UNIVERSITÉ DE GENÈVE
FACULTY OF PSYCHOLOGY AND EDUCATIONAL SCIENCES
Psychology Section

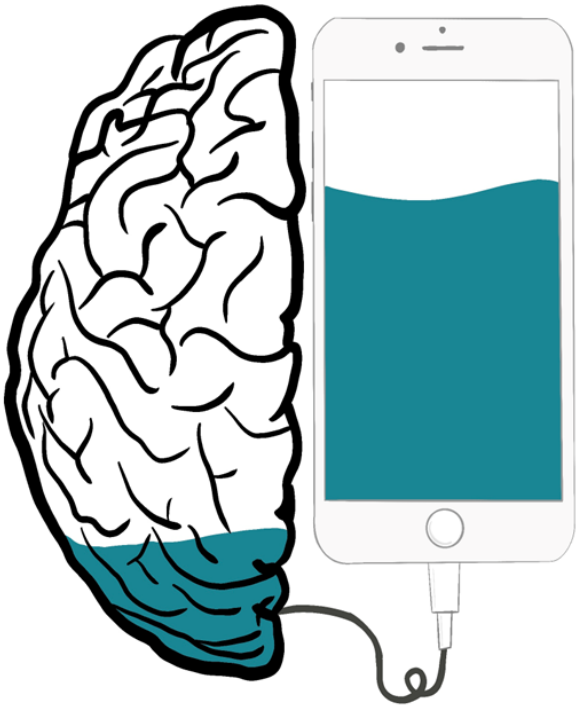
CAL CIGEV COGNITIVE AGING LAB
CENTER FOR THE INTERDISCIPLINARY STUDY OF GERONTOLOGY AND VULNERABILITY

Swiss National Science Foundation

2nd Cognitive Offloading Meeting

September 11-13, 2024

University of Geneva



Venue

Auditoire R070

Uni Mail

Boulevard du Pont-d'Arve 40, 1205 Genève

Access

From the train station:

- **Tram 15** (direction Grand-Lancy, Place du 1er août) to Uni Mail – 10 minutes
- **Tram 18** (direction Grand Lancy, Pontet) to Pont-d'Arve – 14 minutes
- **Bus 1** (direction Thônex, Hôpital Trois-Chêne) to Pont-d'Arve – 14 minutes
  Taxi/Uber to Uni Mail – 7 minutes

From the airport:

- **Bus T72** (direction Annecy, Gare routière) to Lancy Pont Rouge, Gare/Etoile and **tram 17** (direction Annemasse-Parc Montessuit) to Uni Mail – 22 minutes
- **Bus 10** (direction Genève, Rive) to Cornavin and **tram 15** (direction Grand-Lancy, Place du 1er août) to Uni Mail – 30 minutes
- **Bus 23** (direction Carouge GE, Tours) to Grand-Lancy and **tram 15** (direction Genève, Nations) to Uni Mail – 33 minutes
- **Train** from Geneva Airport station to Geneva Cornavin station and **tram 15** (direction Grand-Lancy, Place du 1er août) to Uni Mail – 20 minutes

Geneva public transport network map

Restaurants around the venue

Catering during the conference: All coffee breaks, the welcome reception, and the social dinner are covered.

Lunch: On your own.
You can get lunch at the cafeteria located in the Uni Mail building (approximately 10 to 20 Swiss Francs). There are also several nice restaurants in the surrounding area that offer reduced-price lunch options (ask for the “plat du jour”, about 20 to 25 Swiss Francs).

Conference dinner

The conference dinner will take place on Thursday, September 12. We have reserved a gourmet cruise on Lake Geneva.

Departure from Genève Jardin Anglais is at 19:00, with a return at 22:20. For those interested, we will depart together from Uni Mail.

Social activity

On Friday, September 13, join us for a scenic adventure as we take the famous cable car up Mont Salève, a peak located just a few kilometers from Geneva, offering panoramic views of the city, Lake Geneva, and the surrounding Alps. Known as the "Balcony of Geneva," Mont Salève is a must-see!

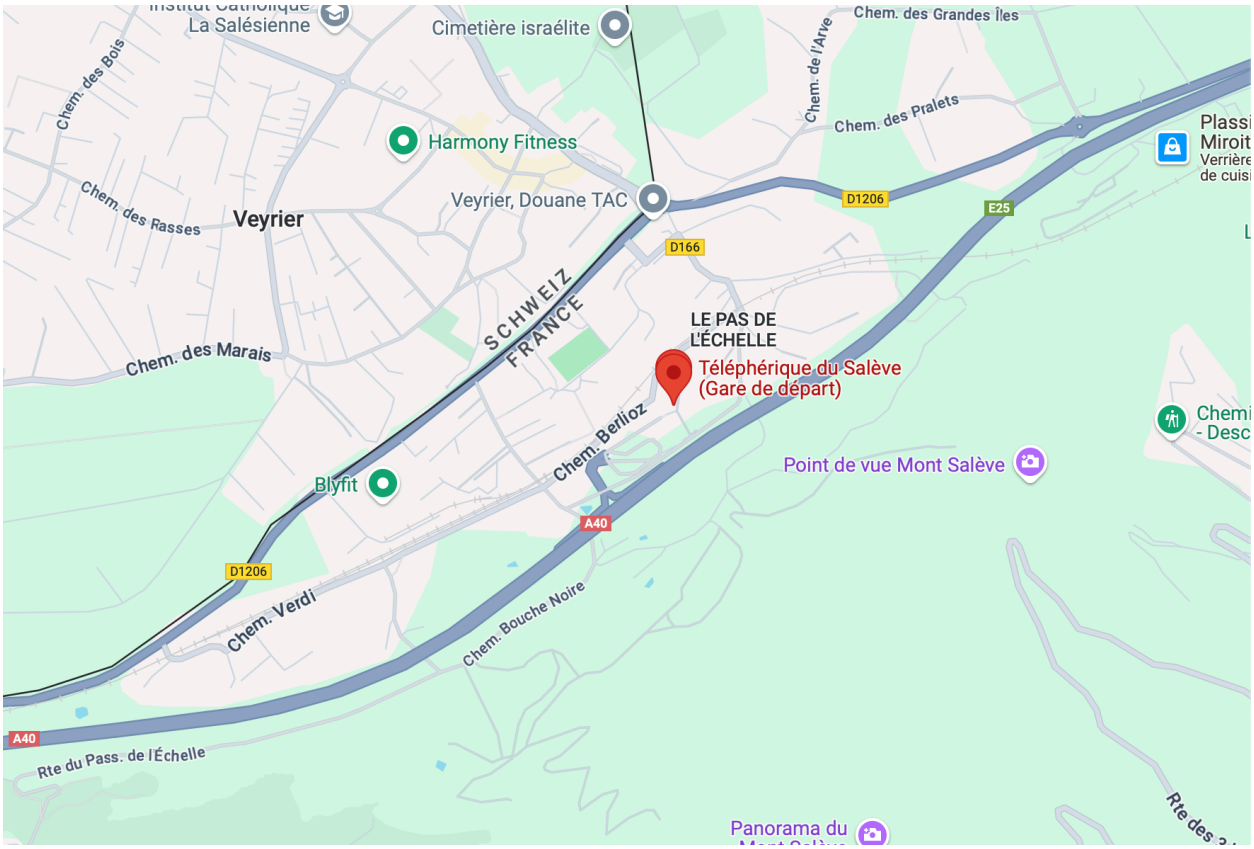
The cable car ticket is included in the conference package.

Departure from the cable car station is at 10:30 AM. For those interested, we will depart together from Uni Mail. We will meet in front of the building and leave at approximately 9:40 AM.

For those who prefer a more active experience, you can hike up Mont Salève and meet the group at the top. The hike takes approximately 2 to 2.5 hours and offers a rewarding challenge with scenic viewpoints along the way. More information can be found here: https://www.telepherique-du-saleve.com/en/activities-events/sports-activities/hiking/

Please bring suitable clothing and footwear, as it can get chilly at the top of Mont Salève, even in summer!

A café at the summit will be open for those wishing to grab a drink or snack while enjoying the views.



Program Overview

Wednesday, September 11, 2024

13:00 – 13:45	Registration

13:45 – 14:00	Welcome
	Chiara Scarampi, Sam J. Gilbert, and Matthias Kliegel

14:00 – 15:30	Session 1
	Megan Kelly *Retrieval effort and the memory cost of external store reliability* 14:00 – 14:30 Patrick Weis *Primacy effects during performance monitoring of environment-based cognitive strategies* 14:30 – 15:00 Sam Gilbert *Metacognition guides optimal cognitive offloading with ChatGPT* 15:00 – 15:30

15:30 – 16:00	Coffee break

16:00 – 18:00	Symposium 1
	Basil Wahn *When do humans offload an attentionally demanding task to an algorithm?* 16:00 – 16.30 Eva Wiese *Offloading depends on the perceived match between agent capabilities and task characteristics* 16:30 – 17:00 Miles R. A. Tufft *Socially attuned de-prioritisation of partner information as evidence for implicit mental acts of offloading* 17:00 – 17:30 Lena Nalbandian *How are patterns of attention shaped by knowledge of a partner's task responsibility?* 17:30 – 18:00

18:00 – 19:30	Reception

Thursday, September 12, 2024

09:00 – 10:30	Session 2
	Sandra Grinschgl *Cognitive offloading in the lab and in daily life* 09:00 – 09:30 Ava Scott *Everyday offloading and metacognition* 09:30 – 10:00 Irene Florean *Cognitive offloading in route planning: strategies and transfer effects* 10:00 – 10:30

10:30 – 11:00	Coffee break

11:00 – 12:30	Session 3
	Michael Scullin *The technological reserve hypothesis: Smartphone- versus paper-based intention offloading in mild cognitive impairment and dementia* 11:00 – 11:30 Annika Boldt *Transdiagnostic compulsivity is associated with reduced reminder setting, only partially attributable to overconfidence* 11:30 – 12:00 Amandine Decombe *Non-optimal cognitive offloading in schizophrenia in a prospective memory task: Influence of both metacognitive beliefs and cognitive effort avoidance* 12:00 – 12:30

12:30 – 14:30	Lunch break

14:30 – 15:30	Session 4
	Hunter Ball *Aging and prospective memory offloading* 14:30 – 15:00 Sebastian Horn *Adult age differences in selectivity and in value-based remembering* 15:00 – 15:30

15:30 – 16:00	Coffee break

16:00 – 16:30	Round table discussion

16:30 – 17:30	Poster session

19:00 – 22:00	Conference dinner

Friday, September 13, 2024

Morning	Social activity
From 10:00	*TBA*

Abstracts

Symposium

Offloading with others: Drawing distinctions between explicit and implicit offloading behaviours across human and artificial agents

Organizers: Miles R. A. Tufft[1] & Basil Wahn[2]

[1]University College London, [2]Technische Universität Berlin

Cognitive offloading takes a situated view of cognition whereby the physical environment in which an individual finds themselves affords opportunities to alter cognitive representations and reduce cognitive demands. These opportunities can involve the manipulation of basic tools such as notepads or calculators, but human environments often include more sophisticated "others" such as intelligent technologies or other humans that in their perceived agency offer richer and more varied affordances. From the artificial to the human, this symposium considers how co-working with such others can shape offloading behaviours, while also highlighting a distinction in the degree of awareness one has into such behaviours. For example, one can imagine asking a colleague or ChatGPT to help write a first draft abstract for an upcoming conference and in doing so, one *explicitly acts* to adopt an offloading strategy that achieves a distribution of cognitive demands. Talks 1 and 2 consider these scenarios involving artificial agents, which either could be an algorithm (Talk 1) or a robot (Talk 2). Talk 3 and 4 then consider scenarios involving other human agents and whether one can also *implicitly act* to achieve a distribution in demands. Talk 3 introduces scenarios in which task information believed to be taken care of by another person can be automatically deprioritised, reducing distraction and improving performance. While talk 4 demonstrates how patterns of visual attention can be automatically shaped in ways that support task division with a partner perceived as competent. We conclude by offering a potential framework by which to consider grouping offloading behaviours. One dimension considers the richness of agency perceived in the offloading other (i.e. from the algorithm to the robot to the human), while the other dimension considers the degree of automaticity involved in the act of offloading (i.e. from the implicit to the explicit). We believe considering these factors in a 2x2 matrix points to interesting spaces for discussion and may stimulate fruitful directions for future research in this field.

When do humans offload an attentionally demanding task to an algorithm?

Basil Wahn[1] & Laura Schmitz[2]

[1]Technische Universität Berlin, [2]University Medical Center Hamburg- Eppendorf

In today's world, complex cognitive tasks formerly reserved for humans start becoming feasible for computer algorithms. Consequently, humans encounter increasingly more opportunities to explicitly offload a variety of tasks to such algorithms. The present studies investigate under which conditions people engage in this form of "cognitive offloading". Our findings demonstrate that people's willingness to offload an attentionally demanding task to a computer algorithm is influenced by their knowledge about the algorithm's capacity and by the possibility to engage in a bonus task. That is, people want to make sure that the offloaded work is performed well: they

are more willing to offload if they have knowledge about the algorithm's reliability. Also, people want to avoid boredom and stay engaged: they are more willing to offload if they themselves have another task to perform – regardless of whether this task promises additional monetary reward.

Offloading depends on the perceived match between agent capabilities and task characteristics

Eva Wiese[1], Patrick P. Weis[2], & Kurt Gray[3]

[1]Technische Universität Berlin, [2]Julius Maximilians University Würzburg, [3]University of North Carolina

Robots are becoming more available for workplace collaboration. But are people actually willing to assign any kind of task to robots? And if so, exactly which tasks will they explicitly assign to what kinds of robots? In a series of experiments, we leverage psychological theories on person-job fit and mind perception to investigate whether and how humans offload tasks to robots in a collaborative setting. We hypothesize that people (a) will assign tasks based on the robots' perceived emotional capabilities and (b) will show predictable social biases in their collaboration decisions. In the experiments, participants performed an arithmetic task (i.e., calculating differences) and a social task (i.e., judging emotional states), either alone or by collaborating with one of two robots: a robot that's described as emotionally capable or a robot that is described as emotionally incapable. Decisions to collaborate (i.e., to offload the response to the robot) were high across all trials, especially for tasks that participants found challenging to perform (i.e., the arithmetic task). The willingness to collaborate was predicted by perceived robot-task fit, such that the emotional robot was more often assigned the social task; the arithmetic task was assigned more to the emotionally incapable robot, despite the fact that the emotionally capable robot was equally capable of performing this task. This is consistent with social biases (e.g., gender bias) in mind perception and person-job fit. The theoretical and practical implications of this work for HRI will be discussed.

Socially attuned de-prioritisation of partner information as evidence for implicit mental acts of offloading

Miles R. A. Tufft[1] & Daniel C. Richardson[1]

[1]University College London

Behaviours and their associated cognitive mechanisms do not exist in isolation, rather they are embedded in a world that is naturally social, and rich in context. As such, paradigms open to such contexts may reveal interestingly adaptive behaviours. With evidence from a range of joint task paradigms, including joint versions of the picture-word interference, retroactive cuing, and Simon tasks, we demonstrate how distributed social contexts have the power to automatically facilitate the reduced tracking of partner information and improve task performance in ways that are sensitive to the social characteristics of the context. We propose that this socially attuned facilitation reflects an implicit mental act of offloading that depends on our situatedness with others, which we term *social offloading*. We conclude by offering for consideration the importance of implicit mental acts as part of the repertoire of cognitive offloading behaviours.

How are patterns of attention shaped by knowledge of a partner's task responsibility?

Lena Nalbandian[1], Miles R. A. Tufft[1], & Daniel C. Richardson[1]

[1]University College London

Social interactions are pertinent in everyday life, but how do our perceptions of others guide patterns of attention? And can such perceptions implicitly guide attention in ways that support distributed forms of cognition. Using the interpersonal memory effect (He et al., 2011), we demonstrate how knowledge about a co-acting partner's responsibilities during a visual search task can proactively and automatically de-prioritise targets assigned their responsibility, which we propose is akin to an implicit mental act of offloading. In this study, participants were instructed to search a visual array, while believing that they were working with another participant, who was in truth a pre-programmed confederate. Participants and their "partners'' were pre-assigned categories of objects (e.g. animals or fruits) and were instructed to search for target circles that could appear in one of four locations in the array and either flanking objects of their or their partner's assigned category (valid cue) or not (invalid cue). Replicating previous findings, we found that participants were quicker to detect circles when they validly flanked objects assigned to them, but interestingly this cuing effect was removed when circles flanked objects assigned to their partner suggesting that these objects had been de-prioritized. In a follow-up study, we show that this de-prioritisation may also be sensitive to the partner being perceived as competent. We conclude that such socially sensitive de-prioritisation points to the automatic guiding of attention by working memory representations of a partner's responsibilities and may support an efficient division of attentional labour.

Session 1

Retrieval effort and the memory cost of external store reliability

Megan O. Kelly[1], Aisling Sampson[2], & Evan F. Risko[1]

[1]University of Waterloo, [2]University of Toronto

There is a reliable cost to memory performance when expecting external memory support compared to when there is no such expectation of external support. One proposed explanation for this reduced memory performance is that individuals expecting to rely on an external memory support at test invest less study effort to internally store the to-be-remembered information (study-effort hypothesis; Kelly & Risko, 2022). While a study effort hypothesis can explain some of this poorer memory performance, we consider a retrieval effort hypothesis as an additional, non-mutually exclusive explanation. In the present investigation, we examined the extent to which the unexpected loss of external memory support leads to reduced retrieval efforts, and whether reduced retrieval efforts mediated the relation between expecting external memory support and memory performance. We also tested the potential influence of expected memory performance on retrieval efforts and subsequent memory performance.

Primacy effects during performance monitoring of environment-based cognitive strategies

Patrick P. Weis[1] & Wilfried Kunde[1]

[1]Julius-Maximilians-Universität Würzburg

Humans frequently make use of their environment when acquiring and processing information. For example, humans retrieve factual knowledge not only from their own organic memory but also from their handwritten notes, sometimes from their colleagues, from the books they studied the facts with in the first place, from search engines, and so on. Clearly, it is a challenge to proficiently navigate the plethora of cognitive strategies available in today's technologized world. Here, we took a look at a mechanism that contributes to such proficiency: performance monitoring. Specifically, we took a look at the time course of speed monitoring. Is speed monitored consistently across all encounters with a cognitive strategy? To answer this question, we subtly manipulated the time it took two algorithms to find the solution to Trivia questions in a forced-choice observation block and subsequently asked participants to use the algorithm they prefer in a free-choice block. Crucially, some algorithms performed faster at the beginning and some at the end of the forced-choice observation block. Across a series of experiments, our results clearly show a preference for algorithms that performed fast in the beginning of the observation block. Results showed no preference for algorithms that performed fast at the end of the observation block. Thus, we found evidence for a primacy but no evidence for a recency effect. In other words, performance monitoring might be focused on initial encounters of novel cognitive strategies and be less pronounced thereafter.

Metacognition guides optimal cognitive offloading with ChatGPT

Sam J. Gilbert[1], Allegra Benett[1], Katie O'Brien[1]

[1]University College London

Previous studies of memory tasks have shown that people have systematic biases in their cognitive offloading strategies, which are related to biased metacognitive evaluations of cognitive ability. Here, we investigated whether the same is true when people (N=150 recruited from Prolific) used ChatGPT to assist with two quiz tasks (science and entertainment) and two tests of creativity (remote associates and alternate uses). On each trial, participants chose between answering themself (for maximum points) or getting help from ChatGPT (for a reduced number of points that varied from trial to trial). This allowed us to measure bias, relative to the optimal strategy. In the science quiz, entertainment quiz, and remote associates test there was an anti-ChatGPT bias. Participants tended to answer for themselves when they would have scored more points by asking ChatGPT. This bias was predicted by confidence: insofar as participants were overconfident of their own ability they tended to under-use ChatGPT. There was also evidence for a domain-general component, where people's pro- or anti-ChatGPT bias in one task predicted bias in others. These results suggest that metacognitive interventions could facilitate people's use of generative AI.

Session 2

Cognitive offloading in the lab and in daily life

Sandra Grinschgl[1] & Christina Venus[2]

[1]University of Bern, [2]University of Graz

Modern technologies such as smartphones, tablets, and computers allow for an increasingly easy externalization of cognitive processes (i.e. cognitive offloading). Thus, individuals often store important information (e.g., appointments, shopping lists) in their technical devices rather than memorizing it. Over the past years, offloading behavior has been investigated with different experimental tasks. For instance, the Pattern Copy Task and Intention Offloading Task were frequently used to test both the determinants and consequences of cognitive offloading. For the present preregistered study (N = 150), we developed and pre-tested a questionnaire to assess offloading behavior in daily life. This questionnaire depicts different forms of daily offloading such as offloading with digital vs. analog tools, offloading onto the body, and transactive memory systems. The aim of our study is to a) test the psychometric properties of our newly developed questionnaire and to b) compare daily offloading behavior as measured in our questionnaire with offloading behavior as measured in the lab using the Pattern Copy and Intention Offloading Task. Furthermore, we test a so far unexplored factor potentially related to offloading behavior—individuals' general intelligence. We will discuss our findings in the light of previous—mostly lab-based—offloading literature and highlight potential new avenues for offloading research incorporating daily life experiences of cognitive offloading.

Everyday offloading and metacognition

Ava Scott[1] & Sam J. Gilbert[1]

[1]University College London

By deploying highly controlled web-tasks, researchers have isolated confidence as a key predictor of intention offloading. However, in everyday life, intentions are more numerous, diverse, and extend over longer durations than those in online tasks. We set out to explore whether the metacognitive mechanism of cognitive offloading applies to people's reminder setting for their everyday plans. We asked people (n = 112) to submit all their upcoming plans for the following three days, and to indicate their confidence in remembering each plan both with and without a reminder. We found that offloaded plans were associated with lower confidence and higher importance than non-offloaded plans. The participants returned to the survey four days later (n =59), and indicated which plans they had fulfilled. In an exploratory path analysis, we found that lower confidence is associated with higher fulfilment, perhaps due to increased reminder setting. This presentation will argue that metacognition and intentionality are promising framings for ecologically-valid psychological research, and discuss the implications for the design of metacognitive interventions deployed to assist people's everyday intentions.

Cognitive offloading in route planning: strategies and transfer effects

Irene Florean[1], Marta Stragà[1], Timo Mäntylä[2], & Fabio Del Missier[1]

[1]University of Trieste, [2]Stokholm University

We investigated cognitive offloading in a task requiring planning the shortest route to connect locations on maps under ordering constraints. In Study 1, we manipulated map difficulty (low/high) and the possibility of offloading cognition by allowing/not allowing the use of a pen on the map during planning (offloading/non-offloading). Four types of offloading strategies were spontaneously used: Marking out start and finish locations, intermediate locations to visit, constraints, and external tracking of planning progress. Participants used offloading strategies more frequently on high (vs. low) difficulty maps, performing better than non-offloading participants on high difficulty maps only. Participants used offloading strategies even on low-difficulty maps, especially when they solved high-difficulty maps first. Study 2 investigated transfer effects by examining how training with free pen use, without pen but with free hands, or with blocked hands affected performance in the test phase when pen use was disabled/enabled. We observed an asymmetric transfer effect: the decrease in performance when pen use was disabled exceeded the improvement in performance when it was enabled. In Study 3, we examined transfer effects when visual aids externalizing the four previously observed offloading strategies were provided/removed during training or test phases. The degree of externalization of the offloading strategies was varied in three training conditions: 4 strategies, 2 strategies, or no externally implemented strategy. Training with strategy externalization was followed by test without externalization, while training without externalization was followed by test with externalization of 2 or 4 strategies. Once again, an asymmetrical transfer effect was observed: The decrease in performance after removing the visual aids exceeded the improvement in performance when external aids were provided. The implications of results for research on cognitive offloading are discussed.

Session 3

The technological reserve hypothesis: Smartphone- versus paper-based intention offloading in mild cognitive impairment and dementia

Michael K. Scullin[1], Jared F. Benge[2], Rovianne Tindaan[2], & Kourtney David[1]

[1]Baylor University, [2]University of Texas in Austin

The first generation who engaged with digital technologies has reached the age where risks of dementia emerge. Has technological exposure helped or harmed cognition in digital pioneers? The digital dementia hypothesis predicts that a lifetime of technology exposure worsens cognitive abilities. An alternative hypothesis is that such exposures lead to technological reserve, wherein digital technologies afford compensatory offloading and promote cognitively stimulating behaviors. We tested these predictions in a meta-analysis of 317,458 adults (baseline age M=68.6 years; 53.3% female) from cross-sectional and longitudinal studies (range: 1-18 years, M=6.3 years). Use of digital technologies was associated with reduced risk of cognitive impairment (OR=0.43, p<.0001) and reduced time-dependent rates of cognitive decline (HR=0.74, p<.0001), even when accounting for demographic, socioeconomic, health, and known

cognitive reserve proxies. In this talk, we will also present the design for a Stage II behavioral trial in which we will be recruiting 200 participants with mild cognitive impairment or mild dementia. Participants will complete baseline assessments and then be randomly assigned to learn to offload intentions using a smartphone reminder app or a paper-based memory support system. Across a 4-week intervention period, participants will use their offloading strategy to complete both patient-selected and experimenter-assigned prospective memory assessments. We will assess if participants continue to use their offloading strategy and durability of benefits to prospective memory at 3-month and 6-month follow-up sessions. It is unknown whether, and for whom, smartphone-based approaches to offloading will be better at supporting prospective memory across 6 months in older adults with cognitive impairment.

Transdiagnostic compulsivity is associated with reduced reminder setting, only partially attributable to overconfidence

Annika Boldt[1], Celine A. Fox[2], Claire M. Gillan[2], & Sam Gilbert[1]

[1]University College London, [2]Trinity College Dublin

In this study, we explored the behavioural and cognitive correlates of the transdiagnostic phenotype 'compulsive behaviour and intrusive thought' (CIT). CIT has often been linked to impairments in metacognition, which has in turn been associated with cognitive offloading. One example of such offloading behaviours is external reminder-setting that plays a key role in fulfilling future intentions. In an online study (N=600) we investigated the link between individual differences in compulsivity, metacognition, and external reminder-usage. We found that compulsive individuals showed reduced preference for setting external reminders. This was partially, but not fully, attributable to their relative overconfidence. We found no evidence for an impaired confidence-action link: compulsive individuals used their metacognition to guide offloading just as much as their non-compulsive counterparts—a finding which stood in contrast to previous studies. Given that offloading often acts in a compensatory way, our findings imply that more compulsive individuals tend to be at risk of insufficient use of external memory aids. In addition to transdiagnostic variation in the general population that was studied here, this finding could have important implications for clinical compulsivity conditions, such as OCD.

Non-optimal cognitive offloading in schizophrenia in a prospective memory task: Influence of both metacognitive beliefs and cognitive effort avoidance

Amandine Décombe[1], Chiara Scarampi[2], Elora Malleville[1], Delphine Capdevielle[1], Sam J. Gilbert[3], & Stéphane Raffard[1]

[1]University of Montpellier, [2]University of Geneva, [3]University College London

Cognitive offloading refers to the use of physical action and the external environment to simplify mental demand. One form of this – intention offloading – involves the use of external reminders to support delayed intentions. Both beliefs of poor memory ability and a preference to avoid cognitive effort lead to offloading intentions rather than using internal memory. Schizophrenia is a population with deficits in prospective memory and to overcome this difficulty, neuropsychological interventions can propose external aids such as reminders. However, it is

unknown what motivates individuals with schizophrenia to spontaneously use reminders. Twenty-seven individuals with schizophrenia and twenty-seven non-clinical individuals were recruited to perform a prospective memory task, with two levels of difficulty, by deciding whether to use reminders or their internal memory. The proportion of reminder use, performance (hits and errors), subjective effort and metacognitive beliefs were recorded. The results show a non-optimal use of reminders in the schizophrenia group: this group used more reminders than the non-clinical group when the task was easy but did not increase reminder usage when the task became more difficult. Individuals with schizophrenia perceived the task to be more effortful than the non-clinical individuals in the easy task, but also overestimated their memory ability. These two contradictory influences may explain the non-optimal use of reminder in the schizophrenia group in this experimental task. The overall results open perspectives on the neuropsychological treatment of prospective memory in this population.

Session 4

Aging and prospective memory offloading

Hunter Ball[1], Connor Dupre[1], Dylan Ellis[1], Kinlie Gohl[1], Phil Peper[1], & Matthew Robison[1]

[1]University of Texas at Arlington

Prospective memory—the process of establishing intentions for future actions and remembering to fulfil these intentions at the appropriate time—is crucial for many instrumental activities of daily living and for maintaining functional independence with increased age. Offloading prospective memory demands onto the environment, such as setting a reminder alarm to take medication, offers an easy and effective way to mitigate age-related prospective memory declines. However, a lack of basic knowledge about the cognitive and metacognitive processes that drive offloading decisions presents barriers to successful implementation. We address these issues in the current study by examining age differences in prospective memory for offloaded (i.e., with reminders) and non-offloaded (i.e., without reminders) intentions. We find that when given the choice to offload, older adults show the typical age-related deficits in prospective memory performance relative to younger adults. This may in part reflect that older adults are overconfident in their own memory abilities and do not offload as frequently as they should when given the option. Critically, age differences in performance are eliminated when participants are forced to offload. These findings suggest metacognitive errors may result in an underutilization of reminder systems that may otherwise circumvent cognitive capacity limitations and improve intention fulfilment for older adults.

Adult age differences in selectivity and in value-based remembering

Sebastian Horn[1], Jasmin Brummer[1], Alexandra Freund[1]

[1]University of Zurich

Age-related changes across adulthood in cognitive abilities as well as motivation likely influence how selectively younger and older adults remember things. In this presentation, we present research on retrospective and prospective memory that examined selective and value-directed remembering in younger, middle-aged, and older adults (18 to 85 years) in laboratory studies

and a field study. The findings indicate that selectivity for valuable information remains high in older adulthood and that the magnitude of age differences in memory performance depends on whether negative (loss-related) or positive (gain-related) consequences are emphasized. Thus, the consideration of motivational orientation can help to better understand age-related differences in selectivity and memory performance.

Poster Presentations

Digital fixation in the age of AI: Examining mental set and cognitive style as digital fixation mechanisms

Zack C. McDonald[1] & Julia S. Soares[1]

[1]Mississippi State University

Storm et al. (2017) demonstrated a digital fixation effect such that participants assigned to use internet search, compared to memory, to answer hard questions were more likely to choose to use the internet over memory to answer easy questions. Digital fixation could be driven by mental set, the tendency to continue using a solution that has worked in the past to solve new problems (Luchins, 1942), or a change in cognitive style such that people become more miserly with their cognitive resources after using internet search (Barr et al., 2015). The current study examined digital fixation in the context of AI chatbots to help differentiate between these two mechanistic accounts.

In Experiment 1, participants were assigned to use Google, ChatGPT, or memory to answer a set of hard trivia questions. They then had free choice to use their memory or an internet source to answer easy trivia questions. Participants in the ChatGPT and Google conditions were less likely to answer the easy trivia from memory compared to the memory condition, showing a digital fixation effect in both conditions. Moreover, participants in the ChatGPT and Google conditions tended to continue using ChatGPT and Google, respectively.

To reduce the possibility that these results were influenced by participants' prior experience with ChatGPT or Google, Experiment 2 was designed to replicate Experiment 1 with internet search (Yandex Search) and AI chatbot (Perplexity AI) options that would be unfamiliar to our participants. Consistent with Experiment 1, participants were significantly less likely to answer the easy trivia questions from memory in the Perplexity AI and Yandex Search conditions compared to the memory condition. However, AI and search participants in E2 often switched to using a different search tool. These findings are discussed in the context of the mental set and cognitive style accounts.

Examining cognitive offloading of textual passages

Tanner Grubbs[1], Oscar Ramirez Perez[1], Zack McDonald[1], & Julia S. Soares[1]

[1]Mississippi State University

Prior research demonstrates memory impairments when participants expect to have access to information compared to when they do not expect access to that information (cognitive offloading; Kirsh & Maglio, 1994; Martin & Schwartz, 2005; Risko, Medimorec, Chisholm, &

Kingstone, 2014; Scaife & Rogers, 1996; Wilson, 2002). Research examining these impairments in cognitive offloading largely focuses on facts or lists of words rather than lengthier text passages. The present study investigated the impact of anticipated access to textual information on memory for the text. Experiment 1 used a within-subjects design with two conditions; participants either anticipated access to the textual passage during the memory test, or participants did not anticipate access to the textual passage. The study consisted of a learning phase where participants read and answered questions regarding two different topics. Afterwards, participants moved on to the testing phase where they read and answered questions regarding two different topics. Passage assignment was counterbalanced for condition and condition order. We hypothesized that individuals expecting access to external text passages will engage in cognitive offloading and thus perform worse on the memory test relative to those who expected to rely on internal memory alone. Performance on a multiple-choice memory test was significantly lower when participants anticipated access to the text compared to when they expected to rely on internal memory. These results suggest that participants engage in offloading even when reading informational text passages exceeding 500 words in length.

Intentional forgetting prevents proactive interference, but does not improve memory for novel stimuli

Anna-Lena Finkler[1] & Hauke S. Meyerhoff[1]

[1]University of Erfurt

When observers memorize different layouts of similar stimuli, their memory performance declines across trials. However, note-taking during the first trials prevents such a decline also in an unaided final trial. This effect was attributed to intentional forgetting of the preceding stimuli (Eskritt & Ma, 2014; Memory & Cognition, 42, 237-246). We argue that the beneficial effect of note-taking on memory performance in the final trial emerges either from a release from proactive interference between subsequent materials or a release of mental fatigue. In two experiments, we aimed at disentangling these two explanations using a Concentration Game paradigm. In the first experiment (N = 53), we replicated the effect that internal memory performance was more accurate in a final (unaided) round of the concentration game (repeating the same pairs of cards) when the participants were allowed to take notes during the first rounds than when they had the solve the game without note-taking. In Experiment 2 (N=87), we varied whether the pairs of cards were repeated or novel stimuli. We observed that the beneficial effect of note-taking appeared only for repeated pairs of cards, but not for novel pairs of cards. This finding suggests that note-taking released observers from proactive interference, but does not improve subsequent memory in a broader sense.

Physical effort in cognitive offloading

Rouven Aust[1] & Wilfried Kunde[1]

[1]University of Wuerzburg

Cognitive Offloading - defined as the use of external resources to minimize cognitive demand - is ubiquitous in everyday life. Although this definition implies an additional action and therefore physical effort to be exerted, the influence of such physical effort on Cognitive Offloading

Behaviour has not or only insufficiently been investigated. Through Hand Motion Tracking (in a typical mouse tracking setup) a deeper understanding of the influence of physical effort as well as the decision making process is accomplished.
An extension of the mental rotation paradigm is used to either rotate a working stimulus mentally or manually. As a manipulation of physical effort the rotation knobs' resistance was varied blockwise. The presentation angle of the working stimulus as well as its complexity were varied trialwise.
Participants use the option to offload the rotation process to the knob more often when the physical effort it takes to do so is low. One reason for this is the reduction of errors made when the task is offloaded. Furthermore there is substantial evidence that physical effort is taken into account as part of a value based decision making process. The Area under the Curve (AUC) is larger for the high physical effort condition suggesting greater decision conflict.
The paradigm used here can replicate common findings of the field as well as add new and promising insights into the decision making process when it comes to Cognitive Offloading. Future studies should make these decision situations less artificial by reducing prespecification of choice options - by adding uncertainty to the choice options.

Prospective memory reminders reduce misses but increase repetition errors

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Event-based prospective memory (PM) refers to the use of environmental targets (e.g., medication bottle) to trigger retrieval of delayed intentions (e.g., taking medication). Evidence suggests that offloading PM demands onto external sources (e.g., Google Calendar) can improve intention fulfilment. While previous research has primarily focused on how offloading influences performance when a target is encountered only once, we often encounter PM targets multiple times throughout the day and our actions (e.g., do or do not take the medication) should differ depending on our memory for the prior response (e.g., already took medication). To simulate this in the laboratory, participants memorized a list of PM target words for which they were to make a special PM response (‘first’ key) the first time each target was encountered during on ongoing task. Critically, on the second presentation of the same target, participants were to make a different PM response (‘second’ key) if they remembered responding to it previously. In the reminder condition the PM targets were displayed at the top of the screen, whereas in the no-reminder condition a series of "xxx's" appeared at the top of the screen instead. The results indicated that repetition errors (i.e., making a ‘first’ response to a target already responded to) were higher in the reminder than in the no-reminder condition (Experiment 1). This repetition effect persisted even when reminder usage (using a lookup table; Experiment 2) or intention retrieval (typing out the PM response; Experiment 3) was made more elaborative. Notably, reminders generally reduced PM misses. These findings suggest that using PM reminders can alter how individuals encode and retrieve information, potentially increasing the likelihood of forgetting previously fulfilled intentions.

Strategic reminder setting for time-based intentions

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Time-based intentions, such as remembering to make telephone call at a particular time or removing food from the oven after a delay, can be highly cognitively demanding. In everyday life, people often offload these demands to the external environment by setting alerts and reminders, however this process of time-based intention offloading has rarely been examined experimentally. Here, we investigated this process in a paradigm where participants had to remember to press a key after a 10, 20, or 30 second delay, while simultaneously engaged in an ongoing 2-back working memory task. Use of reminders improved accuracy, and participants were more likely to offload intentions at longer delays. This process was driven at least partially by metacognitive beliefs about the need for reminders, rather than the actual need. There was also an influence of time-monitoring demands: offloading was reduced when a clock was always visible, compared with a condition where participants had to press a button to reveal it. These results show that principles of cognitive offloading established in other domains also apply to time-based prospective memory: it improves performance, is influenced by cognitive demand, and guided by metacognitive beliefs.

Creating outward to think inward: The effect of intention offloading on mind-wandering

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Intention offloading involves creating external reminders in the environment to help recall delayed intentions, like writing a note on the calendar for an upcoming event. Research shows that as memory load increases, individuals are more likely to offload intentions (1), freeing up more cognitive resources for task-relevant information. The availability of cognitive resources is also crucial for engaging in mind-wandering, i.e., the automatic drift of attention toward personally significant, albeit task-unrelated, content - such as current concerns (2). Building on these assumptions, we hypothesized that intention offloading could enhance cognitive resources availability for mind-wandering. Sixty-six participants performed an online version of the intention offloading task: they had to drag circles containing numbers (from 1 to 15) in ascending order to the bottom of the screen while concomitantly remembering to drag one (low memory load) or three (high memory load) target circles to different locations (left, right, or top). At the onset of intention offloading trials, participants had to set reminders: they had to move the target circle(s) toward their intended location on the screen, thus creating a perceptual cue when reached. Thought probes occasionally interrupted the task, prompting them to estimate their level of off-task thinking and, for each thought, its level of intentionality (how deliberate it was). Our findings indicate that intention offloading improved accuracy levels and decreased the percentages of confusions in the task, especially under the high memory load condition. Off-task thinking levels increased over trials, suggesting a time-on-task effect. However, intention offloading did not exert any clear effect on mind-wandering or its intentionality levels. Further in-person studies are needed to enhance the reliability of self-report off-task thinking measures and, eventually, to confirm the existence of this hypothetical relationship.