EWIC 2026

# The 19th European Workshop on Imagery and Cognition

24-26 June 2026
Leiden, The Netherlands

# BOOK OF ABSTRACTS

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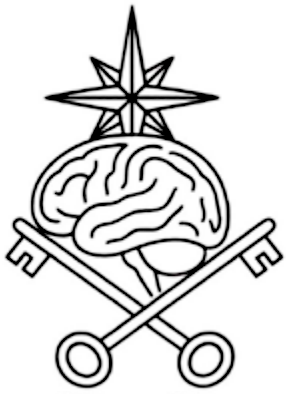

# KEYNOTE SPEAKERS

## Prof. Dr. Christian Doeller

**Title: Structuring experience in cognitive spaces**

Christian Doeller is currently Director of the Department of Psychology at the Max Planck Institute for Human Cognitive and Brain Sciences, Leipzig, Germany and Vice President of the Max Planck Society. With his research team, Doeller aims to answer fundamental questions in cognitive neuroscience: What are the key coding principles of the brain enabling human thinking?

## Margaret Tarampi, PhD

**Title: Seeing space differently: How we think, move, and imagine in space**

Margaret Tarampi, PhD is Associate Professor of Psychology and Neuroscience at University of Hartford in Connecticut, USA, whose research investigates spatial cognition and space perception in select populations, such as visually impaired individuals and spatial experts.

## Dr. Roland Benoit

**Title: The mechanisms and functions of episodic simulation**

Dr. Roland Benoit is an Associate Professor at the University of Colorado Boulder in the Department of Psychology and Neuroscience as well as the Institute of Cognitive Science. He is interested in how we forget memories of our past and construct simulations of our future.

# ABSTRACTS

# Imagery

11:00 - 11:20

## Visual Mental Imagery Enhances Sensory Processing of High and Low Spatial Frequency Information

E. Weber[1], D. Fitze[1], F. Mast[1]

[1]University of Bern, Switzerland

Visual mental imagery and perception rely on overlapping neural mechanisms, suggesting that internally generated signals may interact with incoming sensory information. Previous work has shown that imagery facilitates perceptual detection. We investigate whether imagery involves low spatial frequency (LSF) and high spatial frequency (HSF) information. Participants first viewed a natural scene and then they imagined the scene as vividly as possible. Subsequently, they completed a 2AFC (same-different discrimination) task in which an LSF or HSF version of the same or a different scene was briefly presented (200 ms) embedded in noise. Responses and reaction times were analyzed jointly by means of a drift-diffusion model to dissociate pre-stimulus evidence accumulation (changes in starting point, bias) from variations in sensory processing (changes in drift rate). Imagery selectively increased drift rate when processing HSF stimuli, indicating enhanced sensory processing, whereas no comparable effect was observed for LSF stimuli. Mental imagery did not affect pre-stimulus evidence accumulation. The results suggest that visual mental imagery facilitates discrimination of complex scenes by selectively enhancing the sensory processing of visual HSF information.

# Same performance, different process: Mental rotation across the imagery spectrum

S. Hartgen-Walker[1], G. Ganis[1], A. Smith[1]

[1]University of Plymouth, United Kingdom

When determining whether two objects are identical in shape regardless of orientation, response times reliably increase with increasing angular disparity between the pair (Shepard & Metzler, 1971). This mental rotation effect suggests manipulation of a mental image analogous to physically rotating one object to match the orientation of the other. Thus, such mental rotation tasks have been used in assessing mental imagery ability. However, people with aphantasia - the inability to voluntarily conjure visual mental images - complete mental rotation tasks with the same pattern of responding, despite their lack of visual image.

We compared mental rotation performance across aphants, imagers, and hyperphants - those with exceptionally vivid visual imagery. While the typical pattern was observed for all, neither accuracy nor response times differed between the groups, in contrast to recent work showing aphants to be slower but more accurate than imagers (Kay et al., 2024). Where groups differed was in their strategy use: those with imagery utilised it, and those without used analytical feature-matching strategies most. These findings challenge the notion that mental rotation performance indexes imagery ability and suggest heterogeneity within aphantasia, with implications for how we interpret behavioural similarity across groups with fundamentally different cognitive profiles.

# Improving peripheral visual discrimination by mental imagery

B. Sayim[1,2], R. Aschwanden[3], F.Z. Yildirim-Keles[4]

[1]CNRS, France
[2]École Normale Supérieure, France
[3]University of Bern, Switzerland
[4]Boğaziçi University, Turkey

Crowding, the impairment of object recognition in clutter, can be reduced through long-range grouping mechanisms. Recognition of a peripheral target is improved when an additional item at fixation is identical to the target. Here, we tested whether imagining a central item could similarly facilitate peripheral target recognition. Observers viewed a central item (letter or digit) for 1.5 seconds, followed by a crowded peripheral target at 8° eccentricity. They then either imagined the central item for 4 seconds or maintained central fixation without imagery. Afterward, the crowded target was briefly presented (150 ms) to the left or right of fixation. Observers performed two tasks: reporting first whether the target was a letter or digit and then whether it matched the central item, ensuring attention to both. Performance improved when observers imagined a central item identical to the target compared to imagining a different item or no imagery. In a control experiment using uppercase and lowercase letters, recognition improved only when the imagined item matched both identity and case of the target, indicating a shape-specific effect rather than general cueing. These results suggest that visual imagery can generate signals sufficient to mimic real stimuli and improve peripheral visual discrimination.

## VR and Methods

13:20 - 13:40

### GeoGami: An Open-Source Platform for Spatial Navigation Studies in Real and Virtual Environments

A. Schwering[1]

[1]University of Muenster, Germany

Spatial orientation—the ability to perceive, remember, and reason about one's spatial environment—is a fundamental human cognitive skill. It enables people to navigate, localize themselves, and interact with their surroundings. However, studies indicate a population-wide decline in spatial orientation abilities. Widespread use of geospatial technologies, especially GPS navigation, reduces active spatial reasoning. Young people depend heavily on digital navigation tools, while adults increasingly use map-based applications in professional and everyday contexts. Among older adults, cognitive decline is frequently accompanied by impairments in spatial abilities such as loss of orientation and navigation skills - disorientation is one of the earliest symptoms of dementia.

GeoGami is a free and open-source research software that supports systematic and reproducible navigation studies in real and virtual environments. The platform provides tools for designing and conducting experiments to assess or train spatial orientation competence. GeoGami includes tasks for (1) aided and unaided wayfinding, (2) self- and object-localization, (3) direction and distance estimation, and (4) recall of routes and landmarks. In addition, the system integrates GPS-enabled tracking of participants to record navigation behavior and performance. GeoGami facilitates the setup, execution, and analysis of navigation studies and supports researchers in conducting flexible and comparable experiments across different environments.

# A Visuospatial Complexity Framework for Analysing Anticipation in Naturalistic Active Vision

V. Kondyli[1], M. Bhatt[2]

[1]Lund University, Sweden
[2]Örebro University, Sweden

Understanding active vision in naturalistic settings requires examining how the brain generates predictions and anticipates events under dynamic and uncertain conditions. The study of active vision necessitates investigation of coordinated interactions across distributed brain networks supporting diverse introspective and anticipatory functions while at the same time adopting a naturalistic stimulus design approach. Towards this, we propose a cognitive visuospatial complexity model that enables systematic parametrisation of dynamic visual stimuli for functional neuroimaging, behavioural experimentation, and psychophysics. The model supports controlled construction of graded complexity levels through parametric manipulation and is designed to investigate active vision and event-based anticipation in ecologically valid scenarios. Our methodology defines an abstraction-to-realism axis capturing key prediction-relevant dimensions of visuospatial complexity, including occlusions, contextual continuity, temporal regularity, event-based anticipation, and constraints from commonsense and naïve physics. We additionally provide an accompanying stimulus dataset that demonstrates how the model can be implemented in practice for neuroimaging applications. The framework provides a standardised and reproducible stimulus-design space, enhances cross-study comparability, enables multimodal data integration, and supports the testing computational models of active vision and predictive processing. Our aim is to advance systematic methodological foundations for the neurocognitive and behavioural study of active vision under ecologically valid naturalistic conditions.

# Headfirst into VR: Teaching Brain Anatomy Through Immersive Technology

C. Kuipers[1], I. van der Ham[1], J. Schomaker[2, 3], A. Mol[4], J. van der Hage[5]

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[3]Leiden Institute for Brain & Cognition, Netherlands
[4]Leiden University, Centre for Digital Humanities and the Centre for the Arts in Society, Netherlands
[5]Division of Surgical Oncology, Leids University Medical Centre, Netherlands

Background: Previous research has found that using virtual reality (VR) in education can improve learning outcomes in students. However, it remained unclear how instructional design features—independent of the VR technology itself—could be optimized to enhance learning outcomes.

Objective: This study examined three design factors expected to substantially influence learning performance: presentation format (3D VR vs. 2D computer screen), degree of guidance (fully guided vs. free exploration), and congruency between learning and assessment environments. We aimed to determine their individual and combined contributions to educational effectiveness and to identify design principles that maximize its pedagogical impact.

Methods: A 2 × 2 × 2 between-subjects design was used to investigate the effects of presentation format, guidance level, and learning–assessment congruency. Learning outcomes were measured as the mean scores on questions assessing the name, function, spatial location, and spatial relations of brain structures. Spatial ability, assessed with the Mental Rotation Task and the Corsi Block-Tapping Test, was included as a covariate.

Results: At the time of submission, data collection was still in progress. Preliminary analyses revealed a significant interaction between degree of guidance and congruency, indicating that the effect of congruency differed between guided and exploratory learning environments.

# Toward More Comfortable VR: The Effects of Music and Locomotion on Visually Induced Motion Sickness in Interactive Virtual Reality

E. Herkul[1], J. Schomaker[1]

[1]Leiden University, Netherlands

Virtual reality (VR) is increasingly used in domains such as spatial cognition research. However, visually induced motion sickness (VIMS) remains a major barrier to its effective use affecting approximately 60% of its users. Prior work suggests that auditory context may influence VIMS. However, studies on this relied on passive VR experiences, leaving commonly used interactive environments understudied.

The present study examined whether pleasant music can mitigate VIMS in an interactive VR task and whether this effect differentiates for different locomotion types. Participants performed an object-gathering task in a virtual forest. The experiment employed a 2 x 3 mixed design with locomotion type (real walking vs. joystick movement) as a within-subjects factor and music condition (pleasant, unpleasant, or no music) as a between-subjects factor. VIMS was measured using repeated MIsery SCale ratings and the Virtual Reality Sickness Questionnaire. Sense of presence, prior gaming experience, and sex were included as covariates.

Exploratory analyses examined whether behavioral engagement in VR relates to VIMS by analyzing total distance traveled, time spent moving, and the number of objects collected. This work provided pointers to identify simple design strategies for reducing VIMS, improving the usability of VR for spatial cognition research and other interactive applications.

# Modeling Sustainability: How Virtual Agents Influence Pro-Environmental Behavior in Virtual and Real Contexts

A.L. Silvino[1], T. Iachini[2], G. Ruggiero[2], S. Nunziata[2], S. Iuliano[2], F. Ruotolo[2]

[1]Università degli Studi della Campania, Italy
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Climate change is largely driven by human behavior, making the promotion of pro-environmental behaviors (PEBs) a critical challenge. Social-Cognitive Theory suggests that behavioral change can be fostered through observational learning and increased self-efficacy. Immersive virtual environments offer a promising context to apply these mechanisms.
In the present study, 47 participants were randomly assigned to observe a Virtual Agent (VA) performing either ecological or non-ecological actions within a virtual kitchen. Self-efficacy was assessed before and after observation. Participants were then re-immersed in the same environment without the VA and were free to interact with the kitchen while their spontaneous behaviors and imitations were recorded.
Following the virtual experience, participants were unknowingly exposed to a real-world behavioral measure: after a confederate spilled water, they were asked to pass napkins, and the number used was recorded.
Results showed that exposure to an ecological VA increased imitation of pro-environmental behaviors, reduced non-ecological actions, decreased napkin use, and enhanced self-efficacy.
These findings suggest that virtual behavioral modeling can promote sustainable behaviors and transfer to real-world actions, extending Social-Cognitive Theory to immersive environments.

15:00 - 16:00 |

## Coffee Break & Poster Session

16:00 - 17:40 |

## Spatial Cognition

16:00 - 16:20

### Influence of postural constraints on the upper and lower limbs on our memory of near and far spaces.

J. Dutay Balcarce[1], S. Lhuillier[1], V. Gyselinck[1]

[1]Laboratoire de Psychologie et Ergonomie Appliquées, France

According to embodied and situated approaches to cognition, our memory representations emerge from interactions between our body and the environment. It follows that sensorimotor interactions during learning could shape our spatial representations.
Our objective is to examine the extent to which postural constraints applied to the upper and lower limbs impact our memory of near and far spaces. Some earlier, albeit limited, studies suggest that upper limb sensorimotor information shapes near space representation, whereas far space representation relates more to lower limb information.
In this study, participants had to remember virtual visual scenes containing objects placed either near or far from them. They then performed a proximity judgement task (selecting the closest object) and a localization task (positioning objects on a map). During encoding, three conditions were applied: a control condition (without postural constraint), an arm constraint condition (arms crossed behind the back), and a leg constraint condition (legs crossed).
We hypothesize that arm constraints will affect proximity judgment and position recall performance in the near space, while leg constraint will mainly alter performances in the far space. The results will be discussed in light of the embodied approach to cognition.

# Environmental representation in Action: exploring the relationship between environment knowledge and motor representation

V. Muffato[1], S. Betti[1], L. Sartori[1], C. Meneghetti[1]

[1]University of Padova, Italy

Spatial cognition is linked to bodily action, as the way we move may reflect how we mentally represent space. We aimed to investigate the embodied nature of spatial representations by examining how motor processes support the flexible representation of familiar environments. Therefore, we investigated the kinematics of pointing movements (Study 1) and motor cortex activity during imagined pointing (Study 2) considering the role of gender and alignment effects.
In Study 1, 34 participants (17 women) pointed toward familiar locations while their body orientation was either aligned or counter-aligned with the target. Index finger movements were recorded with a 3D motion capture system. Results showed alignment effects with counter-aligned conditions producing slower movements. While spatial accuracy did not differ by gender, small differences emerged in motor execution, with men producing slightly faster movements and larger displacement.
In Study 2, 35 participants (21 women) imagined pointing toward aligned or counter-aligned locations in a familiar environment while transcranial magnetic stimulation (TMS) was applied. Corticospinal excitability was significantly higher for counter-aligned targets, indicating greater motor system engagement when spatial transformation demands increased, with no gender differences.
Together, these findings provide converging behavioral and neurophysiological evidence that spatial representations are tightly embodied in motor processes.

# The Role of Semantic Information and Temporal Dynamics on Egocentric and Allocentric Spatial Representation Processes

M. Possenti[1], R. Orti[1], T. Iachini[1], F. Ruotolo[1], G. Formisano[1], G. Ruggiero[1]

[1]University of Campania "L. Vanvitelli", Italy

Humans rely on egocentric (body-based) and allocentric (object-based) reference frames to encode spatial relationships. However, everyday spatial behaviour also depends on semantic knowledge about objects and the contexts in which they typically occur, as well as on whether objects appear simultaneously or sequentially. Despite their relevance for natural behaviour, spatial reference frames, semantic context, and temporal dynamics have rarely been examined together.

To address this issue, we investigated how semantic context and temporal dynamics influence spatial representations. Forty participants memorized triads of congruent objects presented either simultaneously (static) or sequentially (dynamic) within meaningful (kitchen/bathroom) or meaningless (abstract) virtual contexts. Participants then judged whether a target object was closest to themselves (egocentric) or to another object in the triad (allocentric).

Results showed that egocentric judgments were more accurate than allocentric ones in meaningless contexts, but this difference disappeared in meaningful contexts, both in static and dynamic conditions. Crucially, allocentric accuracy improved significantly in meaningful contexts only when objects were presented sequentially.

These findings suggest that semantic context selectively facilitates allocentric spatial representations, particularly when spatial information unfolds over time. This effect may reflect an anticipatory mechanism, whereby contextual knowledge supports the prediction of object relationships during spatial encoding.

# Switching Between Egocentric and Allocentric Reference Frames: A Multimodal Study of Behavioural, Physiological, and Neural Mechanisms

R. Orti[1], T. Iachini[1], G. Ruggiero[1]

[1]University of Campania L. Vanvitelli, Italy

Successful navigation relies on the flexible interaction between egocentric (body-centered) and allocentric (object-centered) spatial representations. A critical yet understudied component of this process is the ability to switch between spatial reference frames. In particular, little is known about how environmental structure and cognitive demands influence switching between egocentric and allocentric representations.
To address this issue, we investigated visuospatial switching processes using a novel paradigm, the Ego–Allo Switching Task. Participants memorized triads of objects and subsequently provided relative distance judgments in both switching conditions (Ego-to-Allo, Allo-to-Ego) and non-switching conditions (Ego–Ego, Allo–Allo).
Across three studies, we examined the behavioural, physiological, and neural mechanisms underlying spatial reference frame switching. Behavioural results (Study 1) showed that non-orthogonal environmental layouts selectively impair switching from allocentric to egocentric representations. Cognitive pupillometry (Study 2) further revealed that this transformation elicits greater cognitive load, as reflected by increased pupil dilation. Finally, fNIRS (Study 3) identified a fronto–parieto–temporal network supporting visuospatial switching, with the temporo-parietal junction emerging as a key hub for translating between reference frames.
Together, these findings provide a multilevel account of spatial reference frame switching, revealing how environmental structure and cognitive demands jointly constrain the transformation between egocentric and allocentric representations.

# From Objects to Environments: Exploring the Link Between Small-Scale and Large-Scale Spatial Abilities and the role of spatial anxiety in Children

J. Moorkens[1], M. Oldenburger[1], M. Hickendorff[1], I. van der Ham[1,2], D. Jolles[1]

[1]Leiden university, Netherlands
[2]Delft University of Technology, Netherlands

Spatial abilities play an important role in everyday functioning and are strongly linked to success in science, technology, engineering, and mathematics. Spatial cognition encompasses multiple skills that operate at different scales. Small-scale spatial abilities involve the mental manipulation of objects that can be perceived from a single viewpoint (e.g., mental rotation and spatial visualization), whereas large-scale spatial abilities involve navigation and the representation of environments extending beyond the immediate perceptual field. Although both types of abilities are widely studied, their relationship remains unclear.

The present study investigates the relation between small-scale and large-scale spatial abilities in children (grades 5-6). In addition, we examine how individual factors are related to these large-scale and small-scale spatial skills. Spatial anxiety is of particular interest, as it may reduce children's engagement in spatial activities and thereby hinder the development of spatial skills, while limited spatial skills may also contribute to higher levels of spatial anxiety. Furthermore, we explore whether gender differences are present at this stage in development, as previous research has reported gender differences in both small-scale and large-scale spatial abilities, with boys outperforming girls. Therefore, we examine whether the relationship between spatial anxiety and spatial skills differs between boys and girls.

## Individual Differences

9:00 - 9:20

### The orienteering practice and spatial abilities: To be elite and expert orienteers can make the differences?

C. Meneghetti[1], T. Feraco[1], V. Muffato[1], F. Taufer[2], E. Visintin[1]

[1]University of Padova, Italy
[2]Swedish University of Agricultural Sciences, Sweden

Orienteering is a navigation-based sport. Previous research suggests an association between orienteering practice and spatial abilities. However, while elite orienteers have been investigated for the strategies used during competition, their spatial abilities—both small-scale and large-scale—have not been assessed systematically. This study examined whether different levels of orienteering practice are related to spatial abilities and wayfinding inclinations. A total of 122 participants (16–45 years) took part: 32 elite orienteers, 45 amateur orienteers affiliated with the Italian Orienteering Federation (FISO) (with a comparable number of years of experience and competitions per year), and 45 non-athlete controls. Participants completed a battery of spatial tasks and wayfinding questionnaires. Regression models showed that elite orienteers performed better on mental rotation, perspective taking, spatial perception, and spatial visualization, and reported greater pleasure in exploring, a better sense of direction and more frequent use of cardinal points. Amateurs differed from controls on some measures but did not differ significantly from elites overall. For the elite group, competition behavior and championship performance were also recorded; spatial anxiety was significantly and negatively correlated with championship performance. Overall, these findings support a link between orienteering practice with both small-scale spatial abilities and wayfinding-related inclinations.

# Human spatial exploration behavior: Individual and intra-individual differences

J. Schomaker[1]

[1]Leiden University, Netherlands

In an environment with limited resources, exploration is a central characteristic of mammalian behavior that is crucial for survival. Exploration behavior is a multifaceted activity, however, that can be operationalized in various ways. Interestingly, the human literature has focused on exploratory decision-making, while the animal literature often involves spatial exploration of real-world environments. There currently is no consensus on how to measure or characterize spatial exploration behavior in humans. Inspired by work in animals, we developed a novel task to investigate free exploration in a virtual environment in humans. We identified three core dimensions of human exploratory behavior, including measures related to exploratory activity, efficiency and complexity. Our task captured both individual and intra-individual differences. In particular, males showed more exploratory activity, while females explored more efficiently, and age affected the complexity of the exploratory behavior. In a recent study, we further observed that individuals with dementia showed less exploratory behavior than healthy controls. These findings suggest that intact exploratory behavior may represent a hallmark of healthy aging, while reduced exploration may be a behavioral marker of pathological aging and cognitive impairment. Future studies should determine whether behavioral indices of exploration can serve as sensitive markers for early cognitive change.

# Age-Related Differences in Map Reading for Wayfinding: Cognitive Decline or Preservation of Skill?

H. Dedetaş Şatır[1], B.C. Fehringer[1], S. Münzer[1]

[1]University of Mannheim, Germany

Extracting route information from maps is essential for wayfinding. It depends on both map-reading skills and cognitive abilities. To succeed in this task, older adults may benefit from map-reading skills (that were developed before navigation assistance systems became widespread), whereas younger adults may benefit from higher spatial abilities. This study examined age-related differences in map-based route learning performance between younger (M age = 21.3) and older adults (M age = 65.5), and the mediating roles of visuospatial working memory (VSWM) capacity and perspective-taking ability (PTA) in these differences. 86 participants (41 old, 45 young) learned a route depicted on a digital map while their gaze patterns were recorded, and navigated the route from memory in a virtual environment. Navigation errors were recorded as a measure of route memory. Younger adults demonstrated higher VSWM capacity and better PTA, and performed better on the navigation task. This effect is fully mediated by PTA, but not by VSWM capacity. Results thus suggest that cognitive abilities play a stronger role than age-related experience in this task. Additionally, exploratory gaze pattern analysis suggests a group difference regarding the benefit of repeated reading of the depicted route as an ordered sequence during map reading.

## Papers session

11:30 - 11:50

# Imagining Climate Change Promotes Pro-Environmental Motivation and Donation Behavior

T. Zaleskiewicz[1], A. Sobkow[1], J. Ji[2], L. Mayiwar[3], J. Traczyk[1]

[1]SWPS University, Poland
[2]University of Plymouth, United Kingdom
[3]Oslo Metropolitan University, Norway

This experimental project investigated whether prompting participants to generate vivid mental imagery while reading about climate change enhances pro-environmental intentions and behavior. Climate change is one of the most urgent global challenges, requiring effective policy and sustained public engagement. Despite widespread awareness of climate risks, many citizens remain reluctant to change their lifestyles, partly because they perceive the threat as psychologically distant or their individual actions as ineffective. Providing information about climate impacts and mitigation strategies appears intuitive, yet such interventions often fail to produce behavioral change, likely due to limited attention, cognitive biases, habitual behavior, low motivation, and perceived upfront costs.
In our present work, across two preregistered experiments, participants instructed to generate visual mental imagery while reading official EU climate information reported significantly stronger pro-environmental intentions and donated more money to an environmental charity than those who read the same material without imagery instructions. Crucially, Study 2 replicated the effect of mental imagery on donation behavior in a large, five-country sample (Poland, Germany, Spain, Sweden, and the Netherlands). These findings highlight mental imagery as a scalable cognitive tool for promoting pro-climate behavior.

# How you encode is how you remember: Center-to-surround inhibition during encoding underlies repulsion bias in working memory

A. Karabay[1], P. Vriens[2], J. Adams[2], N. Tran[2], M.I. Sahan[2]

[1]University of Birmingham, United Arab Emirates
[2]Erasmus University Rotterdam, Netherlands

When multiple items are held in visual working memory, their representations often shift away from each other as a function of feature similarity, a phenomenon known as repulsion bias. Previous work has mainly attributed this bias to interactions during memory maintenance. However, the role of perceptual processes in repulsion bias remains unclear. In two experiments, we tested whether early perceptual processes contribute to repulsion. In Experiment 1, we manipulated the temporal proximity between two to-be-remembered colors and found that repulsion was reduced when the items were encoded and consolidated separately. In Experiment 2, we used backward masking to disrupt perceptual processing of memory items in successive and sequential pairs. This manipulation again reduced repulsion. To examine the underlying mechanism, we compared a descriptive repulsion model and its variants with a center-to-surround inhibition model that simulates competition during encoding. The center-to-surround inhibition model consistently fit the data better and accounted for condition differences across both experiments. These findings suggest that repulsion bias can arise during encoding and that perceptual competition shapes memory representations.

## Clinical

13:30 - 13:50

### Spatial abilities as a key component of freezing of gait problems in Parkinson's disease

M. Ruitenberg[1], M. Soppe[1], P. Santens[2], I. van der Ham[1]

[1]Leiden University, Netherlands
[2]Ghent University Hospital, Belgium

Approximately 65% of people with Parkinson's disease (PD) experience freezing of gait, which refers to a sudden inability to step effectively. Despite the disabling nature of freezing, it still remains one of the least understood symptoms. Inspired by reports that freezing mostly tends to occur during movements like turning, navigating through narrow spaces, and avoiding obstacles, this project investigates the novel hypothesis that decrements in spatial cognitive abilities are a key factor in freezing of gait. To systematically investigate different aspects of spatial abilities, we move beyond traditional 2D pen-and-paper assessments and leverage the availability of virtual reality to better capture the 3D spatial aspects of daily life activities. We designed an online study in which the absence/presence of freezing was determined via the New Freezing of Gait Questionnaire. Participants completed a series of validated neuropsychological tests spanning the breadth of spatial functions, namely spatial perception (Judgment of Line Orientation Test), mental rotation (Mental Rotation Test), and spatial navigation abilities (Leiden Navigation Test). Self-reported navigation ability was measured using the Wayfinding Questionnaire. Data collection is currently ongoing with 53 people with PD having participated to date; results will be presented at the conference.

# Modelling forgetting: Understanding forgetting mechanisms in Korsakoff's syndrome

S. Albarran-Berlanga[1], A. Postma[1]

[1]Universiteit Utrecht, Netherlands

Forgetting in memory may arise from time-based decay or from different forms of interference, yet their relative contributions remain unclear (Ryan &Frankland,2022), particularly in clinical populations such as Korsakoff's syndrome(KS). This project investigates the mechanisms underlying forgetting in an object–location memory context, a type of contextual memory that requires binding object identity to spatial information and supports everyday behaviours such as locating personal belongings (Postma etal.,2008). Impairments in this binding process are common in KS, where brain regions critical for contextual memory are often damaged.

To investigate the mechanisms underlying forgetting in KS, we analyze data from an object–location memory task designed to manipulate retroactive interference, negative transfer, and decay. During the task, ten object images were presented within a spatial frame on a computer and had to be placed back in the frame. Interference was created by presenting subsequent trials with the same objects in new locations, thus enabling controlled induction of different forgetting mechanisms. Performance of KS patients is compared with that of healthy controls. Using advanced statistical analyses and cognitive modelling, we aim to determine whether forgetting in KS and healthy population is best explained by decay, interference, impaired binding,or broader deficits. Data analysis is currently ongoing.

# Musical and motor imagery in Parkinson's care

D. Rose[1], R. Schaefer[2], E. Poliakoff[3]

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[2]Leiden University, Netherlands
[3]University of Manchester, United Kingdom

Anecdotal evidence suggests that Music Imagery can be useful in neurological rehabilitation, most notably to support movement and to regulate emotions. However, its potential needs further clarification, from the specific problems that can be targeted and the longevity of the effects, to individual differences that may influence its usefulness.
The Songlines Protocol is a group-based music-and-movement course intended for and co-developed with people with Parkinson's (PwP) and various specialists, providing a toolbox of strategies to ameliorate motor and non-motor symptoms for PwP. Here, Music Imagery was often coupled with Motor Imagery as techniques addressing motor and non-motor issues in daily life. However, the term imagery was often not understandable, especially for people with no prior experience. To remedy this, materials and exercises were developed, demonstrating that with some assistance, PwP were quite capable of applying both types of imagery beneficially. Notably, longitudinally measured imagery skills indicated that for most people, imagery abilities did not change with training, whilst the use of Motor and Music Imagery increased over time.
Recently, novel shareable materials were co-developed with PwP, explaining Music Imagery in an accessible way. These materials may also be applicable to other populations undergoing neurological rehabilitation or managing long-term health conditions.

# Exploring the boundary extension effect in memory drawings from dementia patients

J. Braams[1, 2], S. Ramanan[2, 3], Z. Goldberg[2], R. Ahmed[3, 4], O. Piguet[2, 3], A. Postma[1], M. Irish[2, 3]

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Memory drawings can offer us a unique method of exploring representations of our visual experiences. Typically for drawings from memory, the boundary extension effect occurs, whereby recalled scenes appear more zoomed out than the original. This effect likely occurs because people imagine the visual scene beyond its original frame. While drawing tasks have been used successfully across patient populations with impaired memory, often showing no boundary extension effect, their application in dementia syndromes remains lacking. Therefore, we aimed to explore the boundary extension effect as expressed through memory drawings in patients with Alzheimer's disease (AD) and the rare syndrome of semantic dementia (SD). Participants completed a novel drawing task in which they drew a verbal cue from memory. Memory drawings were evaluated in terms of (i) the degree of boundary extension and (ii) level of detail as derived from computational metrics and ratings by independent observers naive to the purpose of the study. Comparisons are made between patient groups and healthy controls, within-group consistency, and the concordance between the two analysis methods. Findings will be discussed in terms of how differential damage to the episodic and semantic memory systems impacts the way in which memory representations are reflected during drawing.

# A novel tool for assessing individual wayfinding preferences of people with various types of visual impairments

D. Blokland[1], N. Van der Stoep[2], A. Postma[1], K. Overvliet[1]

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Orientation and mobility (O&M) training supports independence and quality of life for people with visual impairments (VIPs). Given the heterogeneity of this population, effective training requires tailoring instruction to individual preferences for sensory cue use (e.g., auditory versus haptic information) and wayfinding strategy (e.g., a focus on a single sensory modality over the combination of multiple senses). Yet, current O&M practice relies largely on instructor judgement, which varies across instructors and institutions. No standardised method exists to systematically assess clients' sensory navigation preferences. To address this need, we developed the Personal Sensory Navigation Profile Survey: an instrument to assess a client's personal sensory and strategic wayfinding preferences. Construct validity is evaluated through cognitive interviews using a think-aloud protocol and confirmatory factor analysis. Predictive validity is evaluated by examining associations between survey responses and performance on a behavioural wayfinding task using auditory, haptic, visual, and multisensory beacons. We report the survey's factor structure, reliability, and its predictive relation to behavioural performance. When validated, this survey provides the first empirically grounded, standardised tool to inform personalised O&M instruction and consequently improve instructional alignment, efficiency, and training outcomes.

## Attention

9:00 - 9:20

### Investigating Visual Imagery in Aphantasia: A Multi-Method Approach

M. Vohs[1], O. Lindemann[1], R. Zwaan[1]

[1]erasmus university, Netherlands

Aphantasia is characterized by a reduced or absent ability for mental imagery. This deficit is typically assessed with the Vividness of Visual Imagery Questionnaire (VVIQ), which relies solely on subjective ratings of visual imagery. As a result, most studies conceptualize aphantasia as a visual-specific deficit, overlooking the fact that imagery ability exists on a spectrum and extends across multiple sensory domains. To address these limitations, we developed a holistic battery including a new subjective measure of mental imagery across multiple sensory modalities, as well as objective measures. A total of 457 individuals with self-identified aphantasia and 194 control participants completed the new questionnaire, followed by an episodic memory task and an autobiographical memory task. Individuals with low imagery ability scored significantly lower across all measures. Importantly, combining objective tasks with the VVIQ improved the discrimination between self-reported low and typical imagers. Expanding the subjective measures to multiple sensory modalities revealed an additional imagery-related factor not captured by the traditionally used VVIQ questionnaire. These findings support the view that aphantasia reflects a multi-domain cognitive phenomenon and highlight the need for more comprehensive tools to assess mental imagery.

# Distraction Masks but Does Not Disrupt Across-Trial Learning in Older Adults

J. Yao[1, 2], J. Snell[1, 2], J. Theeuwes[1, 2]

[1]Vrije Universiteit Amsterdam, Netherlands
[2]Institute Brain and Behavior Amsterdam (iBBA), Netherlands

Statistical learning, the ability to detect regularities in the environment, is fundamental to human cognition. However, whether this capacity declines with age remains unclear. Previous research suggests that older adults can learn intertrial regularities, although this learning appeared attenuated in the presence of salient distractors. It therefore remained uncertain whether distractors impair the learning process itself or merely reduce its behavioral expression.

To address this question, 96 older adults (65 ± 4.60 years) completed the additional singleton task in which the target location on one trial predicted the target location on the subsequent trial. The task comprised two phases: Phase 1 without distractors and Phase 2 with a salient distractor on every trial. Participants responded more quickly on regular than on irregular trials in both phases, indicating that the learning effect persisted under distraction. We then compared the magnitude of the learning effect in Phase 2 with that observed in a previous experiment in which distractors were present throughout the task and found no difference between the two experiments. These findings suggest that salient distractors do not disrupt statistical learning itself, but rather obscure its behavioral manifestation, providing strong evidence that statistical learning remains intact in older adults.

# The transfer of learned distractor suppression: on the role of spatial configurations

Y. Ilksoy[1], D. van Moorselaar[1, 2], S. Los[1], J. Theeuwes[1, 3]

[1]Vrije Universiteit Amsterdam, Netherlands
[2]Utrecht University, Netherlands
[3]University of Granada, Spain

Locations that consistently contain distracting information can become attentionally suppressed through a process known as statistical learning. The present study examined the flexibility of such learned suppression across stimulus configurations. Participants performed the additional singleton task, in which they searched for a unique target while ignoring a salient distractor. Crucially, the experiments included biased and uniform search displays that differed in configuration, either by varying the spatial positions of the stimuli or by manipulating set size. In the biased displays, the distractor appeared with higher probability at one location, whereas in the uniform displays, distractors were uniformly distributed across locations. The central question was whether suppression learned in a biased configuration would transfer to a different configuration or remain tied to the configuration in which it was acquired. The first three experiments demonstrated that suppression learned in one configuration generalized to another configuration differing in the spatial positions of the stimuli. By contrast, the last two experiments, in which set sizes differed between configurations, provided evidence that transfer of suppression was substantially reduced. Together, these findings suggest that learned distractor suppression is generally rigid across stimulus configurations. However, when configurations differ substantially, suppression may become at least partly configuration dependent.

10:00 - 11:00 |

## Coffee Break & Poster Session

11:00 - 12:30 |

## Perception

11:00 - 11:30

### Eye movements reveal the dynamics of conceptual search in high-dimensional semantic space

G. Cristoforetti[1], s. vigano[2], m. ciapparelli[3], R. Bottini[1]

[1]University of Trento, Italy
[2]NeuroSpin, France
[3]Univerisity of Trento, Italy

Eye movements have been proposed to reflect the internal structure of conceptual representations, but most evidence comes from domains with simple and explicit structures. The present study investigates whether eye movements also reflect search strategies in high-dimensional conceptual spaces during semantic memory retrieval. Participants performed a free-foraging verbal fluency task in which they generated words from conceptual categories while their gaze was recorded. For each produced word, the median gaze position prior to word onset was extracted and linked to semantic representations derived from word embeddings.
We examined the relationship between gaze dynamics and semantic exploration using representational similarity analyses and trial-by-trial measures of semantic distance and trajectory. Results showed that gaze displacement was related to the direction of semantic exploration rather than simply to semantic distance between consecutive words. Cluster analyses further revealed that gaze positions were closer within semantic clusters than across clusters, suggesting that eye movements track conceptual grouping during memory search. Permutation tests confirmed larger gaze shifts at boundaries where semantic exploration changes direction.
Together, these findings suggest that eye movements provide a behavioral window into the dynamics of conceptual search in high-dimensional semantic spaces.

# Multimodal assessment of visuospatial abilities in digital anatomy learning

J. Ribot[1], R. Chaker[2], M. Gallot[1]

[1]Université Claude Bernard Lyon 1, France
[2]Université Lumière Lyon 2, France

Anatomy learning relies heavily on visuospatial abilities, yet individual differences in these cognitive skills are rarely considered in the design of educational tools. A cohort of 74 undergraduate science students (age 18–26 years; 34 men) completed five cognitive assessments targeting complementary aspects of visuospatial abilities. These include the Mental Rotation Test to evaluate spatial manipulation abilities, the Corsi Block-Tapping Task to measure visuospatial working memory, an anatomical mental rotation task based on bone laterality recognition, a multiple-choice questionnaire assessing baseline anatomy knowledge, and a spatial orientation task involving 3D skeleton positioning across anatomical planes. Participants also completed three osteology-focused exercises using digital 3D anatomy software. Additional psychometric, physiological and behavioral data were collected during tasks, including questionnaires, electrocardiography and electrodermal activity to estimate cognitive load, alongside eye-tracking to investigate learners' visual strategies. This multimodal dataset aims to provide a comprehensive evaluation of learners' visuospatial abilities by combining cognitive, behavioral, and physiological indicators. The resulting data will be analyzed to identify cognitive profiles associated with anatomy learning performance. Ultimately, these profiles will inform the design of adaptive learning pathways within a digital 3D anatomy learning environment, with the goal of supporting students with diverse visuospatial abilities.

# Embodied Navigation: The Role of Multisensory Information on Spatial Learning

B. Petit[1], R. Vidts[1], C. Gillebert[1], J. Bosmans[1]

[1]KU Leuven, Belgium

Background: Successful navigation relies on the integration of visual, vestibular, and proprioceptive cues. This study examined whether the availability of congruent multisensory input enhances navigation performance beyond visual input alone and whether this effect differs by gender.
Methods: Forty healthy adults completed the virtual Morris Water Maze in an immersive virtual reality (VR; multisensory) and a desktop (visual-only) setup. Navigation performance was analyzed using Bayesian hierarchical Beta regression models.
Results: Navigation performance was higher in the immersive VR setup than in the desktop setup, with an estimated mean increase of 0.022 (95% CrI [0.004, 0.040]). A gender-by-setup interaction was observed, characterized by a VR disadvantage for men and a VR advantage for women.
Conclusion: These findings provide evidence that congruent multisensory input enhances navigation performance beyond visual information alone, but that this benefit is strongly modulated by gender.

# How visual experience shapes peripersonal space boundaries: evidence from blindness

R. Frinco[1], N. Castellani[1], C. Fossataro[1], S. Schmidt[1], C. Tinti[1], F. Garbarini[1]

[1]University of Turin, Italy

Peripersonal space (PPS) is a multisensory interface that defines the spatial boundaries within which actions, interactions and defensive reactions occur in the space immediately surrounding the body. Although vision plays a crucial role in spatial processing, whether and how the absence of visual experience affects PPS organization across interactive and defensive functions remains unclear. To address this issue, congenitally blind, late-blind, and blindfolded sighted individuals took part in two experimental tasks, i.e., auditory enhancement of touch (Experiment 1) and the hand blink reflex (Experiment 2), allowing us to probe the extent of the interactive and defensive PPS. In Experiment 1, blind individuals showed multisensory facilitation and spatial tuning comparable to sighted participants, suggesting that visual experience does not influence PPS boundaries. In contrast, Experiment 2 revealed that defensive PPS is strongly modulated by visual experience. We found no spatial modulation in congenitally blind individuals, a partially preserved modulation in late-blind individuals, and a typical distance-dependent increase in sighted controls. Taken together, our findings reveal a clear functional dissociation between the two functions of PPS and highlight how visual deprivation influences the development of defensive PPS representations, providing new perspectives on sensory plasticity in spatial cognition.

## Papers session

14:50 - 15:10

# Investigation of the role of stress in human spatial exploration: Stress increases the complexity of exploratory behavior

L. Zheng[1], V. Baumann[2], I. van der Ham[1,3], J. Schomaker[1]

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[2]Otto-von-Guericke-Universität, Germany
[3]Delft University of Technology, Netherlands

In an environment with limited resources, we must make a trade-off between exploiting opportunities with a known outcome or exploring risky novel territory with a potentially better outcome. Whether we lean towards exploration or exploitation is influenced by individual differences (e.g., gender or personality traits). However, the effect of stress on spatial exploration has not yet been addressed in humans. Here, we investigated the effects of stress on exploration in 3D spatial environments. To experimentally manipulate stress, participants performed the Sing-a-Song Stress-Test (SSST), in which half of the participants had to sing a song unannounced (high stress group) and the other half listened to the singing of another participant (low stress group). After the SSST, participants explored a 3D virtual environment and performed a landmark memory test. The stress manipulation was effective, as confirmed by subjective stress and arousal ratings. Interestingly, we observed that stress affected the complexity of the exploratory behavior, with higher scores in the high than low stress group. In addition, males generally explored more than females. These findings suggest that stress may impact how we explore an environment, and could amplify individual differences in exploration behavior, including gender differences.

# Emotion and Spatial Memory: A Stage- and Role-Dependent Model of Egocentric and Allocentric Processing

F. Ruotolo[1], F.L. Sbordone[2], G. Ruggiero[2], T. Iachini[3]

[1]University of Campania, Italy

[2]University of Campania Luigi Vanvitelli Department of Psychology: Universita degli studi della Campania Luigi Vanvitelli Dipartimento di Psicologia, Italy

[3]Università della Campania, Italy

Emotions are known to influence attention and memory, yet their effects on spatial cognition remain inconsistent. To investigate how emotional information interacts with spatial representations, we conducted four behavioural studies using spatial tasks requiring egocentric judgements (which object was closest to oneself) or allocentric judgements (which object was closest to another object).
In three studies, emotional images were introduced as distractors at different stages of working memory: before encoding, during maintenance, or immediately before retrieval. In a fourth study, emotional content was embedded directly in the spatial stimuli, requiring participants to encode the location of emotionally salient objects.
Across studies, emotional influences on spatial memory showed distinct patterns. Positive stimuli were associated with higher spatial accuracy during encoding, whereas emotional interference during maintenance reduced spatial performance more generally. At retrieval, allocentric judgements appeared more vulnerable to emotional distraction than egocentric ones. When emotional content was part of the spatial target, different patterns emerged across egocentric and allocentric processing.
These results reveal multiple pathways through which emotional information interacts with spatial memory, depending on when it occurs during memory processing and on the role it plays within the spatial scene.

# POSTERS

Poster Presentation EWIC 2026

# 4

## Neural Correlates of Method of Loci Training: Connectivity Changes Associated With Learning Success in Aging

Raquel Lezama, Rossanna Pinto, Gianni Perrucci, Federica Tomaiuolo, Davide Di Censo, Carlo Sestieri

Progressive cognitive decline threatens successful aging, with memory impairments affecting daily functioning. Cognitive training leveraging neural plasticity may mitigate decline. The Method of Loci (MoL) is a spatial mnemonic strategy that enhances memory by associating items with locations along a familiar mental route. Neuroimaging studies suggest that MoL engages hippocampal and visuospatial networks, yet substantial inter-individual variability in training gains remains unexplained. The present study examined whether training-related changes in global functional connectivity (post > pre) are associated with behavioral improvement following MoL training in elderly people.

Thirty healthy older adults (Mage = 68.66; SDage = 3.00; 17 females) completed resting-state fMRI before and after 28 days of adaptive, home-based MoL training delivered via tablet. Behavioral gains were indexed by the maximum difficulty level achieved. Voxel-wise global correlation (GCOR) analyses revealed significant training-related increases in right middle frontal gyrus connectivity and decreases in right frontal pole connectivity.

Importantly, greater learning gains were associated with decreased connectivity between the right middle frontal gyrus and left hippocampal and occipito-temporal regions. These findings suggest that successful MoL training is linked to functional reorganization within fronto-hippocampal and increases in visuospatial networks, possibly reflecting increased neural efficiency in strategic memory encoding during aging.

Poster Presentation EWIC 2026

# 8

# Novelty-Enhanced Extinction Learning in Healthy Adults: Behavioral, Psychophysiological, and fMRI-based Amygdala Mechanisms in Fear Reduction

Lea Pagani, Franz Wurm, Julie Hall, Judith Schomaker

Extinction learning reduces conditioned fear by presenting conditioned stimuli without expected threat, leading to the formation of inhibitory safety memories. This mechanism underlies exposure-based treatments for anxiety and trauma-related disorders, yet extinction learning is often unstable and prone to relapse. Novelty has been proposed as a potential enhancer of extinction, though its mechanisms remain unclear and findings are inconsistent. This study examined whether novelty facilitates fear extinction and whether effects occur immediately or persist after 24 hours across psychophysiological, behavioral, and neural indices. Healthy adults (n=29) completed a within-subjects 3×3 fear-conditioning paradigm manipulating Threat (control, low-shock, high-shock) and Novelty (blank, familiar, novel). Fear responses were measured using skin conductance responses (SCR), subjective arousal ratings, and fMRI amygdala ROI activation during extinction across two testing days. Results confirmed successful physiological fear acquisition, with higher SCR under higher threat. However, subjective ratings did not reflect fear acquisition, and amygdala threat-modulated activation was not observed during extinction. Contrary to expectations, novelty did not reduce fear responses. Instead, novelty increased SCR under high threat and subjective arousal in control conditions. No delayed novelty effects were observed. Exploratory analyses suggested hippocampal and occipito-temporal engagement, indicating novelty-related memory and perceptual processes rather than direct fear reduction.

Poster Presentation EWIC 2026

# 14

## SketchMapia: A Qualitative Method for Systematic Sketch Map Analysis

Angela Schwering

Sketch maps are widely used to investigate human cognitive maps and spatial memory. Map drawing provides an intuitive way to assess how people remember environments, capturing spatial features such as streets and landmarks as well as the two-dimensional relations between them. Sketch maps therefore contain rich spatial information, including allocentric spatial relations and egocentric route relations derived from navigation experiences. However, systematically analyzing this information remains challenging.

Existing approaches to sketch map analysis often rely on researcher-specific scoring rubrics that are difficult to standardize and reproduce. Other methods simplify the spatial complexity by focusing on limited aspects, such as counting landmarks or analyzing their spatial distribution using bidimensional regression. As a result, much of the spatial structure represented in sketch maps—such as street networks and spatial relations between features—is typically ignored.

This poster introduces SketchMapia, a qualitative method for systematically analyzing sketch maps while preserving their rich spatial information. The approach evaluates three aspects: (1) completeness of streets and landmarks, (2) spatial generalization, and (3) spatial accuracy with respect to routes, street networks, and landmark relations. We present results from a sketch map study assessing inter-rater agreement and demonstrating the feasibility and reproducibility of the proposed analysis approach.

Poster Presentation EWIC 2026

# 15

## A-MAZE-ing Navigation? Using a maze activity to understand differences in navigation ability in children.

Isabelle Kaiko, Judith Schomaker, Jolien Moorkens, Dietsje Jolles, Ineke van der Ham

Understanding navigation differences in informal wayfinding contexts can strengthen both spatial cognition research and science communication practice. This study combines a naturalistic maze-navigation task with a brief Developmental Topographical Disorientation screener to evaluate individual differences in children's navigation abilities and estimate the prevalence of potential navigational difficulties within this cohort. At a Nationale Wetenschapsagenda (NWA; Expeditie NEXT) science festival for children aged 4-12, participants navigate a physical maze and subsequently complete three short experimental measures: landmark recognition and placement, route drawing, map selection. This provides metrics for landmark knowledge, egocentric route memory and allocentric spatial understanding. For children aged 8-12 years, performance on these tasks will be compared within an age-normative framework (Leiden Navigation Test) to situate their abilities. By combining naturalistic behavior with targeted experimental assessments, this project examines early indicators of navigation difficulties and how these abilities manifest in real-world settings. The findings underscore the value of playful "real-world" outreach activities as meaningful tools for studying spatial cognition and informing the future development of diagnostic and educational supports.

Poster Presentation EWIC 2026

# 16

# Different Associations Between Self Confidence and Mental Rotation Performance in Men and Women

Martina Rahe

Performance in the Mental Rotation Test (MRT) usually produces robust sex differences in favor of men, who also report higher confidence in their performance. The present study analyzed gender differences in mental rotation performance and perceived performance before and after the task. 103 participants (36 men, 67 women, age: M = 29.34, SD = 14.09) solved the MRT (12 items) and filled out a questionnaire about their perceived performance after the description of the task and after they solved the task. Men did not outperform women in the MRT but reported higher perceived performance before (d = .472) and after the task (d = .511). For male participants, mental rotation performance was significantly predicted by their perceived performance after the task (ß = .533) but not by their perceived performance before the task. For women, only the perceived performance before the task (ß = .475) significantly predicted the actual performance. To conclude, women's performance seems to be more strongly influenced by their general assessment of the task than by their actual performance.

Poster Presentation EWIC 2026

# 17

## Empowering Spatial Thinking with Virtual Teamwork (SPaCe-VT): A didactic experience involving University of Padova and Leiden University

Chiara Meneghetti, Marta Mazzella di Bosco, Romina Salehzadeh, Mohammads Yazdani, Chloe Josephine Mulya, Ilgin Culhalar, Ivana Karastoycheva, Alison Drouard, Celia Useo, Iris Isciel, Umut Cetinkaya, Yazgi Simsek, Victoria Mancini, Arianna Balzan, Anja Vejnovic, Duru Ficicigil, Sema Ece Cigdemoglu, Alin Soylemez, Eleonora Zanon, Nurten Eylul Tokgoz

Active learning and participation in classroom activities support the development of professional psychological skills. SPaCe-VT is an internationalisation initiative promoted by the University of Padua within the Shaping a World-Class University programme. The project aims to strengthen knowledge and competencies in spatial cognition by engaging psychology students from the University of Padua and Leiden University in virtual, problem-based collaboration on a task, culminating in a final output. SPaCe-VT was integrated into the Spatial cognition bachelor course (42 hours). Activities included: (A) an initial virtual workshop introducing the project; (B) group work (18 students in four groups) to define the research topic and develop the project with feedback from Leiden students (5 Master/graduate level); (C) a virtual workshop for group presentations; and (D) dissemination of final outputs. In the activities were also involved international experts and early career researchers. Effectiveness was evaluated through student monitoring scales, expert feedback (Leiden students, early-career researchers, and professors) (on a scale 1-5), and exam grades. Padua students reported high scores (>4) for participation, satisfaction, and project appreciation; Leiden students and experts also rated competencies, materials, clarity, and completeness highly (>4). Students in the group work achieved higher exam grades than non-group work ($p < .001$).

Poster Presentation EWIC 2026

# 18

## The effect of symbolic speed on temporal cognition: distinguishing duration perception and passage of time judgment

Sammy Penel, Simon Lhuillier, Valérie Gyselinck

Previous research suggests that folk knowledge about the average speed of vehicles can influence time perception. Participants estimate durations as longer when viewing images of fast vehicles, such as motorbikes, than when viewing images of slow vehicles, such as bicycles. However, these findings are not always replicated, and further studies are needed to assess their robustness. The present study adopts a novel approach using virtual reality with dynamic stimuli and distinguishes between two temporal experiences: duration (how long an event lasts) and the passage of time (how quickly time seems to pass).

60 adults reproduced the duration of videos showing different vehicles (motorbike, bicycle, and cube/control) moving at the same physical velocity. Results revealed no significant effect of symbolic speed on duration reproduction. Building on these findings, a second experiment used different tasks: time bisection and estimation. Participants evaluated both duration (short or long) and passage of time (slow or fast) in two separate blocks using the same vehicles as in Experiment 1. This approach tests whether symbolic speed effects depend on a specific temporal experience or task, which may explain inconsistencies in the literature.

These results could inform transportation choices by showing how modes are perceived regarding time efficiency.

Poster Presentation EWIC 2026

# 21

# The development of Episodic Autobiographical Memory in preschool age: evidence from a longitudinal study

Loredana Carmen Russo, Francesca Vecchione, Maddalena Boccia

Episodic Autobiographical Memory (EAM) is a cognitive function crucial for forming a cohesive self-narrative. Despite its importance, research on EAM development remains limited.

The longitudinal study involved eight five-year-olds (mean age 5.82 years; SD=0.32) assessed at two timepoints, one year apart. The first assessment (T1) occurred the day after a structured group event, with EAM measured through an adapted semi-structured interview (1). The second assessment (T2), conducted one year later, followed a group event to evaluate memory decay and development.

Results revealed a significant decline in recall of the T1 event at T2, consistent with existing findings on memory decay (2). However, a new event's recall at T2 contained more information than the recall of the event at T1, with an increase in total ($F=12.2$ e $p=0.001$) and perceptual details ($F=7.96$; $p=0.003$), indicating memory refinement over time.

In conclusion, the findings suggest that between ages five and six, children's EAM undergoes significant development: not only does the amount of recalled information increase, but the quality (3), particularly the perceptual richness of memories enhances during this developmental period. These results contribute to understanding of how autobiographical memory develops during early childhood, highlighting a progression toward more detailed and vivid personal memories.

Poster Presentation EWIC 2026

# 22

# What Is Simulation Good For? Mental Imagery and the Functional Role of Embodiment in Language

Melisa Yavuz, Marie Montant, Florentin Vandeville, Jacques Jayez, Bing Li, Olivier Capra, Tatjana Nazir

Embodied cognition accounts propose that language understanding recruits modality-specific systems in a somatotopic manner, such that reading action words partially re-enacts sensorimotor experience. This simulation mechanism is often linked to mental imagery, yet its functional role in language processing remains unclear: What is simulation for, and when is it actually useful?

Across three complementary studies, we approach this question through individual differences in mental imagery ability. First, using a grip-force paradigm with refined methodological controls, we examined motor system involvement during action sentence processing, including aphantasia as a demonstration case.
Second, through semantic network analyses derived from free associations, we demonstrate that imagery ability systematically shapes the global organization of lexical knowledge, influencing how concepts are structured and interconnected.
Third, using a definition-based vocabulary task, we reveal that vivid imagery is not uniformly advantageous: higher imagery vividness do not necessarily predict broader lexical knowledge.

Together, these findings move beyond the question of whether sensorimotor simulation occurs to how individual cognitive profiles may shape its contribution to language processing.

Poster Presentation EWIC 2026

# 24

## Neural underpinnings of Déjà Vu and its phenomenological properties: evidence from behavioural and resting state fMRI studies

Francesca Vecchione, Loredana Carmen Russo, Alice Teghil, Maddalena Boccia

Déjà vu (DV) is an inappropriate subjective impression of familiarity which may rise from a partial overlap between current and previously encoded contexts[1]. Medial temporal lobe, which bind spatiotemporal details, may misinterpret this similarity as evidence of a prior experience. We assessed the phenomenological properties of DV and their neural underpinnings[2]. In a first study, we found that individuals who perform better on spatial tasks reported a stronger sense of DV across several dimensions of the Inventory for Déjà Vu Experiences Assessment (I-IDEA)[3]. In a second study, we deepen this effect including items aimed at probing spatial dimensions of DV. Exploratory factor analysis revealed two distinct dimensions, which we termed selfscape and anchoring. In a third study, we examined resting-state functional connectivity of medial temporal lobe structures in relation to these dimensions. Higher selfscape scores were associated with stronger functional coupling between anterior parahippocampal cortex and posterior parietal areas, and between hippocampus, posterior parietal cortex, and precentral gyrus. Conversely, higher anchoring scores were associated with stronger functional coupling between posterior parahippocampal cortex and clusters extending from parietal to occipital lobe. Overall, these findings reveal novel dimensional aspects of DV that involve neural networks that are at least partially dissociable.

Poster Presentation EWIC 2026

# 30

## Do spontaneous eye movements reveal the representational structure underlying a virtual museum experience?

Puck Vriens, Muhammet Sahan

The ability to form and retain a mental or cognitive map of our surroundings is an important function for humans to find their way in the world. Research on both animals and humans show that we are able to create such spatial representations in our mind, using brain regions responsible for memory and navigation. Eye movements have been suggested to reflect this internal structure of our mental space, possibly making eye-tracking a valuable tool for studying these representations. In the current study we investigated whether eye movements reflect participants' cognitive maps in working memory with Virtual Reality (VR). After exploring simple environments in VR and making color-object associations, participants were asked to name the objects when cued with the colors from the VR environment while their eye movements were being recorded. Our analyses revealed that although there is no single straightforward translation from cognitive maps to gaze behavior, there is a certain structure reflected in the x-coordinates of gaze behavior that are consistent with the structure of the physical environment. These findings provide evidence that there seems to be a relationship between eye movements and the content of a cognitive map.

Poster Presentation EWIC 2026

# 32

## Semantic Learning in VR and AR: Effects on Long-Term Memory

Liubov Jung-Ivannikova, Jaap Murre

Immersive technologies such as virtual reality (VR) and augmented reality (AR) are increasingly used in education, yet their effects on long-term memory remain unclear. While immersive environments may enhance engagement and contextual richness, it is not well understood whether these features translate into stronger semantic memory over time. We argue that immersive VR may induce a distinct encoding regime characterised by increased awareness of technological mediation, greater top-down control during encoding, and altered hippocampal–neocortical consolidation dynamics. As a result, memory traces formed in VR may exhibit strong initial encoding, but weaker long-term semantic integration compared to learning in more ecologically grounded environments. This study investigates how learning in VR and AR influences the encoding and retention of semantic knowledge. In a controlled experimental design, participants learn novel semantic knowledge in either VR or AR environments, with instructional content and exposure time matched across conditions. Memory performance is assessed immediately after learning, and again after 24 hours, one week, and one month to capture forgetting trajectory. Retention is analysed at the item level using a trace-based modelling approach that estimates parameters of initial memory strength and decay. This approach enables a mechanistic comparison of how VR and AR influence long-term memory.

Poster Presentation EWIC 2026

# 33

## When Nature Lightens the Mind: Virtual Natural Environments Reduce Cognitive Workload

Michela Romano, Michela Possenti, Gennaro Ruggiero, Francesco Ruotolo, Sabrina Iuliano, Luigi Lorenzo Luca Napolitano, Scila Nunziata, Ernesta Panarello, Angelo Lucio Silvino, Renato Orti

Daily activities often impose substantial cognitive demands. Although exposure to natural environments has been associated with cognitive restoration, it remains unclear whether natural contexts can mitigate cognitive workload during task execution. This study used immersive virtual reality (IVR) to examine whether naturalistic environments reduce perceived cognitive workload compared to artificial ones.

Fifty-one university students (38 females; age range 18–35 years, M = 22.58, SD = 2.43) experienced two virtual scenarios: a park (natural) and an office (artificial). In each condition, participants performed a card-matching memory task to remember card positions and identify matching pairs. Behavioural performance was measured through number of movements and completion time. After each condition, perceived cognitive workload was assessed using the Simulation Task Load Index (SIM-TLX).

Behavioural performance did not differ between conditions. However, perceived workload varied as a function of environmental context and task efficiency. Participants who completed the task faster and with fewer movements reported lower mental demand in natural environment than in artificial one.

These findings suggest that natural environments may buffer the subjective cost of cognitive processing without altering behavioural performance. They also highlight the importance of integrating subjective workload and objective performance measures when examining environmental influences on cognitive functioning.

Poster Presentation EWIC 2026

# 36

# Spatial Memory and Emotional Experience in Immersive Multisensory Environments: A Comparison Between Young and Older Adults

Ernesta Panarello, Mariachiara Rapuano, Gennaro Ruggiero, Francesco Ruotolo, Scila Nunziata, Michela Possenti, Angelo Lucio Silvino, Tina Iachini

Spatial representations rely on two reference frames: egocentric representations, based on the observer's body, and allocentric representations, based on object-to-object relations. While egocentric processing tends to remain stable across the lifespan, allocentric processing often declines with age. Research in environmental psychology suggests that natural environments may support cognitive functioning and emotional well-being, potentially influencing spatial representations. This exploratory study examined whether different environmental configurations influence spatial memory and emotional experience in two groups: young (23–34 years) and older adults (65–85 years). Participants explored four immersive virtual environments: two urban (Grandstands and Basket Playground) and two naturalistic settings (Garden and Park). After each environment, they performed a spatial memory task requiring egocentric judgments (what object was closest to you?) or allocentric judgments (what object was closest to another one). Participants evaluated each environment's emotional impact using Likert-scale ratings of pleasantness and activation. Preliminary findings suggest higher spatial memory accuracy in naturalistic environments. Allocentric judgments appeared to improve after exploration of the Garden in both age groups. Natural environments also tended to elicit lower negative emotional evaluations, particularly among older adults. These findings suggest that natural environments may support spatial processing and emotional experience, with potential implications for healthy ageing.

Poster Presentation EWIC 2026

# 39

# Effect of Aphantasia on the Reliance on Egocentric and Allocentric Reference Frames: Preliminary Evidence

Léo Dutriaux, Manon Boyer, Gaën Plancher

Aphantasia is a condition characterized by the inability to generate voluntary mental imagery. The present study investigated whether aphantasia modulates the preferential engagement of allocentric and egocentric spatial reference frames during a Judgment of Relative Direction (JRD) task using a virtual environment. A preliminary sample of aphantasic and imager was first familiarized with object layouts across two geometrically similar virtual rooms. In the JRD task, participants were subsequently required to mentally adopt an allocentric facing direction (e.g., North, West) and then retrieve the egocentric position of a target object (e.g., Front, Left) relative to that imagined orientation. Initial analyses revealed a significant main effect of both allocentric and egocentric directions on reaction times. Participants are faster when the object is in the Front direction (egocentric effect), and in the North condition (allocentric effect). Critically, a significant group × allocentric directions interaction was observed, showing that the effect of allocentric direction is bigger in aphantasic individuals relative to imagers. No equivalent interaction emerged for the egocentric condition. This is preliminary evidence consistent with the idea that aphantasic individuals tend to rely more than imagers on abstract processes like allocentric representation.

Poster Presentation EWIC 2026

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# Emotional Influence on Perceptual Judgments: How Mood Impacts the Perception of Ambiguous Images

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Emotional states influence how individuals process information. For example, research has shown that negative emotions may increase processing of details compared to positive emotions. However, the role of emotions in perceptual processing remains poorly understood.

This study investigated whether emotional states modulate the interpretation of ambiguous stimuli. Thirty-six university students underwent either a positive or negative mood induction. Participants then evaluated images containing different types of perceptual ambiguity: Overlapping Squares (luminance-based ambiguity), Rubin's Vase (figure–ground ambiguity), and the Duck–Rabbit illusion (configural ambiguity). Each stimulus was presented along a continuum from maximally ambiguous to progressively less ambiguous. Participants indicated their interpretation using a continuous slider.

Results showed that emotional state modulated perceptual interpretation depending on the stimulus. In Overlapping Squares, responses of participants in the negative condition closely tracked stimulus changes, suggesting greater sensitivity to stimulus changes. In contrast, in Rubin's Vase, participants in the positive condition switched more frequently between interpretations, indicating greater interpretative flexibility. No emotional differences emerged for the Duck–Rabbit illusion.

These findings suggest that negative emotional states may promote stimulus-driven perceptual discrimination, whereas positive emotional states may be associated with greater interpretation flexible, highlighting potentially complementary influences of affect on perceptual judgments.

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## From sensory processing to embodied experience: the interplay between mental imagery and interoception

Erica Dolce, Irene Ruffo, Alessandra Chiarella, Valentina Leonardo, Silvia Canino, Liana Palermo

Contemporary influential models of mental imagery primarily focus on sensory processing, largely overlooking the contribution of bodily signals to imaginative experiences. Building on recent theories that frame imagery as an embodied experience extending beyond visual representation (Silvanto & Nagai, 2025), this study investigated whether individual differences in interoceptive accuracy (IAcc), sensibility (ISe), and awareness (IAw) relate to imagery abilities.

One hundred nine healthy participants (19.7 ± 3.17 years) completed the Heartbeat Counting Task probing IAcc and IAw, an ISe questionnaire (MAIA), imagery tasks from the CVMIB battery assessing generation, maintenance, inspection, and transformation of mental images, and two self-report imagery questionnaires (OSIQ,VVIQ).

IAcc was positively associated with the mental rotation task, indicating a relationship between bodily signal perception and imagery transformation skills. ISe was positively correlated with OSIQ-object and VVIQ scores, suggesting that higher ISe levels are associated with greater imagery vividness and object imagery preferences. Conversely, IAw was negatively correlated with the inspection task, possibly because heightened awareness of internal bodily signals reduces the attentional resources available for external visual details, resulting in poorer imagery performance.

Overall, these findings support embodied and multimodal accounts of mental imagery, suggesting that distinct interoceptive dimensions are differentially linked to specific imagery processes.

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# The effect of interindividual differences in mental representations in a reasoning task on ambiguous spatial problems - a behavioral and oculomotor study (Sima et al. 2013 replication and extension)

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The relationship between visual and spatial imagery is debated in mental imagery research, due to their overlap. Individuals with visual aphantasia, who report an absence of voluntary visual mental imagery, often retain efficient spatial representations. Following Sima et al.'s (2013) methodology, we examine how interindividual differences in visuospatial representations influence spatial reasoning. Since visual and spatial representations may lead to different approaches in spatial tasks, we hypothesize that individuals with aphantasia rely on specific representations that shape their strategies. This should be reflected in response patterns that differ from those of individuals who experience visual imagery (visualizers). Thirty participants (10 with aphantasia*, 20 visualizers) solved 44 spatial reasoning problems, and their eye movements, response preferences, response times, and self-reported strategies were recorded. Results indicated group differences in response preferences and faster response times among participants with aphantasia. Notably, they reported relying almost exclusively on eye movements as a problem-solving strategy, in contrast to visualizers, a pattern partly supported by eye-tracking data. Overall, these findings underscore the importance of clarifying the distinctions between imagery-based and perceptual representations. They also suggest that sensorimotor-spatial processes (e.g., eye movements), mental imagery, and abstract reasoning collectively influence spatial reasoning.
*recruitment is still ongoing

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# A Happy Place: Emotional Valence in Incidental Episodic and Navigational Memory

Andrea Di Piero, Alessia Bonavita, Laura Piccardi, Cecilia Guariglia, Maria Casagrande

Episodic memory refers to the ability to place events within a specific spatial and temporal context, making its association with navigation unsurprising. Incidental episodic memory involves encoding and retrieving information without explicit instruction, a process that occurs frequently in everyday life. The influence of emotional valence and arousal on incidental memory could benefit from further investigation.

To better understand these mechanisms, navigational and episodic memory were assessed using two versions of the same task that differed only in the instructions provided. One version assessed incidental episodic memory for emotionally charged visual stimuli, whereas the other assessed incidental navigational memory along a route through a city environment.

Preliminary analyses conducted on college students (n = 64; mean age = 25 years; 29 females) are consistent with previous literature. Group differences were analyzed using the Mann–Whitney U test. Hit rates for negative stimuli differed significantly between task versions ($U = 307$, $p = .003$, $r = .37$), whereas positive stimuli showed no significant differences ($U = 451$, $p = .281$, $r = .08$).

Positive stimuli appeared less sensitive to task instructions, suggesting a more stable incidental encoding of positive material, with potential implications for rehabilitation and clinical assessment.

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## A room within a room: Global and local spatial context effects on episodic memory.

Fiona Milani, Albert Postma

According to the encoding specificity principle (Tulving & Thomson, 1973), episodic memory performance is improved when the context at learning is reinstated at testing. The scene reconstruction account (Maguire and Mullally, 2013) emphasizes that a major component of context is the spatial framework of an event. The current project aims to study the effects of two different, simultaneously occurring scales of spatial context on episodic memory: the local, event-based context (virtual rooms in which objects are encountered) and the global, observer-based context (testing room).

During the learning phase, participants are presented with objects appearing inside virtual rooms. The following day, old and new items are shown within novel or familiar spatial contexts (virtual rooms). Confidence ratings and remember/know reports will be used to compute sensitivity and estimate the contribution of familiarity and recollection. We expect higher sensitivity and more recollection when both objects and their contexts are congruent (Old-old, New-new). To investigate the effect of a global context change, half of the participants will be tested in a novel room. Our basic assumption is that global context reinstatement will lead to higher recognition sensitivity, and this effect is mostly due to higher recollection. Data collection is currently running.

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## Shaping memory through perspective: lifelogging research for amnesic patients.

Tijmen van Teijlingen, Albert Postma, Geert Jan Biessels, Erik Oudman

Memory impairments burden millions of people worldwide. Despite the high prevalence of memory impairments, there are few successful tools to aid this patient group. Some interventions, however, offer promising results. Lifelogging uses visual recordings which can be repeatedly reviewed and can support later retrieval. Traditionally, lifelogging employs a first-person perspective for amnesic patients. However, employing a third-person perspective may increase potential implementation of the technology, while still offering solid memory support. Different involvement of brain structures and distinct memories may be supported by the different perspectives. Our research on three Korsakoff patients suggests that both perspectives are beneficial for objective recall and can successfully be used to aid memory, with lifelogging showing significant improvements in memory tests. Furthermore, a first-person condition showed increased subjective memory ratings and experienced vividness when recalling events. While further research is needed, initial results highlight the potential of lifelogging in clinical settings as a memory rehabilitation tool and gives us further insight into how perspectives play a role in reliving memories.

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# The Geometry of Autobiographical Memory: Coordinated Temporal Compression and Importance Fading across the Lifespan

Matteo Frisoni, Maddalena Boccia

Background: Autobiographical memory shows systematic temporal distortions, but whether these reflect random noise or structured reorganization remains unclear. We tested whether temporal representations of memories undergo period-specific restructuring across the lifespan.

Methods: Sixteen healthy adults (mean age = 42.9 ± 3.3 years) recalled 42 events across seven life periods (elementary school to the last 12 months). Temporal placement was measured with a discretized Visual Analogue Scale (VAS) and compared with precise verbal dating. Linear Mixed-Effects Models estimated compression (slope) and displacement (intercept) per period using 1,684 observations. Event importance was rated retrospectively (THEN) and currently (NOW).

Results: Two distortion regimes emerged. Remote periods (childhood–adolescence) showed central tendency bias, with events compressed toward the period mean ($\beta \approx 0.76$, elementary school; $\beta \approx 0.55$, middle school). Recent periods showed backward telescoping, with relative error increasing with temporal distance ($p < .001$), indicating a transition around ages 19–25. During adolescence, higher initial importance predicted stronger fading ($r = -0.36$, $p < .01$). Spatial gaps on a global lifetime VAS correlated with elapsed time ($r^2 = 0.63$, $p < .05$).

Conclusions: Autobiographical memory distortions are structured: identity-formative periods show compression, whereas adult memories follow a flexible timeline dominated by telescoping.

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## The Past Shrinks: Weber's Law Governs Autobiographical Time

Andrea Adriano, Giacomo Meyer, Maddalena Boccia

Autobiographical memory spans a temporal dimension from recent to remote events, yet the principles governing how autobiographical time is represented remain unclear. Drawing on psychophysical theories of magnitude representation, we tested whether autobiographical temporal judgments follow Weber's law, such that discriminability depends on relative rather than absolute temporal differences. Participants compared pairs of autobiographical memories and indicated which event was more recent.

When absolute temporal distance was constant, behavioral data depended on the temporal ratio between memories: performance was worst for comparisons with smaller relative differences. Polynomial analyses showed that both reaction times and accuracy were best captured by a logarithmic function, consistent with Weberian compression of subjective time for remote memories. Trial-level Weber fraction strongly predicted behavioral performance.

Vividness ratings declined with remoteness, while variability increased proportionally, producing a constant coefficient of variation predicted by scalar variability. Individual-differences modeling showed that the internal Weber fraction predicted ART scores, particularly visual imagery, vividness, and reliving. Control analyses using neural-network language models confirmed that lexical and semantic properties did not account for these effects.

Together, these findings indicate that autobiographical temporal judgments follow Weber's law, suggesting autobiographical time is represented as a compressed magnitude dimension as memories become more remote.

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## Determinants of Individual Navigation Ability

Chloë van Steenoven, Muhammet Ikbal Sahan

External navigation devices such as GPS are widely used in everyday life. Their increasing use has raised questions about whether reliance on such technologies may affect the ability to form internal cognitive maps, a function closely associated with the hippocampus. This study examines how different patterns of GPS use relate to internal navigation performance in a virtual adaptation of the Morris Water Maze. Participants complete questionnaires assessing GPS reliance, sense of GPS dependence, and strategic GPS use, as well as the Santa Barbara Sense of Direction scale and a visuospatial working memory task. These measures are examined in relation to navigation performance in the virtual maze. Preliminary analyses from the current sample suggest that general reliance on GPS or perceived dependence on the technology may not be strongly associated with navigation performance. Initial patterns further indicate that different forms of GPS use may relate differently to navigation outcomes. As data collection and analyses are ongoing, these observations remain tentative. The study aims to contribute to a better understanding of how everyday navigation technologies interact with cognitive processes involved in spatial navigation.

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## Musical emotion blobs: A spatial indicator of emotional ambiguity

Nick Dam, Rebecca Schaefer

Music is known to not only communicate emotions that are recognised by, but can also induce feelings in listeners. Recognised emotions in music are partly based on more universal musical aspects such as tempo and loudness, partly on more culture-based aspects such as tonality, but also vary per individual. Sometimes music very clearly conveys a specific emotion, for instance in bespoke film music or in lullabies, but for most music that is more emotionally ambiguous, individual differences in interpretation and especially induction are larger.
The current study sought to visualise this ambiguity spatially by conceptualising emotional responses in the 2-dimensional space of arousal and valence. In this experiment, listeners rated short music clips on both recognised and induced emotion by moving sliders to indicate arousal and valence ratings. This allows for analysis of distributions related to the universality or ambiguity of the musical piece, as well as how individuals differ in their ratings, related to individual traits such as age and musical background.

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# The Role of Visual Experience and Sensory Modality in Spatial Language Processing

Yiting Chen, Kenny Coventry, Andrew Kolarik

Spatial language is an essential part of everyday language use, yet the majority of research has focused on individuals with access to vision (e.g., Coventry et al., 2023; Landau & Jackendoff, 1993; Markostamou & Coventry, 2022). Consequently, little is known about how spatial language is produced and comprehended in the absence of vision. This study investigates how visual experience (full vision vs. temporary vision loss) and sensory modality (visual-only, visual-plus-haptic, and haptic-only) influence spatial language processing. Native English-speaking university students (aged 18-25) complete a set of tasks assessing haptic spatial naming and spatial referencing, alongside measures of tactile sensitivity, proprioception, verbal fluency, and verbal working memory (data collection is currently underway). Accuracy, exploration time and reaction time will be analysed. It is hypothesized that visual experience will affect spatial language processing, with participants with full vision outperforming those experiencing temporary vision loss. Additionally, participants in the haptic-only group will perform worse than both the visual-only and multimodal groups. This work aims to advance our understanding of how visual experience and sensory input shape spatial language processing.