Short Talks:

Talk 1:

Evidence for a stability-flexibility trade off when using valency, and not congruency, as a measure of cognitive stability

Luca Moretti*, Iring Koch, Tobias Egner

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It is currently debated whether cognitive flexibility (the ability to switch between tasks), is inversely related to cognitive stability (the ability to shield the current task from interference). Such debate was greatly fostered by a recent study of Geddert & Egner (2022), showing that manipulating the proportion of switch trials does not impact the congruency effect and, complementarily, the proportion of incongruent trials does not impact the switch cost. These results seem to suggest that being in a more flexible state does not necessarily impair the ability to shield the current task from interference and, complementarily, being more stable does not necessarily impair the ability to switch between tasks. However, we argue that flexibility and stability should only trade off if both are measured at the task level. To test this idea, the present study employs the same logic as Geddert & Egner (2022) but critically uses a different measure of cognitive stability, which better captures task-set interference. To this aim, stability was measured with the valency effect, namely the performance cost associated with congruent trials compared to univalent trials. Across three experiments and a re-analysis of 4 datasets, we observed that increasing the proportion of switch trials heightened the valency effect and, complementarily, that increasing the proportion of bivalent trials increased the switch cost. The present results therefore provide strong evidence in favour of the idea that stability and flexibility trade off. At the same time, they highlight the importance of defining and operationalizing the construct of cognitive stability.

Talk 2:

The stability-flexibility trade-off at different levels of analysis

Jeshua Tromp, Sander Nieuwenhuis, Jonathan Cohen, **Bryant Jongkees***

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Optimal decision making often requires a compromise between opposing functional demands. An influential example is the trade-off between cognitive stability and flexibility. This refers to the notion that stable focus on a given task, to maximize performance and minimize distraction, makes it harder to flexibly disengage from and switch between different tasks. Despite the intuitive appeal of this trade-off, some studies have challenged its obligatory nature, by suggesting that behavioral measures traditionally associated with stability (incongruence costs) and flexibility (switch costs) can increase or decrease together rather than trading off against each other. In recent work we provided a novel interpretation of these findings. We

presented a mechanistic process model of task switching that provides a normative account of the stability-flexibility trade-off. We show that this model predicts several of the behavioral observations that have been used to argue against the trade-off at the mechanistic level, including joint increases in incongruence and switch costs. Our approach therefore suggests a reconciliation between concerns about the stability-flexibility trade-off viewed strictly through the lens of behavioral measures, and its relevance at the level of underlying mechanisms.

Talk 3:

From phone notifications to browsing social media: how reinforcement learning explains digital information consumption

Mangat Guntash, Gaia Molinaro, Tom Verguts, **Irene Cogliati Dezza** *

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In an increasingly information-rich world, humans constantly face decisions about which information to seek or avoid. From checking our phone notifications and browsing social media, to deciding whether to read news about global crises or view our financial statements, these information-seeking choices fundamentally shape our daily experiences and wellbeing. Despite the prevalence and importance of such decisions, a critical gap exists in our understanding of how different motivational factors interact to drive information-seeking behavior. This knowledge gap has significant implications for emerging phenomena like "doomscrolling" and "deliberative ignorance". Here, we integrate recent theories of information-seeking into a novel reinforcement learning framework providing a mechanistic account of both adaptive and maladaptive information-seeking patterns in our increasingly complex information ecosystem.

Talk 4:

The Effect of Conscious Control on the Automatic Reading Response & the Link Between Suggestibility and Metacognitive Efficiency

Vlada Aslanov*, Nicolás Sánchez-Fuenzalida, Tomas Knapen, Simon van Gaal, Johannes J. Fahrenfort

*Vrije Universiteit Amsterdam

Reward- and punishment-associated (i.e., Pavlovian) cues can trigger specific responses that interfere with learning appropriate actions. For instance, several studies have shown that reward impedes the learning of no-go responses, while punishment impedes the learning of go responses. This so-called Pavlovian bias is theorized to arise at the motor level, and to reflect a tight or even "hardwired" coupling between reward and action activation, and between punishment and action suppression. Contrary to this view, across four experiments testing adults (one pre-registered, total N = 585), using behavioral analyses and computational modeling, we show that action framing strongly modulates this Pavlovian bias. When go is

framed as approach and no-go as avoidance, we replicated the typical asymmetry in learning. However, when go is framed as avoidance and no-go as approach, this Pavlovian bias disappeared. The Pavlovian bias thus operates partly on a semantic level, and is less hardwired than often theorized.

Posters:

Poster 1:

Computational modeling of memory (dis)organization in aging

Sven Wientjes*, Clay B. Holroyd, Sean M. Polyn

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Experimental psychologists study the organization of episodic memory using "free recall" of lists of words. Free recall data demonstrates complex temporal organization, with participants showing better recall for later list items ("recency") but also for the earliest list items ("primacy"). In addition, participants tend to sequentially recall items that were encoded in nearby list positions, and tend to prefer forward over backward transitions. This complexity is captured by the "context maintenance and retrieval" (CMR) model, a powerful connectionist model of the episodic memory system. CMR maintains a persistent contextual representation that drifts over time, slowly integrating each moment of experience into the context. This contextual representation then acquires bidirectional associations with new incoming experiences, so that later similar contexts can function to retrieve these experiences, and retrieved experiences can aid to reinstate the context in which they were experienced. We implemented CMR in the software Stan, estimating the parameters in a hierarchical Bayesian framework based directly on the observed order of the recall responses. Considering an immediate free recall dataset that tested both young and older adults (Healey & Kahana, 2016), we observed that this implementation of CMR cannot capture a strong primacy effect, specifically for young adults. We addressed this limitation by turning CMR into a mixture model where participants only show a primacy effect on a subset of trials, and this primacy effect is mediated by top-down changes of the context to resemble the context as it was before the first word was encoded. This top-down control over context could be interpreted as the result of the "flexible" recruitment of encoding strategies, such as forming a coherent story out of the words, or imagining the words as objects in familiar locations (Zhang et al., 2023). Fits of this model reveal that older adults struggle with reinstating the start-of-list context, as well as with retrieving the experimental context in which each item was experienced. Importantly, previous work concluded that older adults were not impaired in recall initiation, because the first recall probabilities look identical between young and older adults, and the overall recall performance of older adults shows a primacy effect. However, our model shows that older adults show this primacy effect because they cannot sustain attention during the encoding of later words in the list, yielding an overall benefit for the early list items without imposing the strong organization observed in young participants. The ability of our mixture-CMR to capture

this nuance in recall organization makes it a promising candidate to further investigate memory impairments in various clinical populations.

Poster 2:

How Does Entrepreneurial Experience Shape Cognitive Flexibility?

Marine Le Petit*, Harry Antony, Frédéric Ooms, Fabienne Collette

*University of Liège

Entrepreneurs evolve in a dynamic environment requiring efficient abilities to adapt to novel, uncertain and often stressful situations - an ability referred to as cognitive flexibility. Recent studies have evidenced that higher cognitive flexibility in experienced entrepreneurs is associated with differences in brain structure and function compared with managers. However, whether this enhanced cognitive flexibility is an inherent trait of entrepreneurs or develops through experience remains unclear. Moreover, prior findings rely on self-report measures, which may not objectively capture individuals' cognitive abilities. The present study aims to examine whether cognitive flexibility, as measured through performance-based cognitive tasks, evolve with entrepreneurial experience. Currently in the recruitment phase, the study will include 90 entrepreneurs at various career stages and 30 employees without entrepreneurial experience. Participants will complete two tasks: phonemic fluency assessing proactive flexibility, and the letter-number task assessing reactive flexibility. We hypothesize that both dimensions of cognitive flexibility will be positively associated with entrepreneurial experience. By disentangling the effects of entrepreneurial experience on specific dimensions of cognitive flexibility, this research seeks to advance our understanding of how environments shape adaptive cognitive processes – an essential ability in today's information rich world. Preliminary findings will be presented at the time of the poster session.

Poster 3:

Sequential changes in reward prospect modulate cognitive control even with implicit learning of reward cues

Sarah Wilts*, Kerstin Fröber

*University of Cologne

Reward prospect modulates cognitive control, promoting either more stable or more flexible behavior depending on the immediate reward history: Previous studies have shown that specifically remaining high reward prospect enhances stability, as reflected by reduced voluntary task switching. However, it remains unclear whether sequential changes in expected reward magnitude influence only conscious control processes or also affect behavioral stability without explicit awareness of these changes. In this study (n=42), we used a voluntary task-switching paradigm with cues announcing varying reward prospects. However, the meanings

of the cues, indicating either high or low reward magnitude, were not explicitly instructed to participants. Results showed that participants nevertheless learned the cue meanings, as they responded faster on high-reward trials than on low-reward trials. In addition, sequential changes in reward prospect influenced behavioral stability, with participants switching tasks less frequently specifically on "remain high" trials. These findings confirm previous results with explicitly instructed reward cues, but suggest that cue meanings can be acquired implicitly, as participants were unable to report them verbally.

Poster 4:

Flexible statistical learning: Online target detection, but not offline recognition reveals adaptation to changing regularities

Brent Vernaillen, **Louisa Bogaerts***

* Ghent University

The ability to discern the statistical regularities in our environments has been shown to support key cognitive functions, including attention, prediction and language learning. While most research has focused on stable regularities, real-world patterns often change over time, requiring flexible updating of internal representations. In the context of embedded pattern learning, where continuous input consists of hidden pairs or triplets, prior work showed that learning of an initial structure can hinder learning of an updated one. Unlike most previous studies, which relied on post-exposure (offline) learning measures, the current study also incorporated an online target detection during exposure, to gauge real-time learning and adaptation to novel patterns more directly. In three separate blocks, participants were exposed to a stream of embedded pairs that were reshuffled into new pairs halfway through the stream. We administered the same task in both the visual and auditory modality, allowing us to explore modality-specific differences. The online target detection measure revealed that participants learned both the initial and updated regularities, but with an advantage for learning the former. In contrast, our offline measure only evidenced recognition of the initial patterns, echoing previously reported primacy effects. These learning effects were only present in the auditory modality, with no evidence of visual statistical learning. Our results corroborate earlier findings and underscore the importance of online measures in capturing flexible learning that is not captured by offline measures.

Poster 5:

Predict to Resist: Targeting Predicted Actions to Shift Impulsive Behavior

Tilia Linthout*, Yannick Boddez, & Pieter Van Dessel

*Ghent University

Impulsive behaviors, such as unintentional snacking, doomscrolling, or reacting in anger, can be hard to change. Across two preregistered studies, we tested a novel intervention grounded in goal-directed predictive processing (GDPP), which aims to shift the automatic predictions people make about their own future actions. In Study 1 (N = 67 adults with self-reported impulse control difficulties, recruited via Prolific Academic), GDPP training more strongly improved self-reported expected improvement in impulse control relative to go/no-go training targeting stimulus-response associations. Study 2 (N = 30) used daily experience sampling over three weeks. Participants receiving GDPP training reported stronger improvements in self-control during and after training compared with both go/no-go training and waitlist control conditions. Limitations include reliance on self-report and short-term follow-up. These findings suggest that re-training future-oriented action predictions may offer a promising new approach to behavior change.

Poster 6:

On the Benefits of Heterogeneity in Cognitive Stability and Flexibility for Collaborative Task Switching

Alessandra Brondetta*, Anastasia Bizyaeva, Maxime Lucas, Giovanni Petri, Sebastian Musslick

*Osnabrück University

Environments pose antagonistic demands on individual and collective cognition, such as trading off cognitive stability against cognitive flexibility. Manifestations of this tradeoff have been shown to vary across individuals, leading to differences in individual task switching performance. In this simulation study, we examine how individual differences in cognitive stability and flexibility contribute to collective task switching performance. Specifically, we study whether diversity in cognitive stability and flexibility among members of a group can facilitate collaborative task switching. We test this hypothesis by probing task switching performance of a multi-agent dynamical system, and by varying the heterogeneity of cognitive stability and flexibility among agents. We find that heterogeneous (compared to homogeneous) groups can perform better in environments with high switch rates, especially if the most flexible agents receive task switch instructions. We discuss the implications of these findings for normative accounts of cognitive heterogeneity, as well as clinical and educational settings.

Poster 7:

Affective Control in Conflict Tasks: A Meta-Analysis on the Congruency Sequence Effect

Felix Cramer*, Philipp A. Schroeder, David Dignath

*University of Tübingen

Emotions influence how we control our thoughts and actions, but theories propose different mechanisms and make opposing predictions how valence and/or arousal modulate control exertion. This meta-analysis of 34 studies (72 experiments, N = 3,748) examined whether and how task-irrelevant emotional stimuli influence the congruency sequence effect (CSE), a widely used measure to assess the flexible weighting of attentional resources. Overall, results showed increased CSEs following negative compared to positive stimuli across a variety of different experimental procedures (g = .12). This negativity-boost for control was stronger in studies that used tonic (sustained) affect inductions, presented non-threatening stimuli, controlled for feature-binding confounds, and employed the flanker task. In contrast, arousal showed opposing effects depending on the overlap between emotional and task stimuli, as well as the format of the emotional stimuli—for example, high-arousing words or stimuli embedded within the task appeared to facilitate control. The valence findings support affective control accounts suggesting that negative affect enhances control adjustment. The arousal findings are compatible with models assuming that emotional stimuli interact with attentional resources. Based on this, we propose a tentative theoretical framework that integrates valence, arousal, and task features to explain how affect modulates control processes.

Poster 8:

Environment-sensitive generalization and exploration strategies

Fien Goetmaeckers*, Charley M. Wu, Tom Verguts, Senne Braem

*Ghent University

Humans seem remarkably adaptive in tailoring search strategies to match different environmental structures. For instance, when exploring a disorganized thrift store, our search patterns differ from those in a more structured brand store where stronger generalization allows for more directed exploration. This study investigated which search and generalization parameters people adapt across different decision making environments, and whether they make those adaptations on the fly or are also able to learn to associate these adaptive parameter settings to different environments. Although many models of human decision making assume we have control over our search strategies, there is limited empirical evidence to support that. Using a within-subject manipulation, we tested human search strategies across two environments designed (through model simulations) to require distinct search and generalization parameters. We model human reinforcement learning using Gaussian Process function learning to generalize and an Upper Confidence Bound to sample from unexplored options. Across three experiments, results revealed that participants adapted their search strategies to different environments: in smooth environments, they showed more generalization, and less exploration than rough environments. In Experiment 3, we show that this strategy adaptation is not just a local adaptation to the environment's needs, but that participants also meta-learned to associate their generalization parameters to different environmental cues. Our findings contribute to a better understanding of human search behavior in vast decision spaces.

Poster 9:

Action framing modulates the Pavlovian bias in go and no-go learning

Zhang Chen*, Senne Braem

*Ghent University

Reward- and punishment-associated (i.e., Pavlovian) cues can trigger specific responses that interfere with learning appropriate actions. For instance, several studies have shown that reward impedes the learning of no-go responses, while punishment impedes the learning of go responses. This so-called Pavlovian bias is theorized to arise at the motor level, and to reflect a tight or even "hardwired" coupling between reward and action activation, and between punishment and action suppression. Contrary to this view, across four experiments testing adults (one pre-registered, total N = 585), using behavioral analyses and computational modeling, we show that action framing strongly modulates this Pavlovian bias. When go is framed as approach and no-go as avoidance, we replicated the typical asymmetry in learning. However, when go is framed as avoidance and no-go as approach, this Pavlovian bias disappeared. The Pavlovian bias thus operates partly on a semantic level, and is less hardwired than often theorized.