

IBERIAN ONLINE MEMORY SEMINAR

Scientific research meeting on the
mechanisms of memory between
universities of Portugal and Spain

15-16 APRIL 2021

CENTRO DE INVESTIGAÇÃO
EM CIÊNCIA PSICOLÓGICA
Research Center for Psychological Science



Faculdade de Psicologia
UNIVERSIDADE DE LISBOA

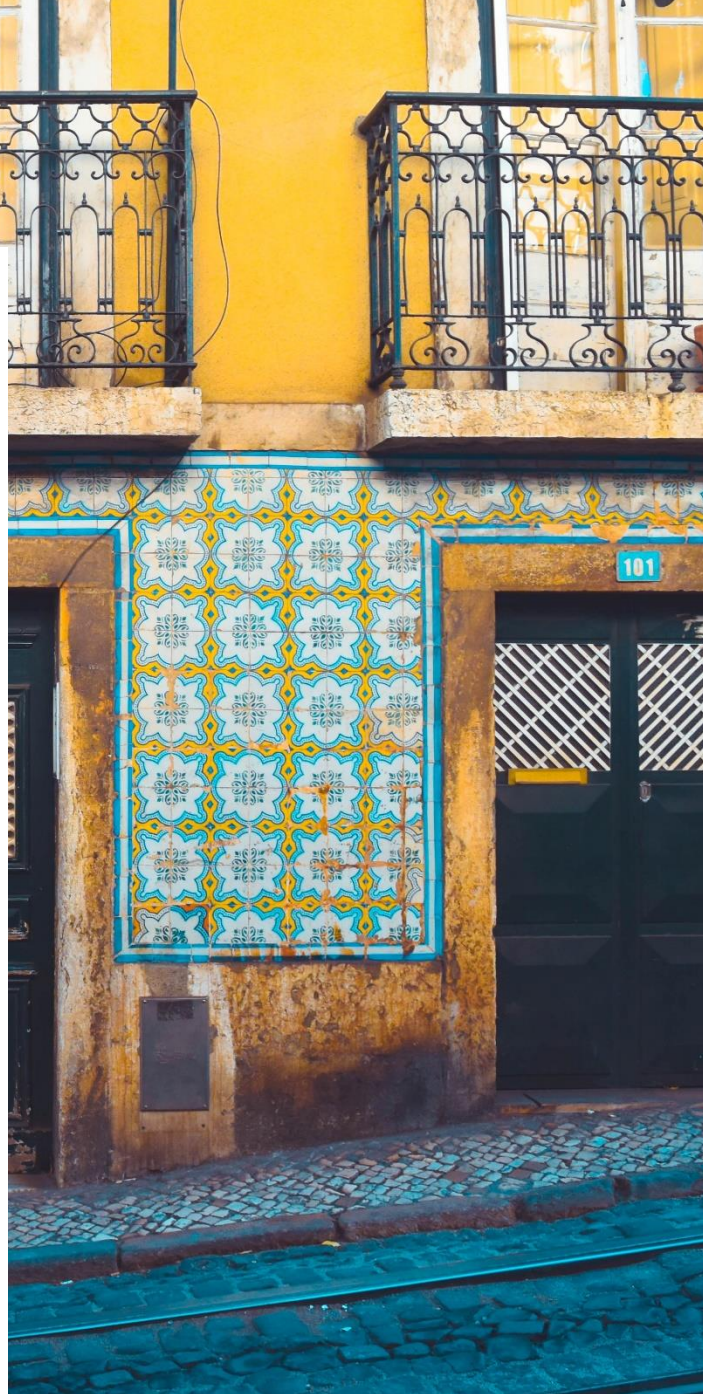
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**REPÚBLICA
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Schedule

Thursday 15 April 2021

Time PT	Time ES	Title and presenter
9:00	10:00	Welcome and opening remarks
9:10	10:10	The interference of the past in the ability of updating learning? Insights from the retrieval mode framework Leonel Garcia-Marques, Universidade de Lisboa
9:30	10:30	The basis of judgments of learning: Monitoring memory for words of high and low frequency Pedro S. Mendes, Universidade do Minho
9:50	10:50	False recognitions for ad hoc categories: Evidence of false memory from malleable knowledge structures Jerônimo C. Soro, Universidade de Lisboa
10:10	11:10	The role of the temporal lobe in the formation and control of semantic memory illusions: Evidence from two tDCS studies Antonio Díez-Álamo, Universidad de Salamanca
10:30	11:30	Break
11:00	12:00	Correcting false memories: The benefits of retrieval and memory updating Ana Lapa, Universidade de Lisboa
11:20	12:20	Retrieval enhances the correction of false memories using pragmatic inference sentences María Jesús Maraver, Universidade de Lisboa
11:40	12:40	Selective directed forgetting is mediated by the lateral prefrontal cortex: Preliminary evidence with tDCS Carlos J. Gómez-Ariza, Universidad de Jaén
12:00	13:00	Discussion

Friday 16 April 2021

Time PT	Time ES	Title and presenter
9:00	10:00	Introductory summary
9:10	10:10	Memory enhancement after aversive learning: Effects of stimulus type and sleep Ana Raposo, Universidade de Lisboa
9:30	10:30	Memory for survival-related words across encoding conditions and retention intervals Emiliano Díez, Universidad de Salamanca
9:50	10:50	I did it again! The role of cognitive load and interference on prospective memory commission errors Patrícia Matos, Universidade do Minho
10:10	11:10	Effects of tDCS over the right dorsolateral prefrontal cortex on memory accessibility and analogical reasoning Tania Valle, Universidad de Granada
10:30	11:30	Break
11:00	12:00	Deficits in inhibitory control of memory with age Teresa Bajo, Universidad de Granada
11:20	12:20	Interplay between cognitive control and episodic memory during adolescence: Filling an age gap in the literature Miguel Ângelo Andrade, Universidade de Lisboa
11:40	12:40	The modulating effect of menstrual cycle in memory and attention Alejandra Marful, Universidad de Granada
12:00	13:00	Final discussion

This event was conceived as an opportunity to cross borders between research centers in Spain and Portugal, to find bridging points in our scientific study of the mechanisms of memory. The aim of this meeting is to promote scientific discussion in a dynamic and peer-to-peer environment and hopefully lead to successful collaborations between the members.

Students and researchers interested in attending are most welcome. To do so, please send an email with a brief statement of interest to María J. Maraver (mjmaraver@psicologia.ulisboa.pt).

Presentations will have a maximum duration of 15 minutes, to guarantee 5 minutes of discussion after each talk.

Thursday 15 April 2021

9:10-9:30PT | 10:10-10:30ES

The interference of the past in the ability of updating learning? Insights from the retrieval mode framework. Leonel Garcia-Marques, *Universidade de Lisboa*

Our ability to memorize new information is impaired when we retrieve information compared to when we restudy it (Finn & Roediger, 2013). This impairment could happen since, when we engage in retrieval mode (Tulving, 1983), we focus on reconstructing our past and refrain from processing information deemed irrelevant for retrieval (Finn, 2017). Interestingly, research in social cognition suggests that when we are forming impressions about others, in comparison to memorizing information, we make more use of integrative and relational processing (Hamilton, Katz, & Leirer, 1980). Thus, we tested whether forming impressions (Exp. 1) and manipulating the relevance new information has for retrieval (Exp. 2) would protect against the impairment retrieval has on the ability to learn new information. Across two experiments, we adapted Finn and Roediger's paradigm and asked participants to form impressions or to memorize a set of stimuli. Later, participants were asked to retrieve (or to restudy, Exp. 1) the material and were presented with new information (relevant and irrelevant, Exp. 2). In a final memory test, we found that engaging in retrieval mode - under memory instructions - impaired learning of new information compared to restudy, while forming impressions protected against this impairment (Exp. 1). Across both conditions, relevant new information was better learnt than irrelevant new information (Exp. 2). Our results suggest that retrieval induced impairment is an outcome of the retrieval mode, thus not affecting impression formation, and can be shaped by the relevancy of the new information to be learnt.

9:30-9:50PT | 10:30-10:50ES

The basis of judgments of learning: Monitoring memory for words of high and low frequency. Pedro S. Mendes, *Universidade do Minho*, Karlos Luna, *Universidad Nacional de Colombia*, Pedro B. Albuquerque, *Universidade do Minho*

People's ability to monitor ongoing learning can be explored through judgments of learning (JOLs), which are predictions of future memory performance. JOLs are said to be based on theory-driven processes (e.g., beliefs about how a cue affects memory) and on experience-driven processes (e.g., processing fluency). It seems that the contribution of one type of processes or the other may vary for the different cues that affect JOLs. Word frequency, whose effects on memory depend on the type of test, has been argued to influence JOLs exclusively through beliefs. Namely, people seem to believe memory is better for high-frequency than low-frequency words, attributing higher JOLs to high-frequency words. However, evidence from word processing research suggests that high-frequency words are more fluently processed than low-frequency words. Through several studies, we explored if the direct experience with high-frequency and low-frequency words explains the word frequency effect on JOLs. Our results strongly suggest that processing fluency mediates the word frequency effect on JOLs, supporting the contribution of both experience and theory-driven processes as the basis of the word frequency effect on JOLs. These findings contributed to a better comprehension of how people monitor their memories.

9:50-10:10PT | 10:50-11:10ES

False recognitions for ad hoc categories: Evidence of false memory from malleable knowledge structures. Jerônimo C. Soro, Mário B. Ferreira, Paula Carneiro, Gün R. Semin, André Mata, *Universidade de Lisboa*

The false memory effect observed using the DRM paradigm (Deese, 1959, Roediger & McDermott, 1995) is usually attributed to strong associations found between concepts in pre-existent knowledge structures in long-term memory. However, knowledge structures can be quite flexible, varying according to the context in which it is processed or the goals that its activation may serve. In the present research we explored false recognitions conditioned by novel knowledge structures, namely ad hoc categories. Ad hoc categories are composed of items that do not share stable pre-existent associations in long term memory, being created for specific purposes or goals. False recognitions for ad hoc categories composed of exemplars from different common categories ("things that can serve as mementos") are quite stable, occurring in similar rates when the categories' lists are presented with their name respective name or not. Explicit identification of the categories' theme is not consistent between participants, nor is its relation to the false recognition rates. The results provide further evidence

of memory susceptibility to errors and have consequences for dominant theories of false memories based on associative activation or processing of meaning.

10:10-10:30PT | 11:10-11:30ES

The role of the temporal lobe in the formation and control of semantic memory

illusions: Evidence from two tDCS studies. Antonio M. Díez-Álamo, *Universidad de Salamanca*, Emiliano Díez, *Universidad de Salamanca*, María Ángeles Alonso, *Universidad de La Laguna*, Carlos J. Gómez-Ariza, *Universidad de Jaén*, Ángel Fernández, *Universidad de Salamanca*

The hub-and-spoke hypothesis of semantic memory (Patterson & Lambon Ralph, 2016) suggests that the anterior temporal lobe (ATL) acts as a semantic representational hub that integrates information from modality-specific areas of the brain. In a previous study in our lab (Díez et al., 2017), transcranial Direct Current Stimulation (tDCS) was applied over the left ATL of a group of participants while they encoded associative and categorical DRM lists of words. The results showed that anodal tDCS reduced false recognition of unpresented critical words related to associative lists—whose semantic network would depend to a greater extent on the role played by the semantic hub—but not to categorical lists. In a more recent study, we used the same experimental procedures but tDCS was applied over the left posterior temporal lobe, including the posterior middle temporal gyrus (pMTG), which is related to a semantic control brain network (Lambon Ralph et al., 2017). The results indicated that anodal tDCS increased false recognition for both types of lists. The results from these experiments add evidence that the ATL plays a significant role in the creation of semantic memory illusions, while the pMTG would be important for semantic control and memory monitoring.

11:00-11:20PT | 12:00-12:20ES

Correcting false memories: The benefits of retrieval and memory updating. Ana

Lapa, *Universidade de Lisboa*, Paula Carneiro, *Universidade de Lisboa*, Bridgid Finn, *Educational Testing Service*

According to the Memory Updating After Retrieval account (Finn, 2017), after retrieval, memory becomes more malleable and prone to change. Across two experiments, we tested the possibility that corrective feedback will be more efficient at reducing false memories if it is provided immediately after retrieval, when memory is more malleable, than after restudy. To test this prediction, we presented DRM wordlists, known to induce false memories, to participants. After presentation of each list, participants were either asked to recall or restudy it. Corrective feedback was then introduced: In Experiment 1, participants were given the opportunity to restudy the correct list; in Experiment 2, after recalling/restudying each item,

participants were informed whether that item was “correct” or “incorrect”. This procedure was repeated for ten DRM lists, after which participants were asked to do a free recall test. Results suggest that retrieval enhanced correct recall (replicating the testing effect, Roediger & Karpicke, 2006) and reduced false memories errors compared to restudy, when feedback was presented immediately after each item. Taken together, these studies suggest that the benefits of retrieval go beyond the testing effect: retrieval also seems to facilitate false memory correction, by improving incorporation of feedback, compared to restudy.

11:20-11:40PT | 12:20-12:40ES

Retrieval enhances the correction of false memories using pragmatic inference sentences. María J. Maraver, Ana Lapa, Leonel García-Marques, Paula Carneiro, Ana Raposo, *Universidade de Lisboa*

The errorful learning perspective states that a generated error can enhance future learning if followed by corrective feedback, because retrieval of a wrong answer provides a good context for incorporating the feedback. Here, we attempt to test this hypothesis using a paradigm that involves episodic retrieval such as sentences including pragmatic sentence implications, commonly used for the study of false memories. In two separate experiments with young adults, participants memory for the pragmatic inference sentences was compared across groups as a function of the type of task performed (Experiment 1: retrieval vs. restudy; and Experiment 2: active vs. passive recognition); and whether they were provided with corrective feedback or math operations after each sentence. In both experiments, we found that corrective feedback is more effective when given after errors committed during retrieval rather than restudy (for experiment 1) or passive recognition (for experiment 2). We suggest that the act of retrieval does more than correcting wrong information, since it enhances memory malleability and hence promotes the incorporation of updated information.

11:40-12:00PT | 12:40-13:00ES

Selective directed forgetting is mediated by the lateral prefrontal cortex: Preliminary evidence with transcranial direct current stimulation. Carlos J. Gómez-Ariza, *Universidad de Jaén*

Goal-driven forgetting is thought to be mediated by the lateral prefrontal cortex (LPFC) that would interact with brain structures underpinning memory representations. Interestingly, topdown control over memory may be exerted either during encoding/consolidation or retrieval to reduce memories' accessibility. To date, however, no previous research has addressed the neural underpinnings of selective directed forgetting (SDF), on which behavioral evidence accumulates to show that it relies on executive-control processes that downregulate mnemonic activity. The present study aimed to test the hypothesis that the selective memory impairment

(the SDF effect) that follows an instruction to selectively forget is prefrontally driven. Because the DLPFC has been shown to play a role in memory downregulation, we used tDCS to disrupt activity in this region using a bilateral stimulation protocol that has been shown to be effective in other directed forgetting paradigm. Our results reveal that, in comparison to sham stimulation, real tDCS not only abolished SDF but also impaired performance in an updating working memory task thought to strongly recruit the lateral prefrontal cortex. These findings join others obtained with a variety of memory control tasks to support that memory downregulation is achieved by control processes mediated by the right lateral prefrontal cortex.

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9:10-9:30PT | 10:10-10:30ES

Memory enhancement after aversive learning: effects of stimulus type and sleep.

Ana Raposo, Marta Pereira, Ana P. Pinheiro, *Universidade de Lisboa*

Aversive experiences enhance memory for the associated event and such memory boost can be generalized for conceptually related events. Yet, generalization is inconsistent across studies and may depend on the type of aversive stimulus used. Besides, the role of sleep in aversive memories remains elusive. We addressed these questions by combining auditory Pavlovian conditioning with recognition memory. Encoding comprised 3 phases: pre-conditioning, conditioning and post-conditioning. Participants saw pictures of animals and tools, and during conditioning, exemplars from one category were reinforced with an aversive sound. Memory was tested immediately, 6h or 24h after encoding. Items of the reinforced category, encoded during conditioning, were better remembered than unreinforced items. This memory enhancement emerged only after a consolidation period (6h and 24h after encoding). There was no memory improvement for items of the conditioned category encoded in pre-conditioning, suggesting a lack of retroactive effects. Memory enhancement was found for items of the conditioned category encoded during post-conditioning, with this proactive effect occurring after 6h, but fading after sleep. Results show that memory enhancement following aversive learning requires a consolidation period; generalization is limited, at least for aversive sound conditioning; sleep promotes memory pruning, such that less important memories are not further strengthened.

9:30-9:50PT | 10:30-10:50ES

Memory for survival-related words across encoding conditions and retention intervals. Emiliano Díez, *Universidad de Salamanca*, María Ángeles Alonso, *Universidad de La Laguna*, Antonio M. Díez-Álamo, *Universidad de Salamanca*, Ángel Fernández, *Universidad de Salamanca*

Material processed with survival-related goals tends to be well remembered, a phenomenon known as the survival effect. The extent to which this effect is observable when the studied material has intrinsic survival value, in the absence of a survival-oriented context, was studied in four experiments. Participants encoded words that were low or high in survival value in two specific dimensions: locating nourishment and avoiding death. With the aim of examining encoding effects, in two experiments the items were presented with intentional memory instructions, while in the other two an incidental encoding task was used. Additionally, and with goal of studying the course of forgetting, the retention interval was manipulated in all experiments, with free recall tests administered immediately, or delayed for 30 minutes, 24 hours, or 7 days. The results showed an overall recall advantage for survival-related words, both under incidental and intentional encoding conditions. The passage of time affected memory for all kinds of words, making recall less likely as the retention interval increased, with a survival advantage found at all retention intervals. These findings constitute new evidence in support of the idea that human memory is specially oriented to process information that is relevant for survival.

9:50-10:10PT | 10:50-11:10ES

I did it again! The role of cognitive load and interference on prospective memory commission errors. Patrícia Matos, Pedro B. Albuquerque, *Universidade do Minho*

Prospective memory (PM) enables us to remember to perform an intention in the future but deactivating irrelevant PM intentions make it possible to flexibly re-adjust our behaviour according to changing contexts and goals. Although several studies have shown that an intention may be erroneously executed despite no longer needed (i.e., PM commission errors), the empirical evidence on this issue is scarce. In two experiments, we aimed to clarify the conditions that may lead to or, otherwise, prevent PM commission errors. First, we investigated whether PM commission error risk is affected by varying the ongoing task demands. Results showed that it was harder to forget (deactivate) a PM task if the ongoing task processing is made more difficult. Second, we sought to explore whether PM deactivation benefits from a retroactive interference mechanism by adding a new-PM intention or by performing filler tasks with increased difficulty levels. Taken together, the results pointed to an overwriting or deterioration of the old-PM task representation, reducing PM commission error occurrence.

10:10-10:30PT | 11:10-11:30ES

Effects of tDCS over the right dorsolateral prefrontal cortex on memory accessibility and analogical reasoning. *Tania Valle, Universidad de Granada, Teresa Bajo, Universidad de Granada, Carlos J. Gómez-Ariza, Universidad de Jaén*

Memory accessibility plays a critical role in reasoning influencing subsequent choices and leading to success in problem solving. Recent work has explored whether information that is temporally less accessible would be more difficult to be selected as a potential solution in four-term analogical problems. Neuroimaging research suggests that both selective retrieval and reasoning by analogy are linked to activity in prefrontal regions such as the dorsolateral prefrontal cortex (DLPFC). The current study used tDCS to determine the causal involvement of the right DLPFC in modulating memory accessibility and its impact on analogical reasoning. Participants were randomly assigned to receive Cathodal or Sham stimulation of right lateral prefrontal cortex while they were performing selective retrieval of items that could be later used as solutions in an analogical reasoning test. The results of this experiment reveal that cathodal tDCS abolished the expected cost associated with selective retrieval in analogical reasoning whereas sham stimulation left such an impairment in performance untouched. However, we failed to observe a stimulation effect on overall analogical performance. Hence, these results support the view that the right DLPFC has a causal role in interference control during retrieval while casting doubt on its contribution to analogical mapping.

11:00-11:20PT | 12:00-12:20ES

Deficits in inhibitory control of memory with age. *Teresa Bajo, Universidad de Granada*

An influential view on cognitive development suggests that aging brings a decline in inhibitory control (Hasher & Zacks, 1988; Park & Festini, 2017). Because of this inhibitory deficit the elderly might not be able to control interference from irrelevant information (external or internal) or to withdraw dominant but inappropriate responses. Evidence supporting this inhibitory account of cognitive aging has also been provided for tasks requiring control of irrelevant information in memory. However, the evidence for reduced inhibition in memory in older adults has not been entirely consistent, and some researchers have proposed that the possible deficit might only be present in memory tasks where older people are explicitly asked to intentionally suppress information. Here, we report behavioral and EEG data providing general support to the inhibitory account, and suggesting that, in contrast to some views, the critical factor to find age differences may be the overall challenge posed by the inhibition task independently of whether inhibition is intentionally or incidentally triggered.

11:20-11:40PT | 12:20-12:40ES

Interplay between cognitive control and episodic memory during adolescence: Filling an age gap in the literature. Miguel Ângelo Andrade, Ana Raposo, *Universidade de Lisboa*

Cognitive control aids episodic memory by promoting the strategic retrieval of contextual details and the inhibition of confounding information. Despite evidence that cognitive control develops until adulthood, the impact of this prolonged development on episodic memory during adolescence remains unclear. Thus, we conducted two behavioural studies comparing adolescents and adults, using distinct paradigms. Study 1 assessed item and associative memory for congruent and incongruent object-scene pairs. Age modulated the congruency effect on both retrieval tasks. Importantly, adolescents showed lower associative memory skills only when retrieving incongruent relationships – an ability that relies on recollection processes. In Study 2, we used the Process Dissociation Procedure to disentangle automatic (familiarity) and controlled (recollection) processes after semantic and perceptual encoding of words. Adolescents' lower performance was restricted to recollection of semantically encoded items. Together, these findings suggest that underdeveloped cognitive control differentially affects the developmental trajectories of familiarity and recollection over the course of adolescence, and highlight the role of semantic elaboration as a key mechanism towards the full maturation of recollection.

11:40-12:00PT | 12:40-13:00ES

The modulating effect of menstrual cycle in memory and attention. Alejandra Marful, Daniela Paolieri, Antonio Bernal, *Universidad de Granada*

There is a current debate about how our processing of the environment can be modulated by hormones. Animal models have consistently shown that high levels of estradiol in females enhance the use of external/global strategies but decrease the preference for internal/local strategies. In two experiments we tested the global/external or local/internal preferences in a sample of women that varied in their hormonal levels and a group of men. In Experiment 1, using the Global-Local task, we observed that, women during their ovulatory phase (high levels of estradiol and low progesterone) were more globally oriented in a low demanding condition. In Experiment 2, when employed the ignore-forget paradigm, preliminary data showed a ceiling effect in ovulatory women when they have to suppress external representations that, interestingly, was accompanied by a memory deficit when they have to suppress internal representations. Taken together, these studies support the role of estradiol in the modulation of our response to the changes of the environment.