.

Estibaliz Muñoz Leache, MS (Euskal Herriko Unibertsitatea), M.Gabriela Chotro Lerda, PhD (Euskal Herriko Unibertsitatea), Mirari Gaztañaga Echeverria, PhD (Euskal Herriko Unibertsitatea)

Early life is a critical period for neurobehavioral development, during which parental care plays a fundamental role in shaping the offspring´s behavior. Parenting strategies can vary, from single-parent to biparental, or alloparental care (the latter provided by non-parent individuals). In biparental species, paternal care has been shown to enhance offspring survival and reduce maternal stress, while alloparental care contributes to development by relieving the caregiving burden on primary parents. Rearing conditions during early life can also function as either protective or stress-inducing factors. Evidence from both human and animal studies indicates that disruptions in maternal care—such as prolonged maternal separation—might increase anxiety-like behaviors and risk for alcohol use later in life, particularly among males. The combination of caregiving type and early-life stressors, such as maternal separation, significantly influences emotional development and behavioral outcomes. Notably, studies with rodents suggest that greater social support during rearing is linked to improved emotional regulation and reduced alcohol intake. The aim of this study was to assess the effects of different caregiving strategies (single-parent, biparental, and alloparental) and varying durations of maternal separation (0, 15, or 180 minutes) on anxiety-like behaviors and alcohol consumption. Anxiety-like behaviors were evaluated in the dam and her offspring after weaning, using three standard behavioral tests: the elevated plus maze, light-dark box, and open field test. Pups' alcohol consumption was measured during both infancy (PNDs 15–16) and adolescence (PNDs 22–23). Results indicate that pups raised under single-parent conditions displayed increased anxiety-like behavior when compared to the remaining conditions. Additionally, prolonged maternal separation (180 minutes) led to heightened anxiety responses during adolescence and elevated alcohol consumption during infancy.

Effects of acute stress on flavor neophobia and locomotor activity in wistar rats: a sex-dependent analysis

María Ángeles Cintado García, MS (Laboratory of Animal Behavior and Neuroscience, University of Seville), Daniel Santos-Carrasco, MS (Laboratory of Animal Behavior and Neuroscience, University of Seville), Lucía Cárcel, PhD (Laboratory of Animal Behavior and Neuroscience, University of Seville), Luis Gonzalo de la Casa Rivas, professor (Laboratory of Animal Behavior and Neuroscience, University of Seville)

Years ago, the exclusive use of male rodents in comparative psychology experiments was common, based on the assumption that females introduced uncontrolled variables due to hormonal changes during the menstrual cycle. This practice created a significant gap in our understanding of the psychological and physiological processes that influence the behavior of female rodents. Specifically, recent studies suggest a possible differential response to stress based on sex, with potential relevance to humans. Recognizing the importance of collecting experimental data considering sex differences, we designed a study with Wistar male and female rats focusing on three areas with documented sex-specific responses. We examined how acute stress, induced by a 5-minute forced swim test, affected flavor neophobia and locomotor activity. To this end, thirty-two rats (16 males, 16 females) were randomly assigned to control or stress groups. After forced swim test, we measure locomotor activity parameters through total activity, rearing behaviors. Neophobia was assessed by recording saccharin solution intake (0.04%) compared to baseline water consumption. The results showed that stressed females had a significant decrease in locomotor activity compared to controls, while stressed males did not exhibit changes. The analysis of neophobia revealed higher levels of neophobia in males compared to females, as well as increased neophobic responses after stress induction, but this was restricted to male rats. These findings suggest that acute stress impacts locomotor activity and flavor neophobia differently based on sex. In females, stress seems to suppress activity, possibly indicating behavioral inhibition, while in males, it heightens neophobia, potentially as an adaptive response to avoid harmful substances. This study highlights the importance of considering sex as a key variable in behavioral research and offers insights into the neurobiological mechanisms of stress and feeding behavior.

Sex-independent effects of acute stress on prepulse inhibition of the startle response: a comparative study

Daniel Santos-Carrasco, MS (Universidad de Sevilla), María Ángeles Cintado, MS (Universidad de Sevilla), Luis Gonzalo De la Casa, PhD (Universidad de Sevilla).

Deficits in prepulse inhibition (PPI) have been identified as a transdiagnostic marker in several neuropsychiatric disorders, but it remains unclear whether these deficits are inherent or modulated by factors like stress. This comparative study integrates findings from human and rat experiments to assess the impact of acute stress on startle response and PPI. In the human study, 108 healthy young adults (stress group: n=54; control group: n=54) completed either the Maastricht Acute Stress Test (MAST) or a non-stressful control task. Following the task, acoustic startle and PPI were measured using electromyographic recordings of the orbicularis oculi. Participants exposed to stress showed significantly higher startle magnitudes and reduced PPI compared to controls (PPI: Stress = 38.95%±15.04; Control = 46.18%±16.48; $F(1,104)=8.99$; $p<.01$, $\eta p^2=.08$). In a parallel rat study, 48 Wistar rats (24 males, 24 females) underwent acute stress via forced swim or inescapable footshocks, alongside a non-

stressed control group. PPI was assessed with a 120 dB pulse preceded by a 90 dB prepulse at 60 and 120 ms intervals. Both stress paradigms led to a significant PPI reduction compared to controls (Control = 42.18%±16.47; Swim = 11.01%±24.56; Footshock = 11.46%±8.19; F(2,41)=14.96; p<.001, ηp^2=.42). No group differences were found in rats' baseline startle magnitudes. Overall, our cross-species approach shows that acute stress disrupts sensorimotor gating. In humans, increased startle and reduced PPI suggest heightened threat reactivity. In rats, consistent PPI impairment—regardless of sex—supports the translational value of PPI as a marker of stress-related neural dysfunction. These results highlight stress as a key modulating factor in neuropsychiatric conditions and suggest the observed pattern may reflect an adaptive response to potential threats.

07:45 -:
SOCIAL EVENT

Traditional Basque Txuleta menu at Saizar Sargardoa

All registered attendants and their accompanying persons.

Friday, October 3, 2025

09:00 - 10:00:
INVITED ADDRESS

The role of noradrenaline in updating of previous learning following changes in reward.

Laura Corbit

Refining previous learning when environmental contingencies change is a critical adaptive function. Studies from our lab have shown that systemic noradrenaline (NA) manipulations, as well as optogenetic manipulations of the locus coeruleus (LC), the primary source of forebrain NA, can strengthen long-term retention of appetitive extinction. To determine whether the contribution of NA is specific to extinction or extends to other forms of learning where reward is less than expected, we suppressed LC activity with clonidine, an a2A-adrenergic receptor agonist, in two tasks: compound extinction, where two previously rewarded cues are presented together and no longer rewarded, and overexpectation, where animals are presented with two previously rewarded cues but receive a single reward rather than the expected two. In compound extinction, we found no differences between groups in training, extinction, or a spontaneous recovery test. However, animals that received clonidine reacquired responding to the previously extinguished cue significantly faster than saline-treated animals, suggesting weakened extinction learning. In overexpectation testing, the saline group responded significantly less to a stimulus that had undergone overexpectation relative to a control stimulus, indicating that they had recalibrated their estimation of reward magnitude following training where reward was less than expected. In contrast, clonidine-treated animals did not differ in responding to the overexpectation versus control stimuli, suggesting that clonidine impaired learning resulting from overexpectation. These results demonstrate that activity of the LC

is important for learning to reduce responding in both extinction and overexpectation paradigms. Finally, to test whether LC activity is sufficient to drive learning even when there is no change in reward we used the blocking paradigm. While control in control subjects, introduction of a novel stimulus alongside a well-trained stimulus resulted in little learning, if the LC was optogenetically stimulated during these trials, there was improved learning about the novel, redundant stimulus. Together, these results demonstrate that the LC and forebrain noradrenaline contribute to learning across a broad range of conditions. Particularly under conditions where learning may usually be weak, augmenting noradrenergic activity can improve learning. These methods may be useful for promoting behaviour change

10:00 - 11:00: SESSION 7
COMPUTATIONAL APPROACHES

Chair: Armando Machado (University of Aveiro)

This session delves into computational modeling of learning and memory, including formal analyses of SOP, Markov processes, and probabilistic learning in both humans and animals.

Classical conditioning as multiple semi-markov process structure learning (msmp-sl)

Sean Risoli, BSc (University of Nottingham), Charlotte Bonardi, PhD (University of Nottingham), Ryan Ward, PhD (University of Otago), Brent Alsop, PhD (University of Otago).

Computational accounts of classical conditioning have long been of interest to researchers working within the field of associative learning. To date, all models suffer from key limitations which either renders them incapable of accounting for seminal findings, or necessitates an inordinate number of free parameters to work adequately. Here, we propose a new computational model of classical conditioning, called 'Multiple Semi-Markov Process Structure Learning'. It is based upon the statistical inference of sets of independent Semi-Markov Processes; the number of which and the parameters governing each process are assumed to be unknown. Hence, we have called this novel statistical framework 'Multiple Semi-Markov Process Structure Learning' (MSMP-SL). The model is a 'real-time' algorithm; that is, it simulates the behaviour of animals and the computations hypothesised to generate them as events unfold in time. MSMP-SL can reproduce 40+ phenomena and counting, including the majority of key results in classical conditioning related to acquisition, extinction, cue-competition, compound conditioning, response timing and higher-order conditioning. Most importantly, the algorithm works 'out of the box' with no free parameters on authentic experimental protocols. It is argued that MSMP-SL is a serious contender for the state of the art in computational theories of classical conditioning.

Computational underpinnings of probabilistic reversal learning in children with attention-deficit/hyperactivity disorder.

Pilar Fernández-Martín, PhD (Universitat de les Illes Balears), José J. León, PhD(Universidad de Málaga), Darío Puertas-López, BSc (Universidad de Almería), PilarFlores, PhD (Universidad de Almería)

Many educational and therapeutic programs use reward-based strategies, providing positive reinforcement for desired behaviors and withholding it for undesired ones, to shape children's actions. Children with ADHD often display an atypical motivational profile: they are driven toward immediate rewards and less responsive to negative outcomes. Such alterations in feedback processing may contribute to core ADHD symptoms, underscoring the need for objective, computational measures of individual sensitivity to positive and negative feedback. In the present study, we aimed to compare the computational mechanisms underlying probabilistic reversal learning in children with ADHD versus typically developing peers. 93 children aged 7–16 (45 ADHD; 48 controls) completed a probabilistic reversal learning task (80% correct/20% error). We fit a reinforcement learning model to each child's choices to estimate reward learning rate (α_r), punishment learning rate (α_p), inverse temperature (β), and stickiness. Compared to controls, children with ADHD showed lower α_r and α_p—indicating slower updating from both positive and negative feedback—and higher stickiness, reflecting a stronger tendency to repeat previous choices. In traditional metrics, they exhibited reduced win-stay yet greater perseveration after reversals, suggesting they both explore new options even after success and have difficulty abandoning formerly rewarded responses when contingencies change. These findings reveal a distinct motivational-learning profile in ADHD: dampened feedback updating combined with inflexible response repetition. Reinforcement-learning parameters thus offer objective markers to personalize educational and clinical interventions based on each child's feedback-sensitivity profile. Funded by the Spanish Ministry of Science and Innovation (PID2023-147063NB-I00/AEI/10.13039/501100011033) and PPIT-UAL, Junta de Andalucía-ERDF 2021-2027, Objective RSO1.1. Programme: 54.A.

Recognition of serially presented items: an sop analysis

Charlotte Bonardi (University of Nottingham) Jasper Robinson (ex-University of Nottingham) Kirsty Woodward (University of Nottingham)

Recognition memory is a fundamental component of human cognition, widely studied in both animals and humans. We have adopted a theoretical account of recognition memory phrased in terms of Wagner's (1981) SOP model of associative learning (Robinson & Bonardi, 2015). This account employs a behavioural definition of recognition, which it explains in terms of associative learning principles. The present experiment applied this analysis to an eyetracking task in which human participants were presented with a six-item sequence of pairs of images (AA, BB, CC, DD, EE, FF), before being tested with either A & F, B & E, or C & D. Based on SOP's principle of self-generated priming (according to which a recently-presented image is processed, and responded to, less effectively than one less recent) SOP predicts that participants should tend to look at the less recent image in each test pair (A, B, C) and that this relative recency effect should be strongest with A F, and weakest with C D. The results will be discussed in terms of SOP, and in relation to other work that has failed to find such an effect (Barker et al., 2019).

Data-driven approach to decision making in the impulsive-compulsive spectrum

Neus Ibáñez Sempere, PhD Student (Universidad de Almería), Rocío Rodriguez Herrera, PhD Student (Universidad de Almería), Pilar Fernández Martín, PhD(Universidad de las Islas Baleares), José Juan León Domene, PhD (Universidad de Málaga), Ana Sánchez Kuhn, PhD (Universidad de Almería), Pilar Flores Cubos PhD (Universidad de Almería).

Traditional diagnostic criteria often fail to capture the neuropsychological variability found within and beyond disorders, including Attention Deficit Hyperactivity Disorder (ADHD) and Obsessive-Compulsive Disorder (OCD). Both are associated with impulsive choice and neural dysfunction in decision making and reward processing. This study adopts a transdiagnostic, data-driven approach to examine risky decision making in individuals with ADHD, OCD, and no diagnosis using the Iowa Gambling Task (IGT). A total of 145 adults completed the IGT, along with tasks assessing inhibitory control (Stop Signal Task) and contingency-based flexibility (Probabilistic Reversal Learning Task). Resting-state functional connectivity (rsFC) was measured using functional Near-Infrared Spectroscopy (fNIRS), focusing on frontoparietal regions: dorsolateral prefrontal cortex (DLPFC), orbitofrontal cortex (OFC), and posterior parietal cortex (pPC). Consistent with previous findings, no significant group-level differences in IGT performance were observed. However, clustering analyses identified three behavioral profiles—learners, explorers, and exploiters—that cut across diagnostic categories. Learners showed better inhibitory control than exploiters, while no significant differences in flexibility were found. On a neural level, rsFC differences emerged especially between explorers and exploiters, involving the rDLPFC, lOFC, and lpPC, regions linked to reward and cognitive control. These findings support a dimensional view of decision making beyond diagnostic categories. Variability in impulsivity and reward sensitivity may be better captured through transdiagnostic, data-driven methods. Integrating behavioral tasks with rsFC and clustering analyses may help identify relevant subgroups and guide more personalized interventions. This work was funded by the Ministry of Science, Innovation and Universities (PID2023-147063NB-100) and PPIT-UAL, Junta de Andalucía FEDER 2021–2027, Program: 54.A.

The ontological foundations of information: associative substrates as the emergent origin of shannon's metrics

Gabriel Rodríguez, PhD (University of the Basque Country)

Classical information theory defines information gain through conditional probabilities, but does not explain how these probabilities emerge in real physical or cognitive systems. In this paper, I present a mathematical framework that demonstrates that Shannon probabilities necessarily arise from associative learning mechanisms. I present three theorems: (1) Necessity: Associative states are required to estimate conditional probabilities consistently, since without them the Neyman-Fisher principles of statistical sufficiency are violated; (2) Sufficiency: Associative updates (e.g., via prediction error) generate information gain $\Delta I \neq 0$; and (3) Capacity: Relational diversity in associative graphs imposes structural limits on informational capacity, quantified by new, more versatile metrics for associative networks. I present additional computational simulations that confirm that associative weights effectively converge to conditional probabilities. This approach contributes to unifying the fields of associative learning and information processing, providing mechanistic foundations for Shannon's theory with direct implications for cognitive models and the optimization of artificial intelligence systems.

11:00 - 12:00:
POSTER SESSION 3

1: Aged pigeons are impaired at the midsession reversal learning task

Mary Flaim, Gianmarco Maldarelli, Laura Zander, Tobias Otto, & Onur Güntürkün (Ruhr University Bochum: All Authors)

Abstract: Aging is related to impairments in inhibition and timing in mammals. To test both cognitive abilities simultaneously in pigeons, we used a midsession reversal learning task. In this task, there are two stimuli; one is followed by a food reward after pecking (S+) and the other is not (S-). Halfway through the session, the contingencies are reversed such that the S+ is now the S-. The stimuli are presented successively, so only one stimulus is on the screen at a time. Previous research with pigeons has shown that pigeons make anticipatory errors before the reversal, errors of timing, and preservatory errors after the reversal, errors of inhibition. After subjects are experienced with the task, performance resembles a psychometric curve, with errors evenly distributed before and after the reversal. We predicted that older pigeons would take longer to learn the task and that performance could be impaired due to timing, inhibition, or both. Preliminary results from 2 young and 3 old subjects, who trained for 50 sessions, indicates that older subjects were impaired at the task and needed more sessions before the typical learning curves emerged. Pigeons made both types of errors, but older pigeons continued to make a high number of anticipatory errors throughout the sessions. We plan on administering the behavioral paradigm to additional subjects until there are 12 pigeons in each group. Further, we will investigate the density of dopamine receptors (D2) in the hippocampus to see if it is correlated with performance.

2: Application of the procedure of differential consequences to improve the recognition of emotional facial expressions using a task in 3D format

Gemma, Quirantes Gutiérrez, Pdh Student, University of Zaragoza Ginesa Ana López Crespo, PhD, University of Zaragoza

Abstract: The recognition of emotional facial expressions is an essential skill for social interaction. Previous studies suggested that clinical and subclinical populations such as those diagnosed with schizophrenia or autism spectrum disorders (ASD), as well as those with high levels of schizotypy or broad autism phenotype (BAP) traits may have difficulties in facial emotion recognition. This deficit could explain difficulties in achieving an adequate social functioning. Given the importance of this type of social functioning, in these populations and others, we aim to explore the use of a training videogame to improve the facial emotional recognition process. Furthermore, the study aims to test if facial emotion recognition improves after applying the Differential Outcomes Procedure (DOP). This approach involves providing specific consequences for correct responses to a stimulus. To achieve this, sixty-four participants first completed a baseline facial emotion recognition task without reinforcement. They were then divided into two groups: the experimental group received the DOP, where each emotion was paired with a specific reinforcer, while the control group completed the task with random reinforcers. The results showed that applying the DOP significantly improves emotional recognition, indicating its usefulness as a training tool. We believe this study opens a new line of research with promising clinical implications for the development of assessment tools and training programs.

3: Are all devaluation methods equivalent? A study using Conditioned Taste Aversion by oral administration of lithium.

Ana González, PhD, (Centro de Investigación Mente Cerebro y Comportamiento (CIMCYC). Departamento de Psicología Experimental.Universidad de Granada) & Isabel de Brugada, PhD/Professor (Centro de Investigación Mente Cerebro y Comportamiento (CIMCYC). Departamento de Psicología Experimental.Universidad de Granada)

Abstract: The Flavor Preference Learning paradigm involves pairing a neutral flavor cue, as vainila (CS+) with a preferred taste, as sucrose (US), resulting in a conditioned preference for the CS+. Traditionally, this phenomenon has been interpreted as a case of Pavlovian learning, in which an association between the representations of both stimuli underlies the conditioned preference (stimulus-stimulus; S–S). Previous work conducted in our laboratory demonstrated that overtraining, unlike standard training procedures, promotes stimulus–response (S–R) learning. Overtrained rats exhibited a conditioned preference that was unaffected by devaluation of the US through a Sensory-Specific Satiety procedure. In the present study, we investigated whether similar effects would occur when a different devaluation method was employed. A Conditioned Taste Aversion procedure was carried out in which sucrose (US) was devalued by pairing it with oral lithium. Contrary to expectations, the results revealed that, although a robust devaluation effect to US was observed, with a clear preference for water over sucrose in a choice test, this did not affect the acquired preference for CS+, which was manifested independently of the type of training (short or extended).The possible mechanisms to account for the absence of the devaluation effect following oral lithium administration are discussed, in contrast to injection-based administration, where such effects have been reported in previous studies. This work was supported by the project PID2022-136219NB-I00 funded by MICIU AEI/ 10.13039/501100011033 and by "ERDF A way of making Europe."

4: Assessing the effect of food specific devaluation on attention to food brand logos

Irene Ruiz, MS (University of Granada), Ana González, PhD (University of Granada), Isabel de Brugada, PhD (University of Granada).

Abstract: In the environment, we are exposed to cues such as logos that signal the availability of highly caloric food. Through associative learning, these cues can predict the presence of food and motivate consumption. With repeated exposure, they may elicit automatic responses of food seeking and consumption, leading to habit formation. In a previous study, we found that food logos captured attention similarly to food images, even in the absence of hunger – suggesting an automatic response. However, when food was specifically devalued through an aversive conditioning task, the results did not seem to support this hypothesis. To further explore this, we conducted two experiments examining how the specific devaluation of food influences attentional capture by food logos. In Experiment 1, we measured attentional capture to food logos before and after specifically satiating the food they are paired with. Experiment 2 was conducted online and consisted of measuring attentional capture by food logos after a specific devaluation procedure using in this case an aversive conditioning. The devaluation procedure consisted of pairing images of food with either negative (unclean toilets; EC+) or neutral pictures (landscapes; EC-). In both experiments, attentional capture was measured using an odd-one-out task, comparing reaction times between food-related and neutral cues, and questionnaires were administered to assess changes in the hedonic properties of the cues (liking and wanting). Both experiments failed to show the basic attentional capture effect for food-related cues. However, we found a decrease in wanting for both the food images and their associated logos after the devaluation, which seems to indicate a reduction in the motivational value. In summary, the findings from both experiments were inconclusive, suggesting the need for a more sensitive task to effectively identify attentional bias and more precisely investigate how environmental cues impact eating behavior

5: Beyond mediation: The direct effect of expectations on the illusion of control.

Carlos M. Vera, MS (UNED), Pedro R. Montoro, PhD (UNED), Cristina Orgaz, PhD (UNED), Carmelo Pérez-Cubillas, PhD (UAM) and María José Contreras, PhD (UNED)

Abstract: How do our prior beliefs influence our judgments (if at all)? This study uses an expectation-inducing task to assess the influence of prior expectations on efficacy judgments in an illusion of control task. The study was conducted online with 150 psychology undergraduate students. The experiment used a between-subjects design. Participants were assigned to one of two groups, with each group being exposed to either a low or high level of expected efficacy. Following the expectation-inducing task, participants performed a standard associative learning task often used to assess the illusion of control. Interestingly, the effect of group assignment influenced the contingency judgments provided by the participants in the standard task both directly and indirectly through impact on their behavior. Although the indirect effect had been reported in previous illusion of control research, the direct effect of expectations in contingency judgments using casual mediation assessments is a novel result.

6: Comparing Multiple-Schedule and Single-Component Procedures in the Time-Diminishing Returns Task

Pedro Vidal, PhD (Universidad Autónoma de Madrid), Ricardo Pellón (UNED)

Abstract: This study examines impulsivity and self-control using the Time-based Diminishing Returns (DIM) task, a paradigm that offers greater ecological validity than classical delay-discounting tasks by more closely simulating complex decision-making scenarios. In the DIM task, selecting an initially disadvantageous alternative under reset conditions can yield long-term benefits, whereas consistently choosing the less-delayed option leads to a lower overall reinforcement rate. In the reset condition, rats choose between a lever with a progressive delay (PD) and one with a fixed delay (FD). The PD increased with each press but could be reset to its minimum value by pressing the FD lever. In the no-reset condition, the PD increased in the same way, but pressing the FD lever did not reset it. The optimal strategy differed markedly between conditions. In the reset condition, the optimal strategy involves pressing PD and waiting for a larger delay before resetting PD well before reaching the equality point. In contrast, in the no-reset condition, the optimal strategy is to use the PD lever only until its delay match the FD, and then switch permanently to the FD lever. The primary objective of this experiment was to compare a multiple-schedule procedure with a single-component procedure. The goal was to determine if the multiple-schedule design, which offers significant practical advantages, could be implemented without producing confounding behavioral contrast effects. To this end, twenty Wistar Han rats were divided into two groups. The first group (n = 10) was exposed to alternating reset and no-reset conditions within the same session to test for potential within-session contrast. The second group (n = 10) served as the comparison, experiencing the two conditions (counterbalanced). In this group, five rats were exposed to the reset condition first, followed by the no-reset condition, while the remaining five experienced the conditions in the reverse order.

7: Divergent paths in causal illusion formation and revision under null contingency

Itxaso Barberia, PhD (Universitat de Barcelona), Josué García-Arch, PhD (Universitat de Barcelona), Javier Rodríguez-Ferreiro, PhD (Universitat de Barcelona)

Abstract: Under null cue-outcome contingency trainings in which both the cue and the outcome occur at a high rate, erroneous causal beliefs (causal illusions) develop easily but disappear with great difficulty. This is shown by just slight group-level decreases on the formed illusions when the amount of training is unusually lengthy and participants are tested at multiple times along the way (Barberia et al., 2019). Here, we investigate whether this modest correction observed at a group-level responds to some individuals being particularly "persistent" in their illusions, while others "adjusting" them in the light of additional contrary evidence. In a pre-registered online experiment, 300 participants were exposed to three blocks of 48 trials, each involving a zero cue-outcome contingency, and including a testing period after each block. We applied k-means longitudinal clustering on the evolution of causal ratings across tests, which resulted in a winning solution based in two clusters, i.e., a "persistent" cluster that did not modify their causal ratings, and an "adjusting" cluster that showed a significant decrease. Crucially, clusters differed in a) their estimation of the probability of the outcome occurring in the absence of the cue, b) their apparent use for causal inference of the estimated probabilities of the outcome occurring in the presence and absence of the cue, and c) their information search strategy when they were given the option of deciding whether to introduce the cue or not at a last (fourth) active block of learning trials. Our results suggest that differential sensitivity towards causal illusions might operate at the levels of the encoding of information, the integration of that information into a causal rating, and the information gathering process when the learning contexts become active.

8: Mechanisms Underlying the Comparison Process in Humans and Animals

Jesús Sánchez, PhD (Universidad de Granada & Universidad San Jorge), Ana González, PhD (Universidad de Granada), Marta Gil, PhD (Universidad de Granada), Isabel de Brugada, PhD (Universidad de Granada).

Abstract: Perceptual learning refers to the improvement in discrimination between similar stimuli (e.g., AX and BX) by prior exposure to them. Situations that promote a comparison, such as an Intermixed exposure (AX-BX-AX-BX...), have been found to result in increased perceptual learning compared to situations that don't, such as Blocked exposure (AX-AX...BX-BX...). It has been suggested that rapid alternation of stimuli leads to short-term habituation of common elements (X), allowing processing resources to be focused on unique ones (A and B). This processing bias associates the subfeatures that compose each unique element into a high-quality representation (i.e., A=a1-a2-a3-a4...), which improves discrimination (Ax vs Bx) but reduces its associability (St ≠> Ax). We will assess in two experiments these mechanisms as underlying the comparison process in perceptual learning and as being shared across species. Experiment 1 preexposed rapidly, Intermixed or Blocked, similar beverages to rats in the laboratory and similar butterfly images to humans in a computer task. In both procedures, the Intermixed stimuli resulted better discriminated than the Blocked ones. In Experiment 2, after the same preexposure, we conditioned the unique element of the stimuli (e.g., A) with a proximal event: the appearance of discomfort after drinking in rats and the appearance of an egg after butterflies in humans. As a result, the unique Intermixed elements were less predictive than the Blocked ones, indicating lower associability. These findings together support the mechanisms of short-term habituation and unitization as promoters of better discriminated stimuli during the comparison process. Moreover, these mechanisms appear to be common in humans and animals.

9: Persistence of incentive salience: Devaluation of Pavlovian to instrumental transfer (PIT) and reversal of value modulated attentional capture (VMAC)

Francisco Garre-Frutos, PhD candidate (Universidad de Granada), Adriana Ariza, PhD candidate (Universidad de Granada), Felisa González, PhD (Universidad de Granada)

Abstract: In two online experiments we investigated the role of Pavlovian control in both attentional prioritization and instrumental performance. Reward-related stimuli can acquire informative or predictive value, signaling the availability of an outcome, but they may also acquire incentive value, capturing attention in a largely automatic manner ("attentional habit"). Value-Modulated Attentional Capture (VMAC), proposed as a human analog of attentional sign-tracking, refers to the phenomenon where task-irrelevant distractors that signal high-value outcomes receive higher attentional priority compared to low-value distractors, even when this is counterproductive for the participant's goal (e.g., responding quickly and accurately to earn more points). Previous studies have shown that, once learned, VMAC can persist even when the outcome is completely omitted in a subsequent phase. Reward cues may also trigger approach responses and reward-seeking behavior in instrumental contexts, biasing action selection toward the choice alternative associated with the same outcome; an effect known as Pavlovian-to-instrumental transfer (PIT). In two online experiments, we examined the persistence of VMAC (following reward-omission in Exp. 1 and reversal learning in Exp. 2) and the influence of outcome

devaluation on PIT across both experiments. Our results indicate that both VMAC and PIT are relatively sensitive to changes in the contingency between cue and reward magnitude and in outcome value, respectively, suggesting that these processes may be more flexible than previously assumed. Funding: MCIN/AEI/https://doi.org/10.13039/501100011033, #PID2021-127985NBI00.

10: Retrieval Practice: Effect Stability of and its Relationship with Anxiety

Nataliya Dianova, MS (Universidad del País Vasco), Yeray Mera, PhD (Universidad del País Vasco) & Eugenia Marín-García, PhD (Universidad del País Vasco)

Abstract: Interleaving tests during study sessions significantly improves learning and long-term memory compared to repeated study, a learning strategy referred to as retrieval practice. Despite extensive research on this phenomenon, it is still unclear whether the magnitude of the testing effect is stable or increases with the number of testing cycles, nor there is a consensus on the relationship between the test effect and anxiety. In this study we compared four groups exposed to different numbers of learning cycles (6, 12, 18) and different learning experiences: the test group, with interleaved tests between study rounds, and three study groups, with only repeated study. During the study cycles, 60 Swahili-Spanish word pairs were studied. During the test cycles, cue-recall tests were performed with Swahili word pairs followed by the first letter of the corresponding Spanish target word. The percentage of correctly recalled words and anxiety level were measured. The final scores of each study group were compared with the corresponding test group scores using t-test analysis. Furthermore, the effect sizes (Cohen's d') from these t-tests after 6, 12, and 18 learning cycles were compared by calculating confidence intervals. Results showed an upward trend of the effect size based on the number of learning cycles, although this trend was not statistically significant. The differences in final recall between the study and test groups cannot be explained by trait anxiety as there were no statistically significant differences in trait anxiety between groups. Furthermore, the results showed that state anxiety was reduced with retrieval practice only after 18 learning cycles. Thus, trait anxiety does not significantly affect retrieval practice benefits and test related state anxiety can be softened practicing testing during learning but with high number of study-test cycles.

11: Self- and Retrieval Priming as Constituent Processes of Recognition Memory

Kirsty Woodward (University of Nottingham)
Jasper Robinson (former University of Nottingham)
Charlotte Bonardi (University of Nottingham)

Abstract: Recognition memory is a key cognitive function, and can be defined as a weaker behavioural response to a familiar than to a novel item. It is often studied using variants of the SOR (spontaneous object recognition) task in which, after exposure to item A, a test is given with familiar A and a novel B. The Sometimes Opponent Process (SOP; Wagner, 1981) theory explains SOR performance in terms of two component mechanisms: Self-Generated Priming (SGP) – in which recently encountered stimuli are processed less effectively than more distant cues – and Retrieval-Generated Priming (RGP), in which processing of a stimulus is reduced when it is associatively retrieved. To investigate whether the interaction between these two mechanisms accords with the predictions of SOP, this study employed an eye-tracking analogue of the SOR paradigm, the Visual Paired Comparison task (VPC), in which recognition is measured as greater visual exploration of a novel than a familiar image (Nitka et al., 2020). The study employed variants of the SOR task, Relative Recency (RR) and Object in Place (OIP), which can independently assess the effects of SGP and RGP respectively. In addition RR+OIP and RR-OIP variants were employed, in which the two effects may add or subtract from each other. In order to avoid the possibility that performance was verbally mediated, different sets of AI-generated images, each of which were variations on the same verbal theme, were generated for each trial. The results will be discussed in terms of the SOP analysis.

12: Starlings in the MidSession Reversal Task: Unraveling Temporal Control by Training and Testing with Equal Reinforcement Rate

Alejandra Salinas, MSc (University of Aveiro), Marco Vasconcelos, PhD (University of Aveiro), Armando Machado, PhD (University of Aveiro)

Abstract: Understanding the variables that guide behavioral flexibility in animals requires isolating the cues they rely on to adapt to changing contingencies. The MidSession Reversal Task provides a valuable framework, as it requires animals to detect a reversal in reinforcement contingencies midway through a session— shifting from one rewarded stimulus to another. In this experiment, we investigated whether starlings' reversal behavior is primarily governed by timing mechanisms or by reinforcement-based feedback or counting. Twelve starlings were trained on a probabilistic version (reinforcement probability= 0.333) of the task with a variable interval intertrial (T: 15s on average) and later tested under conditions in which trial density was manipulated (T/2 and T*2), while reinforcement rate was held constant (at approximately two food pellets per minute). Results revealed that several birds switched preference based on time into the session. However, other birds showed adjustments in their preference reversal based on local cues, while others exhibited mixed strategies. These findings suggest that when the time rate of reinforcement is held constant but trial

density changes, starlings increasingly rely on elapsed time to guide their preference reversal.

13: The impact of affective conditioning and contingencies on generalization gradients

José A. Alcalá, PhD (Universidad Rey Juan Carlos), Celia Martínez-Tomás, MS (Universidad Complutense de Madrid), Gonzalo P. Urcelay, PhD (University of Nottingham), José A. Hinojosa, PhD (Universidad Complutense de Madrid)

Abstract: Generalization—the process of transferring knowledge from previously learned associations to novel but related stimuli—is fundamental to adaptive behavior. While generalization has traditionally been studied through perceptual similarity, recent evidence suggests that affective dimensions also play a crucial role in shaping generalization. However, the extent to which specific affective properties of stimuli influence generalization responses remains largely unexplored. To further advance this understanding, we investigated how affective conditioning (positive vs. negative) interacts with learning contingencies (deterministic vs. probabilistic reinforcement) in shaping generalization gradients. Four hundred fifty participants completed a predictive online discrimination learning task, in which an image of extreme valence was paired with a congruent outcome, serving as the CS+, while an opposite-valence image served as the CS−. We manipulated the polarity of conditioning (positive: positive images paired with a positive outcome; negative: negative images paired with a negative outcome) and the reinforcement schedule (deterministic: the CS+ was always followed by the outcome; probabilistic: the CS+ was followed by the outcome on one-third of the trials). Subsequently, a generalization test was conducted using novel images that varied systematically in affective valence. Results revealed a significant interaction between valence and contingency: negative stimuli were resistant to the effects of degraded contingency, producing steeper generalization gradients. In contrast, positive conditioning yielded broader gradients. These differences were especially pronounced for stimuli with ambiguous affective content. Overall, the findings highlight the importance of specific affective features in generalization processes and are discussed in light of associative learning and emotion theories. This research was funded by grant PID2023-149631NA-I00 from the Spanish Ministry of Science, Innovation and Universities.

14: When Perception Conditions Learning: Exploring the Generalization Gradient in Racial Stimuli

Nadia Loulidi Fernández, graduate student (Complutense University of Madrid), José Antonio Hinojosa Poveda, senior lecturer (Complutense University of Madrid), José Alcalá Martín, PhD (Rey Juan Carlos University).

Abstract: Generalization allows the transfer of responses learned with previously conditioned stimuli (CS+) to novel stimuli in the environment, also known as Generalization Stimuli (GS). A wealth of research has attributed generalization to perceptual similarity with the CS+, reflecting a decrease in response as similarity decreases (i.e., generalization gradient). However, in humans, it also occurs along conceptual dimensions (e.g., affective dimension). Race is complex variable where both dimensions converge, and despite its relevance in social interactions, it constitutes an unexplored dimension. 70 self-identified white participants conducted an online experiment. Participants performed a discrimination learning task in which they had to predict whether the faces corresponded to a person who had posted an insult on a social media site (CS+) or not (CS-). The face group was conditioned with two average faces of a black and a white male (counterbalanced), whereas a control group was conditioned with stimuli without facial information but equivalent in skin colour to the experimental stimuli. After training, the generalization response was explored with 4 GS varying in skin colour. The results of this study showed a linear generalization gradient based on the colour of the face; critically, there was an overall tendency to generalize more when the CS+ was a black face. Furthermore, participants in the face group were better at discriminating between the GS compared to the control group. Taken together, these findings highlight the role of learning in the genesis and maintenance of racial prejudice, and thus, the need to integrate learning models so as to develop effective interventions against racial discrimination.

12:00 - 13:00: SESSION 8
LEARNING ACROSS SPECIES

Chair: Gabriel Rodriguez (University of the Basque Country, (UPV/EHU))

A cross-species examination of learning and cognition, from crickets and giraffes to earthworms and AI, emphasizing comparative methodology and the universality of cognitive biases.

Evaluating recognition memory in earthworms (dendrobaena veneta) using olfactory-based paradigms.

Concepción Paredes-Olay, PhD (Unversidad de Jaén), M. José F. Abad, PhD (Universidad de Jaén), Charlotte Bonardi (University of Nottingham), Sergio Iglesias-Parro, PhD (Universidad de Jaén)

Recognition memory has been extensively studied in rodents, where it is considered an indicator of relatively advanced memory processes related to episodic memory, which depend on specific brain structures such as the hippocampus. Despite its apparent complexity, there have recently been proposals that this recognition processes could also occur in species with simpler nervous systems. This study examines recognition memory in earthworms (Dendrobaena veneta) using two established behavioural paradigms: the spontaneous object recognition task and the relative recency task. In the first experiment, a modified version of the spontaneous recognition task was employed using olfactory stimuli. Earthworms were exposed to the same odour in opposite corners of a rectangular arena. During the test phase, one odour was replaced with a novel odour, and the time spent exploring each corner was recorded. The second experiment involved the relative recency task: subjects were sequentially exposed to two distinct odours, which were then presented simultaneously in opposite corners during the test phase. Recognition memory in this task is inferred if the subject spends more time exploring the first encountered odour. Positive results were obtained, and the potential of associative learning models to explain recognition-like behaviours in invertebrates was discussed. This study contributes to our understanding of memory mechanisms in non-traditional model organisms, supporting a comparative approach to the study of cognition across species.

Giant mathematicians: giraffes (giraffa camelopardalis) can add but not subtract

Iker Loidi Vadillo, PhD (Universitat de Barcelona), Jordi Galbany, Lecturer (Universitat de Barcelona), Federica Amici, Lecturer (University of Leipzig, Max Planck Institute), Pilar Padilla Solé, Chief Mammal Technician (Barcelona Zoo), Álvaro L. Caicoya, Postdoc (Research Institute for Farm Animal Biology).

Arithmetic reasoning involves mentally representing and manipulating quantities to make numerical decisions. While this ability has been observed in various species, ungulates have been largely ignored. This study is the first one to assess arithmetic competence in giraffes (Giraffa camelopardalis). Across 1088 trials, four captive subjects participated in three experimental tasks. To succeed, giraffes had to choose which of two yellow containers held more carrot pieces after we changed the quantities using a third, green container. The containers were designed so that only the experimenter could see inside once they were closed, allowing us to move the items without the animals seeing the final outcome. In the Addition task, items were added from the green container to a yellow one. In the Subtraction task, items were taken from a yellow container to the green one. In the Subsequent Events task, both actions were subsequently combined: items were removed from one yellow container and then added to the other, requiring subjects to mentally track both steps. We included two control tasks to test quantity discrimination without manipulations, using only the two yellow containers. In the Visual Open task, quantities were visible at choice; in the Visual Closed task, containers were closed before the choice. Results showed that giraffes performed above chance in Addition and both control tasks, but their performance fell at chance levels in the other two tasks. Additionally, performance was significantly better in Addition and controls than in

Subtraction. Further analyses suggested that while two individuals might have relied on simple heuristics (i.e., "choose the dish touched by the observer") to solve the tasks, the other two succeeded even when this strategy wouldn't work, indicating the possible use of more complex mental computations. These results support the idea that ungulates may possess more advanced cognitive abilities than previously thought.

Heuristics and biases in artificial intelligence: anchoring and contrast effects in large language models like chatgpt. implications for comparative psychology

Fernando Rodríguez San Juan, PhD (Universidad del País Vasco); Xabier Bereciartu Dorronsoro, (Undergraduate); Paula Blázquez Roldán (Undergraduate).

This study experimentally examines the potential presence of cognitive biases and heuristics in the decision-making processes of large language models (LLMs). By designing and implementing original prompts, we evaluated the extent to which widely used LLMs, such as ChatGPT, reproduce systematic patterns or errors, such as anchoring bias or contrast effects, when performing tasks that involve automated judgments across different application domains. In recent years, LLMs have been progressively integrated into various sectors of society, including healthcare, justice, and education, where they are increasingly entrusted with responsibilities requiring expert advice and complex decision making. Despite their growing technical sophistication, evidence suggests that these models may exhibit heuristic and biased reasoning patterns similar to those observed in human cognition, raising fundamental concerns about the reliability and fairness of their outputs. It is therefore essential to understand more deeply the heuristic mechanisms that can emerge independently of training data, namely, those arising from the functional architecture and operational processes of LLMs during information processing. Determining the extent to which these reasoning patterns mirror human cognition can enrich our understanding of comparative cognition across natural and artificial systems. The results of this work indicate the presence of heuristics and biases in LLMs, such as anchoring and contrast effects, in a range of scenarios, including clinical psychological assessment. The presence and magnitude of these effects vary depending on the specific large language model under test.

Overview of learning and memory in the cricket gryllus bimaculatus

Kanta TERAO, PhD (Shimane University)

For over a century, insects have served as invaluable models in biological research, offering insights into behavior, physiology, and neurobiology. Within this domain, the study of associative learning has traditionally been dominated by two key species: the fruit fly, Drosophila melanogaster, for its genetic tractability, and the honeybee, Apis mellifera, for its repertoire of social behaviors and robust learning paradigms. However, to fully understand the principles and evolution of learning and memory, it is crucial to investigate a broader range of species. In recent decades, the field cricket, particularly Gryllus bimaculatus, has emerged as a new model organism of learning and memory that bridges a gap between these models. Here I would like to present the extensive body of research on classical conditioning in the cricket. It begins by outlining the foundational behavioral paradigms and the distinct memory phases they produce. It then explores the associative learning process observed in crickets, the theoretical frameworks that best describe it, and the specific neurochemical systems that govern it. Furthermore, the molecular pathways and neural architecture related to learning and memory are discussed. Through this comprehensive analysis, I aim to establish the cricket's position as a cornerstone model for modern

neuroethology, revealing fundamental principles of learning and memory that are both conserved across and divergent among animal phyla.

Study of the exploratory behaviour in the snail cornu aspersum

Iria Prieto Araújo, MS (University of Oviedo), Héctor Martínez García, MS (University of Oviedo), Félix Acebes Andreu, MS (University of Oviedo), Ignacio Loy Madera, Professor (University of Oviedo).

Using Pavlovian Conditioning of the Tentacle Lowering, several complex learning phenomena have been demonstrated in the terrestrial snail Cornu aspersum (context specificity of latent inhibition, recovery paradigms of extinguished response or the serial position effect). Considering the exploratory nature of the tentacle lowering behaviour, the aim of the present study was to assess if this behaviour is modulated by a change in the US value. If the tentacle lowering response is specifically Pavlovian, it will not be affected by a change in the US value. On the contrary, if this behaviour contains instrumental components (if it is considered as an intentional response), it will be modulated by the US value. The results showed that snails which experienced a change in the US value (using satiation or taste aversion learning procedures) showed a significant decrease in the tentacle lowering response. Thus, these results prove that the tentacle lowering response exhibited by snails must be an example of intentional behaviour.

13:00 - 14:00: FOCUS SESSION 3

AVOIDANCE

These presentations examine mechanisms and psychological consequences of avoidance behavior, including belief formation, response cost, subjective relief, and generalization in threat learning.

Avoidance increases beliefs of threat (aibot), and it is not due to higher-order learning

Siavash Rakhtshah, MS (University of Nottingham), Christopher R. Madan, PhD (University of Nottingham), Gonzalo P. Urcelay, PhD (University of Nottingham)

Recent evidence gathered in different laboratories and preparations has revealed that the act of avoiding in the presence of a neutral cue (C) can increase the expectation that an aversive outcome follows that cue C (AIBoT), despite the cue never being paired with an aversive outcome. This observation could, in principle, result from participants associating the presence of the excitatory response availability (i.e., a button lighting up) with the neutral cue C, or by prediction error as recently suggested. The current study assessed the merits of these two explanations in an experiment by comparing participants that avoided in the presence of C with participants which also saw the response availability and cue C (i.e., higher-order learning), but did not avoid. A second objective was to assess whether AIBoT can also result in changes in emotional valence. We recruited 47 participants that completed an avoidance task using three stimuli: A+ (a threat cue paired with an aversive outcome – a loud noise) and B− and C− (safety cues never paired with the outcome). During training, avoidance was disabled for B− and C− using a grey bar signal (no-avoid signal). In the critical manipulation phase, C− became avoidable, despite remaining safe, while B− remained non-avoidable and safe. Participants then rated each stimulus on outcome

expectancy and emotional valence. Results revealed an increase in threat expectancy for C− relative to B−, but only in participants who avoided in the presence of C. This suggest that AIBoT results from prediction-error instead of higher-order learning. A+ was rated as significantly more unpleasant than the safety cues (B and C) and participants who avoided in the presence of C also showed less positive valence ratings to B and C. Overall, this preliminary study replicated the AIBoT effect, and suggests that it results from a prediction-error type of mechanism.

Differential effects of extinction with response prevention on avoidance behavior as a function of response cost

Paula Balea, PhD (Universidad Rey Juan Carlos), Diego Alaminos, MS (Universidad de Málaga), Franciso José López, PhD (Universidad de Málaga), Pedro Luis Cobos (Universidad de Málaga)

Avoidance behaviors are a hallmark of anxiety disorders and a key target in exposure-based treatments such as extinction with response prevention (ERP). However, prior research suggests that ERP may be limited in reducing avoidance responses when these are not associated with any cost. This study examined whether the presence of a cost modulates the persistence of avoidance after extinction. A total of 134 undergraduate psychology students underwent fear conditioning, during which an aversive sound was paired with two conditioned stimuli (CS+), while a third stimulus (CS−) was never paired with the sound. Participants were then allowed to avoid the sound by clicking a button, and midway through this phase, doing so incurred a cost (point loss). During ERP, the button became ineffective. Finally, at test, participants could again use the button, with cost manipulated between stimuli. Results showed that costless avoidance was not fully suppressed after ERP, mirroring prior findings. In contrast, costly avoidance was eliminated after ERP. These findings suggest that incorporating or emphasizing the costs of avoidance may enhance the effectiveness of exposure-based therapies for anxiety disorders.

Subjective relief as a proxy for prediction error dynamics in avoidance learning

Bram Vervliet, PhD (KU Leuven)

Prediction errors are the motor of associative learning. In the case of avoidance learning, successful omissions of an expected aversive event trigger a reward prediction error that guides learning to associate the safe outcome to the foregoing action. This is the theory, but there has been little focus on assessing the temporal dynamics of prediction error processing over the course of avoidance learning. In this presentation, I will show experimental results from our lab suggesting that subjective ratings of relief can be used to track underlying prediction errors. We propose that anxiety patients suffer from excessive relief.

The haunted library: the effect of cost on the generalisation of avoidance

María J. Quintero (Universidad Rey Juan Carlos), José A. Alcalá (Universidad Rey Juan Carlos), Gonzalo P. Urcelay (University of Nottingham), Pedro L. Cobos (Universidad de Málaga), & Paula Balea (Universidad Rey Juan Carlos)

The role of response costs in avoidance behaviour has received growing attention in recent years. However, little is known about the effect of cost on the generalisation of avoidance behaviour. In this pre-registered study, our aim was to assess how avoidance generalises under different types of costs. Using a task deployed online, participants were first trained on a differential conditioning procedure (Acquisition phase) to anticipate an aversive outcome using colours at the extreme of the blue-green dimension. We then introduced the availability of an avoidance response to prevent the aversive outcome previously used (Avoidance phase). Finally, we tested the participants' response to five generalisation stimuli varying along the blue-green dimension (Generalisation Test). A total of 212 participants were randomly assigned to one of three groups, which differed in the type of instructions they received regarding the cost associated with their avoidance response: No Cost, Abstract Cost, and Personal Cost. The results demonstrated the successful differential conditioning of unconditioned stimulus (US) expectancy ratings following Acquisition. During the Avoidance phase, all groups showed comparable rates of avoidance, with no significant differences between them. Finally, at Test, despite finding a similar generalisation gradient of the US expectancy ratings, generalisation of avoidance differed between groups. More specifically, participants in the No Cost group exhibited a higher overall rate of avoidance responses in comparison to the Abstract Cost condition. The results of our study indicate that the cost of avoidance can influence the overall response, yielding a differential generalisation gradient. This emphasizes the potential benefit of incorporating costs associated with avoidance in clinical contexts.

Discussion

20 Min Discussion

Questions and discussion of the session.

14:00 - 15:30:
LUNCH

Lunch

LUNCH

Lunch in the Hotel Costa Vasca beginning at 13:40. Sessions resume at 16:00 in the Aula Magna of the Psychology Department on the UPV campus where the Tributes and SEPC meeting will take place.

15:30 - 16:00:
WALK TO AULA MAGNA

Walk to Aula Magna at the UPV/EHU Psychology Building.

Walk to Aula Magna

16:00 - 17:00:
TRIBUTES

In Memoriam: Professors José Javier Campos Bueno and Francisco José López Gutiérrez
Chair: Gabriel Rodriguez (University of the Basque Country, (UPV/EHU))

This special session is dedicated to remembering the academic careers and the scientific and human legacy of Professors José Javier Campos Bueno and Francisco José López Gutiérrez,
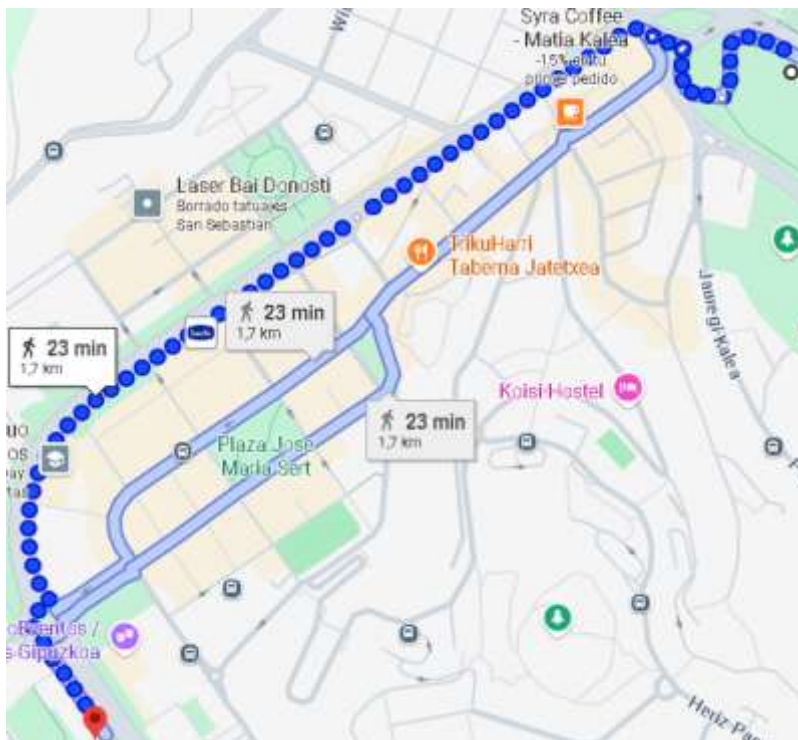
distinguished members of SEPC who have recently passed away. Both played a decisive role in the development of Comparative Psychology in Spain. The tribute will include reflections on their academic contributions and personal impact, through interventions by colleagues and friends who shared projects, ideas, and experiences with them.

Friday, Oct 3, 2025

17:00 - 18:00:
SEPC MEETING

SEPC meeting

SEPC members

SEPC Business meeting. Open to all members.

21:00:
SOCIAL EVENT

Gala Dinner at the Bistró of the Hotel de Londres y de Inglaterra

All registered attendants and their accompanying persons.

Map to Hotel Costa Vasca (Lunch)