



**APCV &
EPC 2026**

Auckland, NZ

Joint meeting of the
**Asia-Pacific Conference
on Vision
&
Australasian Experimental
Psychology Conference**

2026

Waipapa Taumata Rau | University of Auckland
Aotearoa New Zealand



Waipapa
Taumata Rau
**University
of Auckland**



Opening Karakia

Karakia are traditional Māori prayers and affirmations, used to invoke guidance and protection at the opening and closing of events, or to bless kai (food) or taonga (treasures).

Whakataka te hau ki te uru
Whakataka te hau ki te tonga
Kia mākinakina ki uta
Kia mātaratara ki tai
E hī ake ana te atākura
He tio, he huka, he hau hū
Tihei mauri ora!

English translation

Cease the winds from the west
Cease the winds from the south
Let the breeze blow over the land
Let the breeze blow over the ocean
Let the red-tipped dawn come with come with a sharpened air.
A touch of frost, a promise of a glorious day!



Nau mai, haere mai!

Nau mai, haere mai! Welcome to Tāmaki Makaurau/Auckland!

We are delighted to welcome you to this joint meeting of the Australasian Experimental Psychology Conference (EPC) and the Asia-Pacific Conference on Vision (APCV), hosted at Waipapa Taumata Rau/The University of Auckland. This unique gathering brings together researchers, students, academics, and professionals from across the Asia-Pacific region and beyond, creating a vibrant forum for the exchange of ideas at the forefront of psychological and vision science.

In once again uniting these two conferences, we bring together researchers from diverse traditions and distant regions to showcase the latest research in our fields and continue the recent tradition of interdisciplinary dialogue. We are especially pleased to feature three outstanding keynote addresses by Hakwan Lau (Institute for Basic Science, Korea), Elaine Reese (University of Otago), and Corey Wadsley (University of Auckland).

The scientific programme highlights both the breadth and depth of research activity in our region, and we are confident that you will find the conference stimulating and rewarding. The programme also includes a range of satellite events and social functions to ensure that your time here is as enjoyable as it is intellectually enriching. Although we are in the depths of winter, we hope you will also take time to explore the rich cultural diversity and stunning natural environment of Tāmaki Makaurau/Auckland and Aotearoa New Zealand.

Welcome, and thank you for being part of this special event.



Kate Storrs
*University of
Auckland*



Paul Corballis
*University of
Auckland*



Chris Erb
*University of
Auckland*



Courtney Hilton
*University of
Melbourne*



Sam Schwarzkopf
*University of
Auckland*

Acknowledgements

The organisers would like to thank:

- The School of Psychology, University of Auckland, for supporting the Early Career Social event and the Early Career Researcher Excellence prizes
- Prof. Derek Arnold and Prof. Frans Verstraten for their wise advice during conference organisation
- Gene Tang for designing the conference logo and managing social media



Table of Contents

Programme at a Glance	5
Campus Maps.....	7
Useful Information	9
Detailed Schedule.....	10
Keynote Lectures	21
David Badcock Early-Mid Career Plenary: Dr Corey Wadsley	21
Ross Day Plenary: Prof. Elaine Reese	22
APCV Keynote Lecture: Prof. Hakwan Lau	23
Satellite Events	24
Public Lecture: Prof. Gina Grimshaw	24
Synaesthesia Science & Community Forum	24
Image Processing Workshop.....	26
Early Career Panel Discussion.....	27
Member-initiated Symposia	28
Symposium 1- Gaze perception: eye movements as social signals	28
Symposium 2- Current Applications of Virtual Reality within Cognitive Science	29
Symposium 3- Imagined Sensations.....	30
Symposium 4- Attending to and being distracted by threats	32
Symposium 5- XR in Multisensory Perception.....	33
Symposium 6- Seeing through noise: Emerging research on Visual Snow Syndrome.....	35
Oral Presentation Abstracts.....	37
Poster Presentation Abstracts	91
Closing Karakia.....	135



Programme at a Glance

Wednesday 1 st July 2026			
	Time		Location
Workshop	12:00	Understanding the Stimulus: Image Processing Foundations for Visual Cognition	Computer Lab (302-G40)
Satellite Event	12:00	Synaesthesia as Structured Perception and Creative Integration	Case Room (302-G20)
ECR Panel	15:30	What's next? Navigating academia and industry as an early-career researcher in psychology	Stream 1 (303-G20)
Welcome	17:30	Mihi Whakatau & Opening Remarks	Stream 1 (303-G20) & Overflow Stream 2 (303-G23)
Welcome	18:00	Drinks & Canapes Reception	Atrium

Thursday 2 nd July 2026				
Time	Stream 1 (303-G20)	Stream 2 (303-G23)	Stream 3 (303-G01)	Stream 4 (303-G02)
09:00-10:30	Symposium 1 - Gaze Perception: Eye movements as Social Signals	Social Coordination Chair: Zhou Yu	Auditory Awareness Chair: Philip Grove	Clinical Practice and Therapeutics Chair: Melanie Takarangi
10:30-11:00	Morning Coffee (Atrium)			
11:00-12:30	Poster Session (Atrium)			
12:30-13:30	Lunch (Atrium)			
13:30-15:00	Symposium 2 - Current Applications of Virtual Reality within Cognitive Science	Social and Game Decisions Chair: Rachel Searston	Perceptual Modulation Chair: Courtney Hilton	Unconscious Stimulus Processing Chair: Corinne Bareham- Waldock
15:00-15:30	Afternoon Coffee (Atrium)			
15:30-16:30	Corey Wadsley - ECR Keynote (Stream 1 & Overflow Stream 2)			
17:00-19:00	Student Drinks Social (Old Government House)			
18:00-19:30	Gina Grimshaw Public Lecture (303-G01)			



Friday 3 rd July 2026				
Time	Stream 1 (303-G20)	Stream 2 (303-G23)	Stream 3 (303-G01)	Stream 4 (303-G02)
09:00-10:30	Symposium 3 - Imagined Sensations	Society and Social Dynamics Chair: Victoria Bridgland	Developmental Psychology and Healthy Aging Chair: Nicole Nelson	Visuomotor Learning and Action Chair: Paul Corballis
10:30-11:00	Morning Coffee (Atrium)			
11:00-12:30	Poster Session (Atrium)			
12:30-13:30	Lunch (Atrium) EPC Business Meeting (Case Room 302 -G20)			
13:30-15:00	Symposium 4 - Attending to and being distracted by threats	New Methods for Measuring Clinical Conditions Chair: Chris Erb	Mental Representations Chair: Alan Lee	Perceiving Statistics Chair: Kate Storrs
15:00-15:30	Afternoon Coffee (Atrium)			
15:30-17:00	Face Processing and Perception Chair: Ecem Altan	Visual Search and Spatial Orienting Chair: David Carmel	Metacognition Chair: Kate Storrs	Associative Learning Chair: Evan Livesey
17:00-18:00	Elaine Reese - Ross Day Plenary (Stream 1 & Overflow Stream 2)			

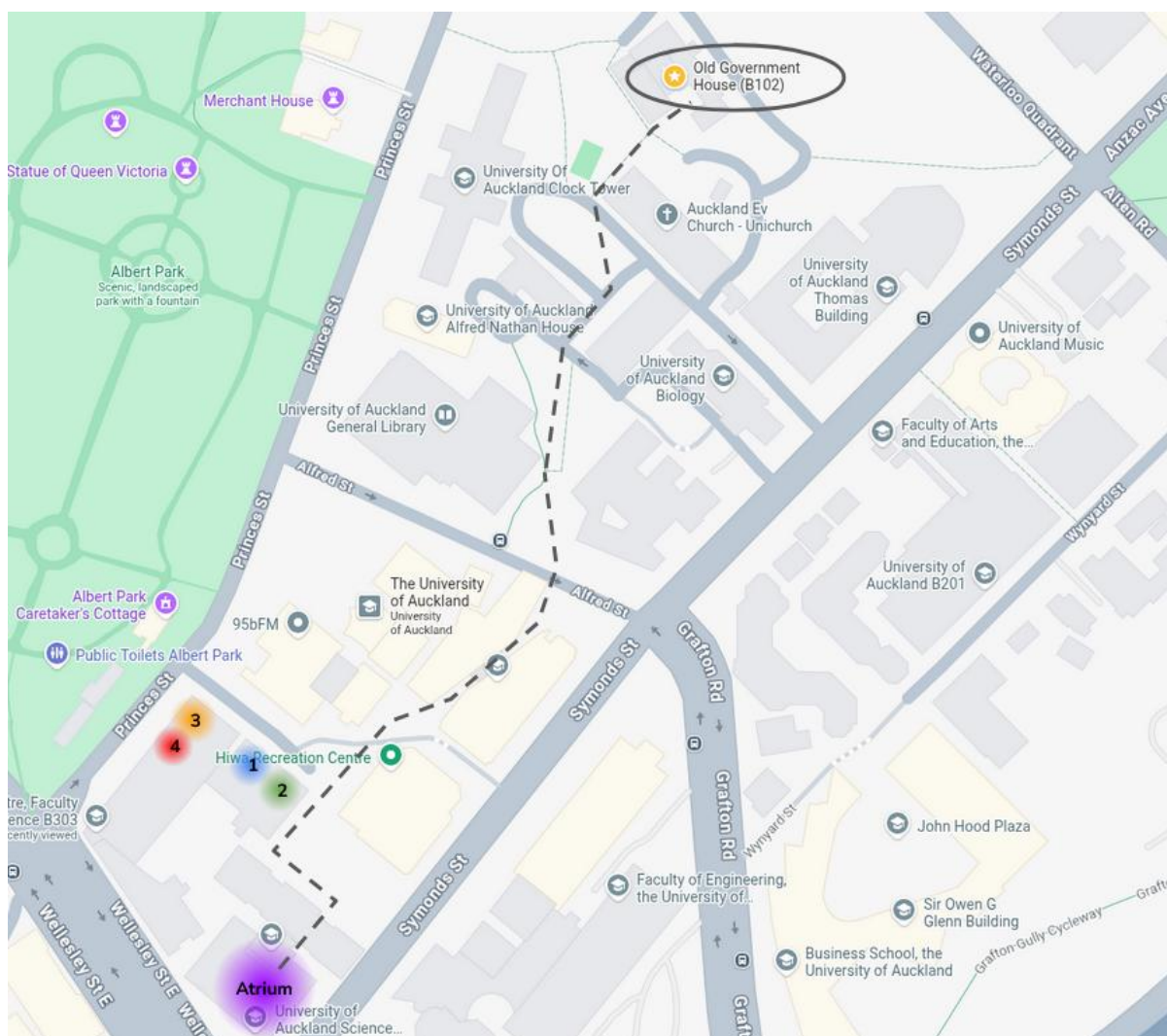
Saturday 4 th July 2026				
Time	Stream 1 (303-G20)	Stream 2 (303-G23)	Stream 3 (303-G01)	Stream 4 (303-G02)
09:00-10:30	Symposium 5 - XR in Multisensory Perception	Affect and Empathy Chair: Philippe Chouinard	Expectations, Surprise and Distraction Chair: Sam Schwarzkopf	Reading and the Brain Chair: Roslyn Wong
10:30-11:00	Morning Coffee (Atrium)			
11:00-12:30	Poster Session (Atrium)			
12:30-13:30	Lunch (Atrium) APCV Business Meeting (Case Room 302 -G20)			
13:30-15:00	Symposium 6 - Seeing through noise: Emerging research on Visual Snow Syndrome	Long-term Memory in Context Chair: Deanne Green	Communication and Misinformation Chair: Saoirse Connor Desai	Perception across Time Chair: Alex Holcombe
15:00-15:30	Afternoon Coffee (Atrium)			
15:30-17:00	Working Memory and Attention Chair: Will Hayward	Visual Neuroscience Chair: Will Harrison	Sight and Health Chair: Michael-Paul Schallmo	Reading and Word Recognition Chair: Erik Reichle
17:00-18:00	Hakwan Lau - APCV Keynote (Stream 1 & Overflow Stream 2)			
18:00-18:15	Announcing Student Prizes (Stream 1 & Overflow Stream 2)			
19:00-23:00	Conference Dinner (The Wharfside Bar & Eatery, Ground Floor/137 Quay Street, Auckland)			



Campus Maps



Way to Student Social in Old Government House





Useful Information

Venue

The conference will take place in the **Science Centre** of the University of Auckland (300 building complex) at **23 Symonds Street, Auckland CBD, Auckland 1010**. We have four parallel streams in lecture halls around the building. The opening ceremony and keynote lectures will take place in the largest lecture hall Stream 1 (303-G20). As the capacity of this lecture theatre may be too small, we also plan to run a livestream in the Stream 2 lecture hall (303-G23).

The welcome reception, coffee and lunch catering, and the three poster sessions will be held in the Atrium of Building 302. Directly adjacent to this is the Computer Lab (302-G40) for the Satellite Workshop on 1st July, and the Case Room (302-G20) where we do the EPC and APCV Business Meetings.

Registration Desk

The registration desk is located in the atrium of Building 302 near the red staircase. The atrium is also where we have the poster sessions and catering.

Wireless Internet

There is a dedicated WiFi network set up for conference attendees:

WiFi Name:	UoA-Guest-WiFi
Log in:	epc26@uoawifi.com
Password:	QQaKCDKR

Moreover, if you have access to the **eduroam** network, this will also be available.

Poster Format

Posters should be in **portrait (vertical) orientation** and have a **maximum size of A0** (841mm x 1189mm or 33.1" x 46.8"). **Poster sessions will be held 11:00-12:30 on each main day (2-4 July). Please attend your poster during this time.** This is flanked by the coffee and lunch breaks, and you are welcome to present your poster also during those times if you like. **Please put up your poster by 9:00 on the day of your session.** Posters will remain on the board for the whole day. We will provide Velcro strips to attach the poster to the board. You can find the day of your poster presentation in our Conference Programme.

Poster numbers 1-25 are facing southwest, towards the Wellesley Street entrance. **Poster numbers 26-50 are facing the opposite direction** towards Coffix café. Posters 1 and 26 etc are the two sides of the same board.

Oral Presentation Format

Oral presentations are strictly limited to 15-minute slots, so your **presentation must be 12 minutes, allowing for 3 minutes of questions**. To ensure smooth transitions **please arrive at least 10 minutes before your scheduled session** to upload your presentation slides on the lectern computer (or plug in your laptop) and test them.

Notice Board

We have set aside one of the poster boards for community notices. Please feel free to put up job adverts or other announcements that might be of interest to other conference attendees. This is on poster board 25/50.

Social Media

The conference social media account is on Blue Sky: [@expasyanz.bsky.social](https://bsky.app/profile/expasyanz.bsky.social)





Detailed Schedule

Thursday 2 nd July 2026 - Morning				
	Time	Name	Title	Location
Symposium 1 - Gaze Perception: Eye movements as Social Signals	9:00	William Hayward	How do idiosyncratic eye-movements affect face processing?	Stream 1 (303-G20)
	9:20	M. Catherine Macpherson	Investigating the influence of visual attention on interpersonal coordination	
	9:40	Colin J. Palmer	Perceptual learning in gaze perception	
	10:00	Lindsay Peterson	The perception of dynamic gaze behaviour	
Social Coordination Chair: Zhou Yu	9:00	Christopher Maymon	LLMs forecast a caricature of human emotional experience	Stream 2 (303-G23)
	9:15	Miao Cheng	Friend or Foe? Cross-Cultural Expression, Perception, and Model Decoding of Embodied Social Intention	
	9:30	Laiton Hedley	The Role of Complementarity in Human-Machine Teaming	
	9:45	Huang Zehao	Eye Movement Kinematics as Late-Stage Social Signals in Human-Robot Interaction	
	10:00	Taniya Rawat (Presented by Sarina Chien)	Authenticity Detection and Trustworthiness Ratings of Real and AI-Generated Faces Across Diverse Racial Groups: Effects of Simultaneous Presentation and Own-Race Advantage	
	10:15	Shwetha Vinod	50 Shades of Empathy and Psychopathy	
Auditory Awareness Chair: Philip Grove	9:00	Zak Buhmann	How does the brain combine sight and sound in speech perception? Insights from a dual-stream network	Stream 3 (303-G01)
	9:15	Sotaro Taniguchi	Semantic Modulation in Audiovisual Postdictive Illusions Depends on Fixation	
	9:30	Derek H. Arnold	A neural signature of susceptibility to involuntary experiences of imagined sounds	
	9:45	Courtney B. Hilton	Tracking global neurodevelopmental variation via conscious access to subtle pitch differences	
	10:00	Leonie Loehn	Foetal Heart Rate Responses show Timbre and Harmony Perception during Late Gestation	
	10:15	Corinne Bareham	Effective Connectivity Reveals a Shift to Left-Hemisphere Dominance for Spatial Attention during sleep onset	
Clinical Practice and Therapeutics Chair: Melanie Takarangi	9:00	Victoria Bridgland	Trigger Warnings Attract People at Risk of an Eating Disorder to Eating Disorder Related Content	Stream 4 (303-G02)
	9:15	Jace Dalton	Self-Triggering in Eating Disorders	
	9:30	Lucy Walter	How much detail should we share? Instructions to minimize aversive details may not reduce the 'disturbing' details people	
	9:45	Lilith Zeng	Punishment Sensitivity in Individuals with Problematic Alcohol Use	
	10:00	Yangxueqing Jiang	Investigating recall accuracy for medication side effects across age and likelihood/severity categories	
	10:15	Shumetha Sidhu	A Multisensory Database of Tropical Urban Green Space Stimuli: Effects on Perceived Restorativeness and Cognitive	
	10:30	Morning Coffee		Atrium
Posters I	11:00	Poster Session		Atrium
	12:30	Lunch		Atrium





		Thursday 2 nd July 2026 - Afternoon		
	Time	Name	Title	Location
Symposium 2 - Current Applications of Virtual Reality within Cognitive Science	13:30	Katherine Storrs	A Surprisingly Robust Visual Illusion in Virtual Reality	Stream 1 (303-G20)
	13:45	Donald Degraen	Feels Like a Hairy Mirror: Designing Haptic Sensations for Investigating Multisensory Perception in Virtual Reality	
	14:00	David Carmel	Using a VR Game to Investigate Visuomotor Skill Acquisition	
	14:15	Christopher Erb	Enhancing the Reliability of the Attentional Network Test with Hand and Eye Tracking in VR	
	14:30	Gina Grimshaw	Cognitive Control in Emotional States: Insights from Virtual Reality	
	14:45	Discussion		
Social and Game Decisions Chair: Rachel Searston	13:30	Augustine Nguyen	Learning What Others Like and the Role of Feedback Noise	Stream 2 (303-G23)
	13:45	Natalie Saul	Killing the Wrong Monster: A Time and Effort Paradigm for Measuring Sunk Cost Behaviour	
	14:00	Andrew Camara	People Place Larger Bets When They Can Control the Decision to ‘Cash Out’ of a Risky Choice	
	14:15	Laura Forbes	Dynamic Preferences for Control in the Choice Abdication Task	
	14:30	Mike Le Pelley	Exploiting the dynamics of gaze to modulate the evaluation of risky prospects	
	14:45	Spriha Goswami	Individual Differences in Domain-Specific Risk-Taking	
Perceptual Modulation Chair: Courtney Hilton	13:30	Varun Gandhi	Long-Term Experience with Visual Structure Distorts Psychophysical Time	Stream 3 (303-G01)
	13:45	Deanne Green	Early Perceptual Mechanisms Shape Boundary Extension	
	14:00	Tony Cheng	Modal Completion based on Linguistic Knowledge: A Cross-cultural Study	
	14:15	Bridget Kelly	Dogs Don't Drive: Constellation Semantic Categorisation Drives Verb Selection for Narratives in Novel Star Fields	
	14:30	Hiroshi Shibata	Does respiratory phase predict judgements of agency?	
	14:45	Max Gurr	Event Segmentation in Virtual Reality	
Unconscious Stimulus Processing Chair: Corinne Bareham-Waldock	13:30	Philippe Chouinard	The role of visual awareness and specific phobias in physiological reactions to evolutionary threatening animals	Stream 4 (303-G02)
	13:45	Zakia Haque	Sex dependency of subconscious visual perception	
	14:00	Ning-Ting Hsu	Ensemble Perception with Unconscious and Conscious Faces	
	14:15	Junhao Jiang	Unseen peripheral color information facilitates visual localization by supporting figure-ground separation	
	14:30	Yu-hsin Lee	Unconscious extraction of implied destinations in goal-directed motion under discontinuous flash suppression	
	14:45	Jacob Coorey	Early Visual Influences on 'Suppression Depth' Using tracking-Continuous Flash Suppression	
	15:00	Afternoon Coffee		Atrium
David Badcock Early-Mid Career Plenary	15:30	Corey Wadsley	Stopping safely: Physiological underpinnings of response inhibition	Stream 1 (303-G20) & Overflow Stream 2 (303-G23)
	17:00	Student Social		Old Government House
Public Lecture	18:00	Gina Grimshaw	Thinking with your head AND your heart: Emotions as core functions of mind	Stream 3 (303-G01)



Friday 3 rd July 2026 - Morning				
	Time	Name	Title	Location
Symposium 3 - Imagined Sensations	9:00	Anthony Lambert	Anauralia and aphantasia: Reflecting on similarities and differences	Stream 1 (303-G20)
	9:20	Amelia X. Yu	When Visual Mental Imagery isn't Perceptual	
	9:40	Loren Bouyer	Autism and Aphantasia	
	10:00	Alexander Sulfaro	What does it mean to "see" a mental image?	
	10:20	Derek H. Arnold	Discussant	
Society and Social Dynamics Chair: Victoria Bridgland	9:00	Allegra Micomono	Commitment to pro-democratic action durably reshapes democratic attitudes	Stream 2 (303-G23)
	9:15	James Phillips	Gluckschmerz and the downvoting of the successful plagiarising professor.	
	9:30	Sebastian Deverson	Inflexibility and Identity Fusion: Predicting Willingness to Fight and Die under Uncertainty	
	9:45	Joseph Higginson	The Company Consensus Keeps: How Connections Between Social Media Users Shape Responses to Agreement	
	10:00	Christopher Buckland	The influence of social group membership on pain recognition.	
	10:15	Saoirse Connor Desai	The limits of repetition in the illusion of consensus	
Developmental Psychology and Healthy Aging Chair: Nicole Nelson	9:00	Vincent Reid	The role of the visual periphery in perceptual and social development	Stream 3 (303-G01)
	9:15	Abby Tuck	Neural responses to emotional auditory stimuli in toddlers: An exploratory ERP study of the Kia Timata Pai (Best Start) Brain and Behaviour Development Substudy.	
	9:30	Florian Bednarski	Results from an interactive facial emotion recognition task with a digital child.	
	9:45	Rose Barton	What Kind of Mind? Mind Attribution to a Digital Simulated Child	
	10:00	Teghan O'Beirne	Exploring Parent-Child Play Experiences with Preschool-Aged Neurodivergent Children	
	10:15	Ceren Ayyildiz	The role of music in mitigating feelings of loneliness in older adults	
Visuomotor Learning and Action Chair: Paul Corballis	9:00	Karamjeet Kaur Sarna	Driving with Future-Oriented Thoughts: Exploring the Influence of Prospective Memory Representations on Driving Performance	Stream 4 (303-G02)
	9:15	Feifei Jiang	Controlling a nonrigid object in a coordination task: Is learning guided by perceptual information or movement feedback?	
	9:30	Yuan Ding (Presented by Evan Livesey)	Investigating the Globality of GABAergic Inhibition during an Oculomotor Stop-Signal Task	
	9:45	Kara Simpson	Error Monitoring: Feedback-Driven Modulation of the ERN in Partial Responses	
	10:00	Hsin-Ting Lo	Domain-general and Domain-specific Mechanisms of Visual Perceptual and Motor Learning: An EEG study	
	10:15	Guy Wallis	A subcortical nexus for visually guided movement	
	10:30	Morning Coffee		Atrium
Posters II	11:00	Poster Session		Atrium
	12:30	Lunch & EPC Business Meeting		Atrium & Case Room (302 -G20)



Friday 3 rd July 2026 - Early Afternoon				
	Time	Name	Title	Location
Symposium 4 - Attending to and being distracted by threats	13:30	Andrea Wat-Si	Does experience blunt perceptual disruption caused by emotional images?	Stream 1 (303-G20)
	13:50	Melanie Takarangi	Do Sensitive Content Warnings Capture Attention?	
	14:10	Nicole Nelson	Children's Visual Attention to Violence	
	14:30	Hedwig Eisenbarth	Emotional content distracts us from (boring) tasks - but not those high on psychopathy	
	14:50	Discussion		
New Methods for Measuring Clinical Conditions Chair: Chris Erb	13:30	Lynden Miles	Diversity in neurodiversity can disrupt interpersonal coordination	Stream 2 (303-G23)
	13:45	Linh Tran	Lost Focus, Found in VR: Enhancing ADHD Assessment Through VR-Based Attention Network Test	
	14:00	Ella Trevaskes	Postural Sway and Cognition in Elderly People with Dementia	
	14:15	Chin-An Wang	Brainstem control dysregulation in late-life depression revealed by pupillometry and microsaccades	
	14:30	Dominic Tran	Prediction-based motor attenuation in schizotypy	
	14:45	Abraiz Azhar	Rapid, Robust, and Reliable Assessment of Contrast Sensitivity in Augmented Reality	
Mental Representations Chair: Alan Lee	13:30	Loren Bouyer	Pareidolia and Visualisations	Stream 3 (303-G01)
	13:45	Konstantina Vasileva	Adapting to seen and imagined faces	
	14:00	Claire Vanbuckhave	Predicting imagery vividness relative to perception with EEGNet	
	14:15	Anton Sidoroff-Dorso	Semiotic System—Unitisation Membership Model of Induction in Synaesthesia	
	14:30	Samantha G. Lane	Mental Rotation is Unaffected by Acute Stress Induction or Schizotypy	
	14:45	Thomas Carlson	What Crowdsourcing and AI Reveal Tell us About How Humans "See" Foods	
Perceiving Statistics Chair: Kate Storrs	13:30	Randolph Grace	Can Psychology Explain Where Mathematics Comes From?	Stream 4 (303-G02)
	13:45	Satoshi Shioiri	Temporal aspect of "Aha!" experience	
	14:00	Nicky Brooks	Communicating forensic evidence in court: Do interpretation aids help or hinder?	
	14:15	Hannah Fenwick	Task Structure and Numerical Complexity in Bayesian Reasoning	
	14:30	Yiming Li	A Transition-Based Multi-Stage Architecture of Haptic Enumeration	
	14:45	Steven Dakin	Do Higher-Order Statistics Matter for Visual Averaging? Testing the Equivalent-Noise Model with Non-Gaussian Distributions	
	15:00	Afternoon Coffee		Atrium



Friday 3 rd July 2026 - Late Afternoon				
	Time	Name	Title	Location
Face Processing and Perception Chair: Ecem Altan	15:30	Nusrat Samiya	I'd know that face anywhere: The effect of scene context on unfamiliar face recognition	Stream 1 (303-G20)
	15:45	Blake Saurels	The impact of backward masking on pareidolia detection	
	16:00	Masaki Mori	An item response theory analysis of the 20-item prosopagnosia index	
	16:15	Haiyang Jin	Picture-plane rotation dissociates facilitation and interference in holistic face processing	
	16:30	Natalie Peluso	Robust categorical organisation of face space in healthy ageing	
	16:45	Alysha Hua	Following the Algorithm: When Automation Reliance Overrides Individual Differences in Face Matching	
Visual Search and Spatial Orienting Chair: David Carmel	15:30	Thérèse Collins	Visual search behavior is determined by the geometry of visual representations	Stream 2 (303-G23)
	15:45	Duan Xiaoting	Inhibitory Tags Do Not Reduce Stimulus Saliency, but Rather Bias Spatial Orienting	
	16:00	Julie Chow	Measuring Attentional Flexibility in Dynamic Environments	
	16:15	Angus Chapman	Attention reshapes the representational geometry of a perceptual feature space	
	16:30	Nick Wyche	Reward-related attentional capture shapes fast decision-making	
	16:45	Luke Scott	Predictiveness enhances orienting without amplifying multisensory integration	
Metacognition Chair: Kate Storrs	15:30	Alan Lee	Real or Generated? Testing signal detection models of realism across visual scene categories	Stream 3 (303-G01)
	15:45	Kit S. Double	Strategy Frequency Biases Metacognitive Beliefs About Efficacy	
	16:00	Xinning Feng	Effects of unconscious information on perceptual and metacognitive judgments	
	16:15	Aastha Sarraf	Development of adaptive behavioural adjustments in arithmetic and spatial compatibility rule switching tasks	
	16:30	Christopher L. Asplund	Endurance exercise reduces motivation for physical and cognitive effort without impairing cognitive performance	
	16:45	Ade Fathiawati	Perceived effectiveness versus actual use of music performance anxiety mitigation strategies among Australian tertiary music students	
Associative Learning Chair: Evan Livesey	15:30	Ottmar Lipp	Deconditioning: Paired presentations of reduced intensity USs early during extinction reduce uncertainty during extinction and impair re-acquisition	Stream 4 (303-G02)
	15:45	Luke Ney	What drives skin conductance responding in fear conditioning?	
	16:00	Madeline Jarvis	Unpaired US presentations during extinction reduce the return of fear: Does arousal strengthen extinction learning?	
	16:15	Gia Nhi Lam	Examination of generalised responses in Pavlovian and trauma film paradigms	
	16:30	Natasha Trolove	From friend to foe: How evaluative conditioning influences fear conditioning and the role of relational information in the transfer of learning.	
	16:45	Peter Lovibond	Do people assume independent alternative causes when judging contingencies?	
Ross Day Plenary	17:00	Elaine Reese	Taking the Long Way: From Basic to Applied Science of Memory Development	Stream 1 (303-G20) & Overflow Stream 2 (303-G23)



Saturday 4 th July 2026 - Morning				
	Time	Name	Title	Location
Symposium 5 - XR in Multisensory Perception	9:00	Harin Hapuarachchi & Juno Kim	Introductory Remarks	Stream 1 (303-G20)
	9:10	Peter Wagner	Visual-Vestibular Integration in Virtual Reality: From Vection to Cybersickness	
	9:30	Zhanna Sarsenbayeva	Towards Accessible, Context-Aware and Emotionally Intelligent Devices	
	9:50	Kenzo Sakurai	From Emerging Technology to Everyday Tool: Virtual Reality in Society and Perceptual Psychology	
	10:10	Takayoshi Hagiwara	Fused Body Augmentation: The Possibility of Body Fusion among Multiple People	
Affect and Empathy Chair: Philippe Chouinard	9:00	Sasha Cox	Do disgust reactions to a highly disgusting and fearful trauma analogue persist more than fear reactions over time?	Stream 2 (303-G23)
	9:15	Mariya Bartosh	Temporal Changes in Affect Influencing Efficacy Beliefs	
	9:30	Zhou Yu	Angry Faces Bias Attention and Motor Responses Across Peripersonal and Extrapersonal Space in Virtual Reality (VR)	
	9:45	Chiahuei Tseng	Embodied emotion from body motion: Challenges and Opportunities	
	10:00	Xinyi Huang	Visual Sampling Strategies During Emotion Recognition from Biological Motion	
	10:15	Yujin Wang	Melanopsin and social-affective processing	
Expectations, Surprise and Distraction Chair: Sam Schwarzkopf	9:00	Vishnu Mohan	Sharpening or dampening? Task demands determine the representational consequences of expectation	Stream 3 (303-G01)
	9:15	Ziyue Hu	Predicting Fast and Forward: Dual Expectation Mechanisms Supporting Adaptive Efficiency	
	9:30	Caleb Stone	Decoding distraction: An EEG study of value-modulated attentional capture	
	9:45	Rebecca Lawrence	Cognitive Failures and Distraction-Induced Quitting During Visual Search	
	10:00	Anina N. Rich	How long does it take to recover from an interruption? Examining the resumption lag in dynamic task	
	10:15	Dan Wang	Dynamic competition between bottom-up saliency and top-down goals in early visual cortex	
Reading and the Brain Chair: Roslyn Wong	9:00	Erik Reichle	Using Co-registered Eye-Tracking and MEG to Identify the Eye-Mind Link in Reading	Stream 4 (303-G02)
	9:15	Shuyuan Chen	Using MEG and eye-tracking to understand the cortical systems that support Chinese reading	
	9:30	Ayuka Nakamura	Interocular and interhemispheric transfer of adaptation to symbolic numerals	
	9:45	Junjie Wu	Transcranial magnetic stimulation impairs the inhibitory role of the right inferior frontal gyrus in bilingual language control	
	10:00	Greig De Zubicaray	Revisiting the family size effect: Systematic form-productivity mappings influence lexical processing	
	10:15	Daniel Van Noorden	The N400 is Dead! Long Live... Naïve Baseline Undermines Inferences and Obscures Associations.	
	10:30	Morning Coffee		Atrium
Posters III	11:00	Poster Session		Atrium
	12:30	Lunch & APCV Business Meeting		Atrium & Case Room (302 -G20)



Saturday 4 th July 2026 - Early Afternoon				
	Time	Name	Title	Location
Symposium 6 - Seeing through noise: Emerging research on Visual Snow Syndrome	13:30	Allison Mckendrick	Exploring visual snow appearance and contrast processing in visual snow syndrome	Stream 1 (303-G20)
	13:50	Jess Taubert	Face Pareidolia Reveals Altered Visual Inference in Visual Snow Syndrome	
	14:10	Michael-Paul Schallmo	Adaptation reveals the feature specificity of visual snow	
	14:30	Samantha Montoya	Photoreceptor Mechanisms of Light-Induced Discomfort: Implications for Visual Snow Syndrome	
	14:50	D. Samuel Schwarzkopf	Discussant	
Long-term Memory in Context Chair: Deanne Green	13:30	Ullrich Ecker	Boosting the memorability and effectiveness of fact-checks	Stream 2 (303-G23)
	13:45	Emily Spearing	Examining the Effectiveness of Safeguards for Protecting Against Misinformation in AI-Generated Police Reports	
	14:00	Jake Goldsworthy	Examining Hyper-Binding in Ageing: An Individual Differences Approach	
	14:15	Uyen Doan	Disentangling the role of semantic priors and sensory details in autobiographical memory retrieval	
	14:30	Presentation Withdrawn		
	14:45	Kayla Rail	Investigating the Neural Correlates of Automaticity in Procedural Category Learning using EEG	
Communication and Misinformation Chair: Saoirse Connor Desai	13:30	Presentation Withdrawn		Stream 3 (303-G01)
	13:45	Daniella Chiarolli <i>(Presented by Rachel Searston)</i>	Lay Forensic Science: the Illusion of Explanatory Depth in the Forensic Domain	
	14:00	Rachel A. Searston	How do people evaluate disclosures of artificial intelligence (AI) use in forensic expert evidence?	
	14:15	Simon Farrell	A range-frequency examination of the effects of payoff structure in a communication game	
	14:30	Benjamin Simmonds	Filtering the Evidence: How Communicative Goals Shape the Balance of Opinion About Health Claims on Social Media	
	14:45	Paul McIlhiney	AI-Podcast Misinformation: Testing Active versus Passive Inoculations	
Perception across Time Chair: Alex Holcombe	13:30	Cameron Phan	Serial Dependence: perception or decision-making? Probing the neural mechanisms underlying attractive and repulsive bias	Stream 4 (303-G02)
	13:45	Henry Beale	Rhythmic visual perception arises from a surround modulation mechanism	
	14:00	Balaje Vivekanandan	Dissociable effects of element-lifetime and stimulus-duration on local and global motion processing: An equivalent noise study	
	14:15	Jye Marchant	Decomposing the Flash-Lag Effect: How Temporal Uncertainty Contributes to Extreme Foveal Biases	
	14:30	De-Wei Dai	Motion and position: Reconciling representational momentum with immediate perceptual judgments	
	14:45	David Yu	Visual–Vestibular Contributions to the Motion Aftereffect in a Hexapod Motion Simulator	
	15:00	Afternoon Coffee		Atrium



Saturday 4 th July 2026 - Late Afternoon				
	Time	Name	Title	Location
Working Memory and Attention Chair: Will Hayward	15:30	Garry Kong	Guiding features behave differently in visual and memory search	Stream 1 (303-G20)
	15:45	William Ngiam	Similarity judgments and visual working memory do not share the same cognitive representation	
	16:00	Barbara Berger	Attention allocation during multi-item maintenance in human working memory	
	16:15	Alexander Sulfaro	Tracking how task information persists in working memory	
	16:30	Qiyu Ren	Implicit auditory cueing under working memory load	
	16:45	John Cass	Stress, cognitive load, and perceptual capacity in Augmented Reality: Implications for adaptive human–system interfaces	
Visual Neuroscience Chair: Will Harrison	15:30	Laura Wang	Bayesian Orientation Biases in Human and Machine Vision	Stream 2 (303-G23)
	15:45	Rania Ezzo	Local orientation asymmetries in V1 depend on global context	
	16:00	Linzhi Tao	Overrepresentation of cardinal orientations in the middle layer of V1 suggests bottom-up priors	
	16:15	Erin Goddard	Neural origins of hue asymmetries	
	16:30	Daniele Scanzi	Reframing Prestimulus Occipital Alpha Activity Through an Event-Based Lens	
	16:45	Yuhua Zhang	Modeling Fixational Microsaccade Transient Motion in the Human Eye	
Sight and Health Chair: Michael-Paul Schallmo	15:30	Hsin-Yi Chao	Haptic Color Wheel as a Tactile Interface for Color Cognition and Artistic Participation in Individuals with Visual Impairment	Stream 3 (303-G01)
	15:45	Santani Teng	Representational dynamics of naturalistic text processing in blind braille readers	
	16:00	Carlie Gavin	Under the radar: The prevalence of echolocation use among the visually impaired	
	16:15	Julian Vail	Do anxious people see the world differently? The visual behaviours associated with general and social anxiety in virtual environments.	
	16:30	Branka Spehar	Sensory Processing Sensitivity and Perceptual and Affective Evaluations of Image Complexity	
	16:45	Anna Ma-Wyatt	Healthy ageing disrupts saccade sequencing during a model copying task.	
Reading and Word Recognition Chair: Erik Reichle	15:30	Lili Yu	Word- and Constituent-Frequency Effects in German Compound Reading: Implications for Language Generality and Specificity	Stream 4 (303-G02)
	15:45	Xin Yi Yap	Wrap-up effects in reading under Auditory Perceptual Simulation	
	16:00	Yi Dong	Translation Strategy and Reader Cognition: Effects of Foreignisation and Domestication on Character Representation	
	16:15	Roslyn Wong	Does prediction error in reading vary with task demands and across individuals?	
	16:30	Aaron Veldre	Limits on the Precision of Orthographic Prediction during Reading	
	16:45	Junjie Wu	Revisiting Language Switching Costs in Reading Comprehension: A High-Powered Replication Examining the Role of Word Concreteness	
APCV Keynote Lecture	17:00	Hakwan Lau	Prefrontal Mechanisms of Perception	Stream 1 (303-G20) & Overflow Stream 2 (303-G23)
	18:00	Student Prizes		
Conference Dinner	19:00	Buffet dinner in waterfront restaurant		
				The Wharfside Bar & Eatery



Posters I - 2 nd July 2026						
Presenter	Title	#		Presenter	Title	#
James Phillips	A signal detection analysis of “suicide” themed Search Engine Optimisation (SEO)	1		Parash Gyawali	Transient and sustained properties of the melanopsin spike train are evident in its enhancement of cone vision	26
Takahiko Horiuchi	Wavelength-Dependent Contribution of ipRGCs to the Luminance Pathway: A Psychophysical Study Using Metameric Stimulation	2		Yefei Liang	Subvocalization and Reading-Aloud Performance: Evidence from Comprehension and Eye Movements in Junior High School Students	27
Alana Topsfield	Examining real-life ToM in adolescence using the “Director Task”	3		Yalun Huang	Comparing Satisfaction-Based and Just-About-Right Scaling Methods for Sensory Attribute Diagnostics: Evidence from Coffee Consumer Research	28
Georgia Westfall	Dorsomedial Prefrontal Cortex Pathology and Goal-Directed Behaviour	4		Wei-kuang Liang	Revealing Rhythms of Attentional Sampling in Behavioral Data Using a Generalized Adaptive-Trend Analysis	29
Kieran J. Pang	Modulation of Shape Perception by Spatial Context	5		Dayanita Kannan	Effects of Haptic Feedback in a VR Sliding Task	30
Chloe Ryder	The Effect of Psychopathic Traits on the Would/Should Gap in Probability Discounting of Rewards	6		Dana L. Walker	Evaluating Lab-Acquired Face Familiarity using Event-Related Potentials	31
Kay Reid	Generalising Visuomotor Skill Learning in Virtual Reality	7		Daniel Joyce	Modelling perceptual colour structure for observer-specific display optimisation	32
Qian Qian	Temporal Dynamics and Adaptive Control in a Prime-Probe Task: A Distributional Analysis of Congruency Effects	8		Chia-Chen Yang	Evaluation the relationship between motion energy and body expression recognition	33
Ling Wah So	Hormonal Influences on Insomnia Across the Female Reproductive Lifespan	9		Reese Ducusin	Gamified Auditory-Cognitive Training for Mild Cognitive Impairment	34
Xinyu Chen	Walking reduces visual dominance in multisensory perception	10		Natasha Ke Ying Sia	Visual statistical learning and perceptual grouping: Cooperation or competition?	35
Yiran Ma	Visual Workload Reshapes Dynamic Trust Calibration in Human–AI Collaboration	11		Maya Mitsuoka	Influence of Display Device on Model-Based Estimation of Color-Matching Functions	36
Yu Nakajima	Spatial Regularities Preferentially Drive Distractor Suppression	12		Sheena Henderson	Are Ordinality Judgments Processed by a Common System?	37
Timothy Gastrell	Late Integration of Prior Expectations During Precision Weighted Perceptual Decisions	13		Huyen My Nguyen	Probing Domain-Specific and Domain-General Mechanisms of Face Recognition in Complex Visual Scenes	38
Shu-Ling Peng	Cognitive Appraisal and Epistemic Emotions: How Manipulating Motivational Beliefs Shapes Curiosity, Confusion, and Engagement	14		Yang Guang	Robustness of Adaptation-Like Dynamics in Recurrent Models of Visual Motion	39
Hiroshi Ashida	Rotating Snakes illusion before and after cataract removal: a single case study	15		Renèl Rodrigues	Eye-movement landings as an indicator for attentional bias	40
Thérèse Collins	Stimulus motion coherence and eye of presentation determine the strength of a repulsive history effect	16		Amaya Fox	Characterising EEG spectral activity following mild traumatic brain injury	41
Sania Zahra	Spectral Regulation of Ocular Growth and Retinal Function in the Chick Model	17		Bianca-Mihaela Preda	Modelling Brightness Perception Using Symbolic Regression	42
Max Hill	Cue-Based Modulation and Transfer of Cognitive Control Across Conflict Tasks	18		Kae Mukai	How Social Relationships Shape Interpersonal Body Synchrony	43
Peeraya Sripan	Investigation the Magnification Illusion in VR - Part II	19		Huang Yi-ruei	More Than Emotion: N400 Evidence for the Semantic Primacy of Moral Evaluation	44
Siew Kei Kho	Personality and Social Anxiety in Other-Race Face Recognition	20		Eriko Matsumoto	Attentional Suppression of Emotionally Salient Words: An Eye-Tracking Study	45
Kimihiro Yamanaka	Effects of Visual Presentation Methods on Drivers' Visual Search Behavior: Analysis of Eye–Head Coordination in Driving Simulators	21		Huan-Yu Pi	Quality Emerges from Structural Quantity: Optimizing Developmental Trajectory by Enhancing Internal Representation Capacity through Systematic Manipulation of Learning Experiences	46
Po-Sheng Huang	Preparing for an Uncertain Future: A Design Thinking Intervention for Creative Thinking on Social Problems	22		Kenta Matsuura	An investigation of the robustness of depth perception by motion parallax in peripheral vision against variety stimuli	47
Li Zhuoyang	The Effect of Auditory Rhythmic Patterns on Chinese Printed Word Segmentation	23		Yu Li	The Involvement of Parietal Cortex in First-Person Shooter Skill Learning	48
COMMUNITY NOTICE BOARD		25		COMMUNITY NOTICE BOARD		50



Posters II - 3 rd July 2026						
Presenter	Title	#		Presenter	Title	#
Ceren Ayyildiz	The effects of music and traffic noise on the vividness and content of mental imagery	1		Gene Tangtartharakul	The Geometry of Material Representation Across Vision, Language, and Action Models	26
Ella Mcleod	Understanding Perception and Anxiety	2		Jasmine Cooper	Investing the Effect of Response Options in Face Matching Tasks to Improve Human-algorithm Teaming Performance	27
Yin Tingting	Sound as a Tool for Focus: Why There Is No One-Size-Fits-All Soundtrack for Productivity	3		Bree Cavanaugh	Walking speed impacts attentional performance: evidence from a Navon task in wireless-VR	28
Zihe Wei	Selective Encoding of Human Faces in Peripheral Vision	4		Saoirse Connor Desai	Beliefs and Behavioural Intentions in Response to Health Misinformation	29
Lin Shi	A Open Source Time Course Synchronize Tool for Visual Psychophysics Experiments	5		Daniel Carragher	Investigating automation-assisted unfamiliar face matching performance over time	30
Yu Li	Subjective ratings of inter-talker similarity predict word reading ability in young adults	6		Haruyuki Kojima	Line Bisection Performance Bias in Virtual Reality Space	31
Yiya Chen	Critical Role of High Spatial Frequency in Adult Sensory Eye Dominance Plasticity	7		Te-Yi Hsieh	Fixation behavior during AI interface interaction predicts user satisfaction: evidence from a humanities knowledge discovery system	32
Yen-Ju Chen	Integration of visual attributes in spatial segmentation based on temporal asynchrony revealed by a noise masking paradigm	8		Junjie Wu	Neural Basis of Eye Movement Metrics in Natural Reading: A Fixation-Related fMRI Study	33
Hikari Takebayashi	Summary Statistical Perception in Daytime Traffic	9		Tara Rasmussen	Understanding the neurophysiological basis of mind wandering under different task demands: A drug and brain stimulation study	34
Hiroshi Ishikane	Spatial-scale-dependent surround modulation enhances receptive field center gain in frog retinal ganglion cells	10		Alexandra Nicholson-Brown	Individual Differences in Attentional Control and Epistemic Motivations	35
Yen-ju Feng	Investigating Memory Without Awareness: Neural Evidence for Unconscious Processing of Memory Retrieval	11		Simon Cropper	Time out of Mind: The role of modality, absence and change on the perception and metacognition of time	36
Yishu Sun	Confidence Reflects Boundary-Weighted Evidence in Perceptual Decision-Making	12		Ryohei Nakayama	Attractive aftereffect in mean orientation perception induced by motion trajectory adaptation	37
Akifumi Fukushima	Meaningful stimuli support binding in visual working memory, limited to younger participants	13		Lezhi Zhang	Comparing Human and AI Curiosity in 3D Object Exploration	38
Xin Yi Yap	The Role of Linguistic and Visual Word-Segmentation Cues in Chinese Reading	14		Guangsheng Liang	Narrowing attentional scope enhances eye-region sensitivity and reduces interference in face perception	39
Lindsay M. Peterson	Measuring suppression-related attenuation of stimulus information in binocular rivalry	15		Jamie Dracup (Presented by Andrea Wat-Si)	Cross-domain aversion to breaking a sweat: Evidence that people who avoid cognitive effort exercise less	40
Liang-Sheng Chang	Beyond Vision: Shared and Modality-Specific Mechanisms in Visual and Haptic Sound-Shape Correspondences	16		Kowa Koida	A Spectral Transmittance-Based Simulation of Color Trajectories: Implications for the Abney Effect and Unique hue	41
Lu Liu	The effects of contextual constraint, character-position frequency, and individual differences on Chinese word segmentation	17		Deborah Apthorp	Integrating Objective Measures in ADHD Assessment: Online Eye-Tracking and Continuous Performance Test	42
James Donohoe	Surveillance induces perceptual biases towards a more threatening stimulus	18		Xuehao Yang	A Portable Single-Camera Method to Quantify Lens-Zone Use in Myopia-Control Spectacles	43
Tz-Yu Chen	Gender Differences in Color Preference and Perceived Harmony	19		Irina-Maria Varzaru	Modulation of Central Brightness Perception by Peripheral Light Stimuli	44
Jinli Zhu	Linking Contrast Processing Deficits to Underlying Neural Property Changes in Amblyopia with a Biologically-Interpretable Model	20		Mizuki Takikawa	Phase-Dependent Melanopsin Responses in the Human Pupillary Light Reflex Vary with Temporal Frequency	45
Sameer Bhaila	Melanopsin increases spatiotemporal contrast sensitivity by reducing retinal noise and improving calculation efficiency	21		Li-Chuan Hsu	Caught by the Body: How Body Image Distortion Shapes Attention to Self- and Ideal-Referenced Body Cues	46
Ece Aksu-cortuk	Not All Failures Are Equal: How Failure Context Shapes Children's Responses to Parental Failure Mindsets	22		Shi-Yu Hsieh	Overestimation of Upper-Body Size Following Media Exposure Is Associated with Psychological Well-being in Men	47
COMMUNITY NOTICE BOARD		25		COMMUNITY NOTICE BOARD		50



Posters III - 4 th July 2026						
Presenter	Title	#		Presenter	Title	#
Christel Devue	Contextual salience modulates, but does not eliminate, the Other-Race Effect	1		Yijing Teng	Orientation Extrapolation in Humans and CNNs: A Fatigue-Based Account	26
Takahiko Horiuchi	Effects of Temporal Luminance Modulation on Depth Perception of Small-Field Light Sources	2		Nianzeng Zhong	Temporal Dynamics in Perceptual Decision-Making	27
Sarina Hui-Lin Chien	PI-26: A proposal for the 26 Items of Prosopagnosia Index for detecting developmental prosopagnosia in children	3		Henrik Kotaniemi	Investigating the breakdown of two-frame motion and disparity defined form as a function of horizontal and vertical displacements in random dot patterns	28
Jing Pan	Using gaze measures to differentiate surgeons' looking behaviors in laparoscopic cholecystectomy	4		Katsuki Nakashima	Neural representations underlying memory-based hand pre-shaping during virtual object interaction	29
Junxiang Luo	Hierarchical response profiles to optic flow patterns and speeds along the human dorsal visual stream: an fMRI study	5		Mizuki Mori	Effect of emotional arousal on visual search varies with set size	30
Zhifen He	Establishment of an Asthenopia Assessment System Integrating Multi-Dimensional Visual Function Indicators	6		You-Zhen Huang	Spatial Summation of Ensemble Perception	31
Michiteru Kitazaki	Obstacle-based physical plausibility modulates body ownership for an impossibly deformed arm in virtual reality	7		Kamilla Flem Mathisen	How Does Social Interaction Shape Peer Cooperation During Early Childhood?	32
Xiaowei Ruan	Modeling Visual Deficits in Amblyopia via Artificial Neural Network with Spike-Timing-Dependent Plasticity	8		Dian-Tsang Tsai	A Recurrent Neural Network Modeling Account to Children's Cognitive Development: The Role of Working Memory Constraints	33
Lidao Xu	Tracking Perceived Motion Paths in Apparent Motion Using SSVEP and Neural Decoding	9		Jinxiao Dai	Visual Cortical Modulation Underlies Eye Movement Reduction of Trauma-Related Intrusive Memories	34
Wenman Lin	Impact of Refractive Surgery on Interocular Correlation	10		Xiaofei Hu	Attention-mediated Binocular Integration: Restoring Stereopsis in Stereo-deficient Adults via Dichoptic Visual Search Training	35
Chuchen Zhang	Human Navigation in Virtual Spaces: Comparing: Euclidean and Non-Euclidean Geometries	11		Ling-Jia Hung	Context Matters: The Influence of Background Hue on Color Preference	36
Ryan King	Visual and haptic cues in goal-directed reaching across virtual and physical environments	12		Marjan Persuh	Testing the Richness of Visual Experience at Small Set Sizes	37
Rinkal Suwal	Slope of Lea symbols visual acuity psychometric functions in preschool children	13		Chih Ying Liao	Body Size Discrepancy and BMI in Attentional Orienting and Disengagement to Body Shape Cues	38
Pi-Chun Huang	Neural Correlates of Modality Compatibility in Crossmodal Task Switching Across Age	14		Chun-Wei Ma	Foveal Load and Environmental Complexity Affect Peripheral Perception: Eye Movement Evidence for Tunnel Vision in Driving	39
Yu-Sin Kuo	Effects of Depth Cues on the Perception of Second-Order Symmetry	15		Fumika Osumi	Effects of Reference-White Chromaticity on Color-Matching Functions in the Maxwell Method	40
Hira Nath Dahal	How can rods see in daylight?	16		Aiko Ogawa	Implicit Associations Between Color Categories and Basic Tastes: An IAT Study	41
Ayane Kusafuka	Development of looming-based depth judgment and its relation to ball-catching performance in children	17		Shahir Adha	The Impact of H.A.L.T. MAX Lens Technology and Spatial Frequency on Face Identification Contrast Thresholds	42
COMMUNITY NOTICE BOARD		25		COMMUNITY NOTICE BOARD		50

Keynote Lectures

David Badcock Early-Mid Career Plenary: Dr Corey Wadsley

Thursday, 2nd July 2026, 15:30-16:30

Stream 1 (303-G20) & Overflow Stream 2 (303-G23)

Stopping safely: Physiological underpinnings of response inhibition

Dr. Corey Wadsley
School of Exercise, Sport & Rehabilitation Sciences
University of Auckland

Meaningful interactions with our environment rely on both the ability to go and the capacity to stop. This keynote explores the physiological mechanisms that support human action preparation and inhibition across the lifespan, drawing on evidence from behavioural paradigms, electrophysiology, non-invasive brain stimulation, and neuroimaging. I first examine how physiological computations support action preparation in humans, highlighting how canonical principles from sensory systems such as gain modulation and functional tuning may extend to the motor system. I then consider the mechanisms that support stopping actions when they are no longer needed, focusing on recent proposals of a pause-then-retune framework of response inhibition. Finally, I outline future directions for understanding how the physiology of action preparation and stopping may generalise to real-world contexts such as driving. Together, this keynote aims to highlight the integrated nature of human action control across cognitive neuroscience.



Biography

Corey Wadsley investigates action preparation and stopping using behavioural testing, electrophysiology, non-invasive brain stimulation, and neuroimaging techniques. Corey completed his PhD in Exercise Sciences at the *University of Auckland* in 2023, where he examined the neural mechanisms underlying selective action stopping. He then undertook postdoctoral training in Human Physiology at the *University of Oregon*, focusing on the physiological computations that support goal-directed action preparation. Corey was recently awarded a *Mana Tūāpapa Future Leader Fellowship* from *Royal Society Te Apārangi*, through which he will examine how age-related changes in response inhibition impact action stopping in both conventional laboratory and simulated driving tasks. Through his research, he aims to improve driving safety and reduce road accidents in Aotearoa New Zealand.

Ross Day Plenary: Prof. Elaine Reese

Friday, 3rd July 2026, 17:00-18:00

Stream 1 (303-G20) & Overflow Stream 2 (303-G23)

Taking the Long Way: From Basic to Applied Science of Memory Development

Prof. Elaine Reese
Department of Psychology
University of Otago

Elaine's research began with basic science questions about young children's autobiographical memory development. Through longitudinal studies in the U.S. and Aotearoa New Zealand, she and her colleagues found that parents' reminiscing styles were linked to children's memory, language, and socioemotional skills. In response, she began another line of research addressing applied questions of how parents and teachers can support children's development through their everyday conversations. Elaine will share her path from basic to applied science and some lessons learned along the way.



Biography

Elaine has conducted longitudinal research on children's and adolescents' memory development for over 35 years. She led the early education domain of *Growing Up in New Zealand* and is currently leading Kia Tīmata Pai (Best Start), an early childhood intervention trial. She has served as editor of the *Journal of Cognition and Development*. Her books include *Tell Me a Story: Sharing Stories to Enrich Your Child's World* (OUP, 2013) and *How Stories Change Us: A Developmental Science of Stories from Fiction and Real Life* (OUP, 2024). Elaine is a fellow of the Royal Society Te Apārangi.

APCV Keynote Lecture: Prof. Hakwan Lau

Saturday, 4th July 2026, 17:00-18:00

Stream 1 (303-G20) & Overflow Stream 2 (303-G23)

Human Perception is Rich and Compelling

Prof. Hakwan Lau
Institute for Basic Research
Sungkyunkwan University
South Korea

Perception is typically rich. Experiencing it first hand gives us much more information than words can convey. It is also compelling, in that we have a strong and automatic tendency to believe what we perceive. Richness can be studied using similarity judgments. Some criticize these judgments as entirely subjective and arbitrary, but we show that they are grounded in an individual's psychophysical sensitivities. The relevant information can be found in early sensory cortices, as expected. But it can also be read out from higher cognitive areas such as the lateral prefrontal cortex. These areas lack clear homologues in rodents. They support mechanisms for implicit metacognition, which may underlie the compellingness of perception. Arguably, both richness and compellingness are essential features of subjective experience. Compellingness may be especially important for understanding an agent's capacity for suffering. Future work in computational modeling of compelling perception may help address current limitations in discussions of consciousness in AI and animals.



Biography

Hakwan Lau is a cognitive neuroscientist whose work bridges psychology, neuroscience, and philosophy to investigate the nature of consciousness and metacognition. He received his D.Phil. in Experimental Psychology from the *University of Oxford* as a Rhodes Scholar, and has worked at *University College London*, *Columbia University*, *UCLA*, the *University of Hong Kong*, and the *RIKEN Center for Brain Science*. He is currently Co-Director of the *Center for Neuroscience Imaging Research* at the *Institute for Basic Science* at *Sungkyunkwan University* in South Korea. His past research combines neuroimaging, computational modeling, and experimental methods to uncover how the brain supports subjective experience and self-awareness, themes developed further in his book *In Consciousness We Trust*. More recently, he has developed an interest in furthering our understanding of human prefrontal cortex.

Satellite Events

Public Lecture: Prof. Gina Grimshaw

Thursday, 2nd July 2026, 18:00-19:00

Stream 3 (303-G01)

Thinking with your head AND your heart: Emotions as core functions of mind



Prof. Gina Grimshaw

Victoria University of Wellington

Conventional wisdom often pits emotion against reason – thinking with your heart instead of your head. But this couldn't be further from the truth. Emotions guide our attention, enhance our memories, foster human connection, and help us make good decisions. Drawing on historical perspectives, philosophy of mind, and the latest advances in neuroscience, Professor Grimshaw will show the many ways that emotions are an integral part of a healthy mind.

This lecture is open to the public and free to attend. But please register for the event [here](#).

Synaesthesia Science & Community Forum

Raewyn Turner, Independent Artist
Carol J. Steen, Touro University & American
Synesthesia Association
Anton Sidoroff-Dorso, Macquarie University

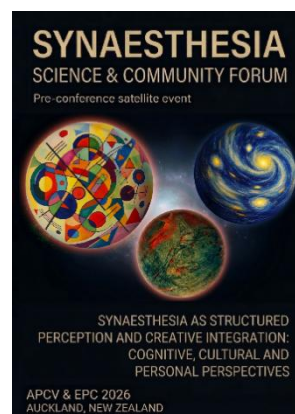
Wednesday, 1st July 2026, 12:00-15:15

Stream 1 (302-G20)

Synaesthesia as Structured Perception and Creative Integration: Cognitive, Cultural and Personal Perspectives

Noam Sagiv, Brunel University of London
Anina Rich, Macquarie University
Patrick Shepherd, University of Canterbury
Brian Boyd, University of Auckland

What happens when music has colour, or letters carry taste? Synaesthesia, where one sense automatically and consistently triggers another, is a stable, measurable neurocognitive trait shared by an estimated 4% of the population. In Aotearoa New Zealand alone, that is roughly the population of Wellington. And yet it has long been



associated with artists, musicians, and writers. That connection is no coincidence. Research now shows that synaesthetic mappings are systematically shaped by categorical, semantic, and structural principles, and that people with synaesthesia display distinctive perceptual profiles and heightened involvement in creative fields. The blended senses don't just colour experience, they reveal something fundamental about how the brain organises perception, meaning, and imagination.

This pre-conference satellite event brings together leading and emerging researchers to examine synaesthesia from converging perspectives in cognitive neuroscience, sensory psychology, phenomenology, and cultural psychology, including long-term qualitative and mixed-methods research on how synaesthesia shapes lived experience, memory, artistic practice, and environmental interpretation.

Six talks progress from large-scale questions of consciousness and cross-modal perceptual organisation through lived, creative, and cultural dimensions of synaesthetic experience, closing with a formal semiotic-neurocognitive model of synaesthetic meaning-making (Sidoroff-Dorso). A final 20–25 minute discussion will synthesise findings, address research challenges, and outline directions for future work.

Whether you are a researcher, a student, or simply fascinated by the mind, this session offers fresh insight into one of perception's most compelling phenomena: how differently we can all experience the same world. This event is open to the public but please register [here](#).

Talk 1: Synaesthesia as a Model-Problem for the Scientific Study of Consciousness.

Noam Sagiv

Dr. Sagiv will take a cognitive–neuroscience perspective on synaesthesia and its place in the scientific study of consciousness. He will outline how synaesthesia contributes to the scientific study of consciousness offering a novel perspective and research data to inform theoretical discussions on the nature of consciousness. This includes the issues of cross-modal interactions, individual differences in perception, the neural correlates of consciousness, perception of the self and others, and the nature of perception itself (perceptions as hypotheses), and the relationship between veridical perception, hallucinations, and voluntary mental imagery. Finally, he will briefly address the question whether synaesthesia is merely a peculiar aberration or perhaps an enhancement that serves useful cognitive functions.

Talk 2: Synaesthesia: A Cognitive Neuroscience Perspective

Anina Rich

Professor Anina Rich will also focus on synaesthesia from a cognitive neuroscience perspective. Synaesthesia has long captured the imagination and interest of scientists, artists, and the public alike. With modern cognitive neuroscience, we have begun to unravel the complexities of this fascinating phenomenon, taking it from the realm of subjective descriptions through to objective behavioural indices and underlying neural representations. Focusing primarily on grapheme–colour synaesthesia, where letters and digits elicit involuntary consistent experiences of colour, in her talk Professor Rich will give an overview of a recent study testing major theories of synaesthesia, and how understanding synaesthesia might inform our understanding of perception in general.

Talk 3: Synaesthesia as Lived Practice: Phenomenology, Culture, and Creativity

Patrick Shepherd

Drawing on two decades of research in Aotearoa New Zealand, Dr Shepherd will explore synaesthesia as both a stable neurocognitive phenomenon and a lived, culturally shaped experience. He will examine how synaesthetes understand and use their experiences in daily life. Using behavioural verification, interviews, and phenomenological analysis, he will demonstrate how synaesthesia functions as both a cognitive resource and a perceptual challenge in artistic and educational contexts. His talk will consider the long-standing question of synaesthesia and creativity, historically linked to figures such as Kandinsky and Messiaen. By integrating empirical, cultural, and phenomenological insights, this presentation positions synaesthesia as a fertile model for understanding how perceptual systems scaffold higher cognition in education and the Arts.

Talk 4: Synaesthesia, Sensory Acuity, and the Nabokov Family

Brian Boyd

Distinguished Professor Brian Boyd will introduce Vladimir Nabokov (1899–1977), the renowned Russian-American novelist and poet, as a compelling case study of synaesthesia in a highly creative individual and within his immediate family. He will explore how Nabokov's well-documented grapheme–colour synaesthesia, along with that of his mother, wife, and son, intertwined with his extraordinary visual acuity and colour sensitivity. Boyd will examine the ways in which these cross-

modal experiences may have shaped Nabokov's distinctive perceptual style, memory, and artistic imagination.

Talk 5: Synaesthesia, Multisensory Art, and Environmental Perception (provisional title)

Raewyn Turner

This talk draws on Raewyn Turner's artistic practice since 1975, using synaesthesia and scientific theory to explore human sense-making in complex technological and ecological environments. Working across painting, performance, lighting, video, and olfaction, she has translated cross-modal experiences into large-scale performances, multisensory concerts, and workshops. Through collaborations with scientific institutions, other artists and musicians, Turner examines synaesthesia as both creative resource and investigative tool. She will reflect on how cross-modal perception informs environmental awareness and multisensory design practice.

Talk 6: When Perception Becomes Imagery

Carol J. Steen

What happens when perception itself becomes a source of imagery? Many artists who experience synaesthesia draw on it in their creative work—whether they know the name for it or not. What is it like to create as a synaesthetic artist? Does learning about synaesthesia change the way an artist works? And when perceptions behave differently, do the usual rules of art begin to shift—or even break? This talk explores how synaesthetic perceptions can shape artistic practice and asks whether traces of possible synaesthesia might be detected in artworks—even when the artist never identified as synaesthetic during their lifetime.

Talk 7: Seven Questions about Synaesthesia: Colours, Inducers, and Higher-Order Conceptual Systems

Anton Sidoroff-Dorso

What makes synaesthetic colours unique, where do they come from, and what do they reveal about the mind? Sidoroff-Dorso's talk works through seven questions drawn from years of interdisciplinary research in psychology, linguistics and anthropology. Cross-linguistic evidence shows that synaesthetes share a near-universal palette; larger trigger alphabets modify the palette saturation but not its brightness or vividness. Synaesthesia inducers themselves are culturally constructed sign systems that require conceptual mastery, such as language, music, mathematics, calendars, and so on, through which humans structure reality ('semiotic systems').

How can synaesthesia be measured? And is synaesthesia different in non-western settings such as Kenya? Answers to these questions extend the picture across cultures and cognition.

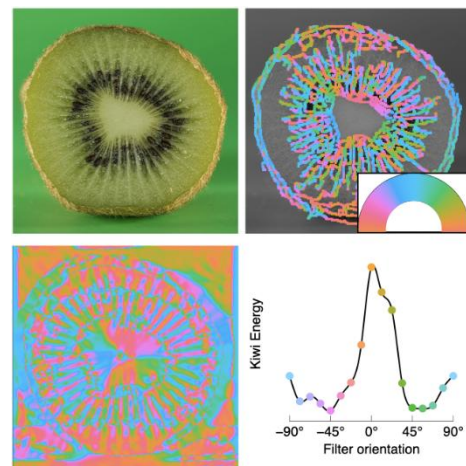
Image Processing Workshop

Wednesday, 1st July 2026, 12:00-15:30

Computer Lab (302-G40)

Understanding the Stimulus: Image Processing Foundations for Visual Cognition

*William Harrison, University of the Sunshine Coast
Reuben Rideaux, University of Sydney*



This hands-on workshop introduces the foundational image processing concepts that underpin both biological vision and contemporary computational models. Decades of research in vision science and neuroscience have established that perception is strongly shaped by the statistical structure of natural environments. Rather than thinking of an image as a collection of millions of pixels, therefore, we can instead think of it in the same currency used by the human visual system: patterns of contrast that vary across space and time. These ideas remain central to understanding visual cognition today. In this workshop, we will introduce attendees to classic image analysis techniques, and associated visual cognitive theory, with worked examples in MATLAB and Python.

In the first part, we will briefly contextualise state of the art computational knowledge within the last century of (vision) science history: what were the experiments, results, and theories that form the basis for much of modern vision research? Participants will then learn how to measure and visualise core image statistics using tools such as Fourier transforms and Gabor filtering, and how these analyses are closely linked to the tuning properties of neurons in early visual cortex. Emphasis is placed on developing intuition for how simple image manipulations relate to perceptual and neural responses.

The second part of the workshop shows how these simple techniques can be built upon using more modern machine learning tools. Using simple neural network examples, we illustrate how sensitivity to motion and other dynamic properties can emerge from computations over image sequences, and how these models can help to explain established neurophysiological findings. Rather than treating modern networks as disconnected from earlier approaches, the workshop highlights continuity between classical image processing, neural coding, perception, and contemporary modelling.

Throughout, the emphasis is on transferable skills and conceptual understanding. Participants will gain hands on experience with widely used analysis techniques, an appreciation of their historical role in vision science, and a clearer sense of how fundamental image statistics continue to shape models of visual cognition. While the workshop is aimed at people with experience in MATLAB and Python, all attendees can expect to benefit from the conceptual and theoretical aspects of the workshop.

Early Career Panel Discussion

Wednesday, 1st July 2026, 15:30-17:00

Stream 1 (303-G20)



What next? Navigating academia and industry as an early-career researcher in psychology

Join us for a pre-conference panel discussion on 1 July prior to the Welcome Ceremony. We will explore the challenges, opportunities, and strategies involved in answering the question “what next?” as an early-career researcher in the psychological sciences. Panellists spanning career stages from postdoctoral researchers to professors will share how they have navigated—or are currently navigating—key decisions and transitions. Topics will include evaluating postdoctoral opportunities, writing grants, weighing the pros and cons of academia versus industry, and between research versus teaching-oriented roles, and managing the uncertainties along the way.

Chair:

Courtney Hilton (University of Melbourne)

Panellists:

Corey Wadsley (University of Auckland)
 Saoirse Desai (University of Technology Sydney)
 William Ngiam (University of Adelaide)
 Rachel Searston (University of Adelaide)
 Gina Grimshaw (Victoria University of Wellington)

Member-initiated Symposia

All symposia will be held in the Stream 1 lecture hall (303-G20),
in parallel with regular talk sessions in the other streams.

The timing of symposia is somewhat flexible so please refer to
the schedule for the exact timing of individual talks.

Symposium 1- Gaze perception: eye movements as social signals

William G. Hayward, Lingnan University
M. Catherine Macpherson, Macquarie University
Colin J. Palmer, National University of Singapore
Lindsay M. Peterson, UNSW Sydney

The movement of our eyes is a powerful social signal that facilitates social and cognitive processes. Patterns of gaze direction can provide insight into another person's mental state and the focus of their attention and play a key role in how we communicate and understand other people. This symposium surveys recent work investigating gaze behaviour, both in terms of what influences where we direct our own gaze as well as how we interpret the gaze of others. In the first talk, Prof. Will Hayward will discuss how idiosyncratic eye movements relate to differences in face processing. In the second talk, Dr. Cathy Macpherson will discuss how our gaze patterns influence the degree to which we coordinate our behaviours with others. The third talk from Dr. Colin Palmer focuses on perceptual learning in gaze perception. In the final talk, Dr. Lindsay Peterson will discuss how we perceive the dynamics of other people's gaze behaviour.

Talk 1: How do idiosyncratic eye-movements affect face processing?

Will Hayward

The human face is a highly reliable physical structure, yet different individuals show distinct patterns of eye-movements when extracting information from it. In particular, some individuals focus initial fixations on the eyes and other upper regions of the face, whereas others fixate more on the nose and mouth (lower regions). In a series of studies, we have sought to understand the cognitive and neural differences that can be observed between individuals with differing fixation patterns. We have found that upper-

focused individuals show position sensitivity in the composite face effect, suggesting differences in the strength of holistic face processing across changes in fixation position, whereas lower-focused individuals showed invariance in holistic processing across position. Further, when identifying a face, upper-focused individuals show a reduced face-specific N170 ERP-component when fixating away from their preferred fixation location. Taken together, these results suggest that differing eye-movement patterns are associated with differences in position-specificity of perceptual face processing.

Talk 2: Investigating the influence of visual attention on interpersonal coordination

Cathy Macpherson

Interpersonal coordination is fundamental to social interaction. Prominent theoretical models suggest that coordination depends on how people attend to others. Relevant empirical support, however, is primarily drawn from experimental tasks conducted in minimally social contexts. To better understand the mechanisms that sustain real-time social interaction, we conducted two experiments in virtual reality that examined how patterns of social vision shape interpersonal coordination. Study 1 manipulated the attentional focus of participants (self vs other) and their virtual partner (direct vs averted gaze). Visual attention directed towards the virtual partner predicted greater coordination, but only when the partner's gaze was averted. Study 2 examined whether the reliability of a partner's gaze cues in combination with individual differences in social anxiety shapes coordination. Invalid gaze cues diminished coordination – an effect amplified by higher levels of social anxiety. Together, these findings show that patterns of visual attention shape interpersonal coordination in socially meaningful settings.

Talk 3: Perceptual learning in gaze perception

Colin Palmer



Gaze direction is a fundamental visual cue in social interactions, providing insight to the inner thoughts of other people by revealing the focus of their attention. Correspondingly, sensitivity to other people's gaze direction is a key social-cognitive milestone in early development, yet individual differences in gaze perception occur and persist in adulthood. The current study investigated the experience-dependent plasticity of visual mechanisms underlying gaze perception in adulthood. Twenty neurotypical adults each completed 10 daily sessions in which they practiced discriminating the horizontal gaze direction of consecutively presented faces, controlled by an adaptive algorithm that tailored task difficulty to individual performance on a trial-by-trial basis. Training led to significant improvement in gaze discrimination thresholds that generalised to novel faces and untrained locations in the visual field. Most strikingly, in almost all participants tested, gaze discrimination training led to substantial changes in the "cone of direct gaze" – the range of gaze directions perceived as looking at oneself – even though this wasn't trained directly. A psychophysical model of gaze categorisation was fit to individual subject data to examine how underlying sensory processes adapt during training. Results suggest that training benefits arise from both reducing the internal noise of sensory representations and modifying the self-referential categorisation of gaze direction. These results demonstrate the experience-dependent plasticity of visual processes underlying gaze perception and the potential utility of perceptual training for enhancing sensitivity to social-communicative cues in adulthood.

Talk 4: The perception of dynamic gaze behaviour

Lindsay Peterson

Perceiving and interpreting the gaze of other people is a crucial part of social communication. In two studies, we explore how observers perceive the dynamics of other people's gaze behaviour. Study 1 examines whether people can be recognised from their idiosyncratic gaze behaviour. We find that a person's dynamic gaze behaviours can inform how others recognise them, expanding current understanding of the visual cues that contribute to identity recognition. Study 2 focuses how observers perceive the dynamics of other people's gaze behaviour in relation to their shared visual environment. We find that observers have expectations for how another person should direct their gaze while in a particular environment. Observers also expect others to direct their

attention towards visual features of the environment that attract our own attention, such as a colourful object or a face. This research highlights the critical role that gaze behaviour—both our own and others—has in social interactions.

Symposium 2- Current Applications of Virtual Reality within Cognitive Science

Katherine Storrs, University of Auckland
Donald Degraen, University of Canterbury
David Carmel, Victoria University of Wellington
Christopher Erb, University of Auckland
Gina Grimshaw, Victoria University of Wellington

Current Applications of Virtual Reality within Cognitive Science The quality and accessibility of Virtual Reality systems has increased dramatically in the last 5 years, presenting new opportunities for cognitive science research. This symposium features five presentations highlighting recent applications of VR to the study of visual and haptic perception, action, cognition, and emotion.

Talk 1: A Surprisingly Robust Visual Illusion in Virtual Reality

Katherine Storrs

In Virtual Reality, like in the real world, we can move ourselves and other objects in order to better understand what we're looking at. One might expect, then, that visual illusions requiring carefully contrived viewpoints or illuminations, which work well on static two-dimensional computer screens, would be reduced in this richer environment. We used VR to explore an illusion in which perfectly matte surfaces can look glossy if lit by a close frontoparallel light source (Wijntjes & Pont, 2010). Across three experiments we explored the effect of surface shape, stereoptic cues, motion, lighting, and display resolution on the perception of this illusion. To our surprise, participants robustly continued to mis-perceive surface gloss even when interacting with test objects. Observers do not, in this case, optimally use the available visual information.

Talk 2: Feels Like a Hairy Mirror: Designing Haptic Sensations for Investigating Multisensory Perception in Virtual Reality



Donald Degraen

Virtual Reality (VR) is powerful for studying multisensory integration as it enables precise control over individual stimuli. Early work in Human–Computer Interaction (HCI) investigated congruent visual and haptic cues to enhance users' sense of presence and realism, while recent research shifted toward deliberately mismatching sensory signals to shape perceptual experiences. In this talk, I present how haptic feedback in VR can be designed to study perceptual phenomena that are challenging or impossible to investigate in the real world. Through a series of user studies, I discuss how digital fabrication and computational design support investigations of material and texture perception, and how vibrotactile feedback can build on cross-modal correspondences to enable sensory substitution. The intersection of HCI and experimental psychology offers mutual benefits: existing software frameworks offer precise control over multisensory stimuli to build theoretical frameworks for understanding complex perceptual processes.

Talk 3: Using a VR Game to Investigate Visuomotor Skill Acquisition

David Carmel

Daily life involves skilled visuomotor activities: driving, playing ball games, or even making coffee require coordinated movements that are continuously adjusted using sensory feedback. As we improve in such tasks, are we learning a general skill or just stereotyped action sequences (or a bit of both – learning to do a single thing also confers skill)? To investigate this, we have been using Beat Sabre, a popular VR game requiring bimanual movements at specific times and angles to the rhythm of songs. We train players on one song and then test them on another; we also assess a range of relevant cognitive functions before and after training, to examine whether they are improved by (or predict) beat sabre improvement. Findings to date indicate that about two thirds of beat sabre improvement is due to general skill acquisition, and that this skill arises through the integration of multiple cognitive functions.

Talk 4: Enhancing the Reliability of the Attentional Network Test with Hand and Eye Tracking in VR

Christopher D. Erb

The Attention Network Test (ANT) has been widely used to investigate how attentional functioning differs across individuals, develops over the lifespan, and is impacted by high incidence disorders such as ADHD. However, longstanding

concerns remain regarding the reliability of the test to detect stable differences in the functioning of the alerting, orienting, and executive networks. In this study, we used Virtual Reality to record participants' hand and eye movements as they performed a modified ANT in an immersive virtual environment. Results from 74 adult participants demonstrate that hand and eye measures of the alerting and orienting network provide substantially improved reliability relative to traditional tasks (split-half reliabilities $> .75$), while hand measures provide excellent reliability across most indices (split-half reliabilities $> .90$). These results indicate that hand and eye tracking in VR presents a promising path to improving the richness and reliability of research in behavioural psychology.

Talk 5: Cognitive Control in Emotional States: Insights from Virtual Reality

Gina Grimshaw

Emotions aren't just feelings; they influence how we prioritise perceptual information, encode memories, communicate with others, and make decisions in service of goals. These processes are all targets of cognitive control. Unfortunately, most research on the interactions of emotion and cognitive control are conducted in sterile laboratory environments where participants often view pictures or films meant to evoke emotional processing. These are hardly situations in which people can feel authentic emotions. Virtual Reality allows us to conduct experimental studies on cognitive control while participants are immersed in compelling emotion-inducing environments. In our experiments, participants walk a "virtual plank" - a simulation that induces strong subjective, physiological, and behavioural fear responses. Our findings show that inhibitory control is surprisingly robust in the face of fear, but performance on more complex tasks is impaired. Virtual reality provides a novel paradigm for advancing study of complex interactions between emotion and cognition.

Symposium 3- Imagined Sensations

Loren Bouyer, University of Queensland
Anthony Lambert, University of Auckland
Amelia X. Yu, University of Auckland
Alexander Sulfaro, Macquarie University

Discussant: *Derek H. Arnold*, University of Queensland

In this symposium, we will present work documenting contemporary understanding of individual differences in people's experiences of imagined sensations, inclusive of evidence of people who cannot have imagined audio sensations (Anauralia) or visualise (Aphantasia). In addition to presenting evidence for these differences, a key focus of the symposium will be to discuss ongoing challenges to the scientific investigation of imagined sensations.

Talk 1: Anauralia and aphantasia: Reflecting on similarities and differences

Anthony J. Lambert

In this talk I will reflect on relationships between auditory and visual imagery. Self-reports of imagery across different modalities are strongly associated: Most people with vivid auditory imagery also report vivid visual imagery and about half of those who experience complete absence of auditory imagery (anauralia) also experience complete absence of visual imagery (aphantasia). When anauralics and those who experience typical auditory imagery carry out a range of tasks assessing musical and auditory-verbal working memory, closely similar patterns of performance are seen. This echoes the broadly similar performance of aphantasics and typical imagers on a range of visual working memory tasks. Despite these parallels, several dissociations are also apparent. Anauralia but not aphantasia is associated with higher conscientiousness, greater mindfulness, less inattention and lower hyperactivity. Aphantasia but not anauralia is associated with increased perfectionism, psychological distress and difficulties with autobiographical memory. Implications of these similarities and differences will be discussed in light of the distinct roles of vision and audition in psychological functioning.

Talk 2: When Visual Mental Imagery isn't Perceptual

Amelia X. Yu & D. Samuel Schwarzkopf

Mental imagery varies widely across individuals and is usually measured using subjective vividness reports. Our recent work suggests that vividness judgements do not fully capture the experience of mental imagery. While some individuals report highly vivid mental representations without the sensation of actually seeing them, others report visually experienced imagery (with closed eyes or as projections in the external space). These findings suggest that imagery is multidimensional and comprises several partially dissociable components.

How do these dimensions modulate real perception? Previous research demonstrated that imagined stimuli prime what participants subsequently perceive in binocular rivalry. In three experiments, we found such priming generalises to other forms of perceptual rivalry, specifically the face-vase illusion. However, we found no strong relationship with either subjective vividness or the experience of seeing the mental image. This suggests that priming in ambiguous stimulus perception might be driven by decision bias rather than perceptual modulation.

Talk 3: Autism and Aphantasia

Loren N. Bouyer & Derek H. Arnold

Visual Aphantasia has been reported to be more prevalent in autistic populations. However, the strength of the link between imagination saliency and Autism might have been overstated. The operationalisation of Autism in empirical studies typically encompassed imagination as a criterion, and this might have driven the relationship between Autism and Aphantasia. We have addressed this issue across two studies. The first study did not find a robust relationship between visual imagination saliency and the expression of autistic traits within a sample of the general population. In our second study, we recruited a sample of participants who self-reported having a formal diagnosis of autism. Visual Aphantasia was also not more prevalent in the Autistic group than the non-Autistic group. However, we did find that Autistic individuals reported having less salient imagined sensations in general, inclusive of imagined visual sensations, in comparison to a non-Autistic group. Moreover, a greater proportion of the Autistic group reported an inability to have imagined sensations of smell and of taste. These associations were primarily driven by questions directly relating to people's ability to have imagined sensations, but also by questions relating to non-verbal communication. Overall, our data suggest associations between Autism and multisensory Aphantasia are weak. Our data does, however, suggest that poor face processing skills are common to both Autism and to Aphantasia, and that difficulty in non-verbal communication might bring about a weak shared association between multisensory Aphantasia and Autism.

Talk 4: What does it mean to "see" a mental image?

Alexander Sulfaro

Experiencing a mental image is not quite like perceiving an external image, nor like perceiving nothing at all. Yet, a concrete description of what it actually means to "see" a mental image has eluded researchers for decades, making it impossible to

validly identify individuals who are incapable of imagery (aphantasics) because there is no consensus on what exactly they are rejecting. Although mental imagery's ethereal appearance is frequently equated to that of an external image with coarse low-level features (e.g., blurry, dim, desaturated), this talk discusses reasons why this cannot be the case, and why neural correlations cannot (yet) solve the problem of aphantasia identification. Instead, a candidate for typical imagery is proposed that may demystify mental imagery's ethereal appearance by defining it in terms of reliably induced components of other common perceptual experiences. The proposed candidate seems to resolve why mental imagery is preserved in cortically blind individuals, why it affects fusiform regions far more than primary visual regions, and why it has been so difficult to precisely describe for so long. This account also shows how it would be reasonable for two individuals to describe the exact same imagery experience in polar-opposite ways, and I show evidence that such confusions are actively confounding aphantasia identification on a large scale within the community right now.

Symposium 4- Attending to and being distracted by threats

Andrea Wat-Si & Steven Most, University of New South Wales

Nicole Nelson, University of Queensland

Melanie Takarangi, Flinders University

Hedwig Eisenbarth, Victoria University of Wellington

Navigating the world with numerous visual and other stimulation around us requires an ability to discern relevant from irrelevant cues, the ability to switch attention or focus. Just focus on working at a laptop in a café with other people around, emails coming can be possible but challenging, but if there is someone at the next table breaking into tears, some of us might switch attention to them. This symposium covers a range of studies that use experimental tasks to investigate when and how our attentional systems manage to keep us on task and when they provide necessary flexibility.

Andrea Wat-Si and Steven Most will present a study on the effect of experience in negative emotional content on emotion-induced blindness. Nicole Nelson will present a study comparing adults' and

children's attention to violent scenes. Melanie Takarangi will present a study testing the effect of content warnings on attention. Finally, Hedwig Eisenbarth will present a series of studies using central and peripheral positive and negative distractors to illustrate how psychopathic personality traits moderate distraction by emotional stimuli.

Together, the set of talks will highlight in which cases emotional cues receive preference in processing and in which cases they don't describing the boundaries of "emotional salience".

Talk 1: Does experience blunt perceptual disruption caused by emotional images?

Andrea Wat-Si & Steven B. Most

Emotional stimuli are so prioritised by our visual system that they often blind us to other things we are looking right at. This robustly replicated effect is known as emotion-induced blindness. Most studies of emotion-induced blindness focus on its significance for theoretical understanding of interactions between emotion, attention, and perception. However, it may have practical and legal ramifications as well. For example, when police question eyewitnesses of a traumatic event, are some people more likely than others to have been "blinded" by the emotional details? What if one eyewitness is accustomed to graphic imagery whereas another is not? We tested this by recruiting participants who watched clips from the horror movie franchise, *Saw*, before a set of emotion-induced blindness trials — some watched a selection of graphic clips that the franchise is known for, whereas others watched a selection of mundane conversations from the franchise. We compare and contrast the findings from this study with other findings from our lab on the role of experience in shaping people's experience of emotion-induced blindness.

Talk 2: Children's Visual Attention to Violence

Nicole Nelson & Caitlin Millward

This study compares adults' ($n = 33$) and children's (7-8-year-olds; $n = 37$) visual attention to a variety of emotional scenes in which characters make physical contact with each other. Some contact was violent (i.e. initiated in anger) and some contact was non-violent (happy, sad, or scared). Like adults, children attended to faces more when contact was violent vs. non-violent. In addition, children attended most to the character initiating the physical contact during happy and sad scenes, but attended more to the

character receiving the physical contact during angry and fearful scenes.

Talk 3: Do Sensitive Content Warnings Capture Attention?

Melanie Takarangi, Isabella Anestopoulos, Victoria Bridgland, Sasha Cox, Ella Moeck, & Lucy Matson

Growing evidence suggests that the sensitive content screen warnings media platforms use to protect users from potentially distressing content do not mitigate the impact of viewing such content. However, the mechanisms underlying warnings' limited effectiveness remain unclear. One possibility is that warnings increase people's attention to the content they precede. To test this possibility, we had participants view positive, neutral, and negative images in an Instagram style format; half of the negative images were preceded by a sensitive content warning (warned images) and half by a control screen (unwarned images). We measured attention using a Line Discrimination Task, where slower response times indicated greater attentional engagement. We found mixed support for our prediction that warnings would make disengagement from negative images more difficult: overall, there was no significant difference in attention to warned vs. unwarned images. However, warnings initially slowed responses to negative images, an increase in attentional engagement that diminished over time. These findings indicate that while warning screens do not consistently heighten attention to negative content, they may do so under specific conditions. These data have implications for platforms that use such warnings: although intended to protect users from distress, warnings may subtly alter how users engage with content.

Talk 4: Emotional content distracts us from (boring) tasks- but not those high on psychopathy

Hedwig Eisenbarth, Kasia Kuczaj, Evie Cleland & Gina Grimshaw

Humans are good at focusing on a primary motivated task, but this can be easily and transiently disrupted when distractors of significant emotional content - either positive or negative - appear occasionally. Given the current debate about the role of emotion, attention and motivation for psychopathic personality, emotional distraction paradigms would be able to disentangle some of these factors. Across three studies, we implemented a cognitive control task with central distractors and an emotion induced blindness task, in University-based samples varying in self-reported psychopathic traits to explore how emotional distraction varies with different factors of psychopathy. Fearless

dominance, but not other psychopathic traits, were associated with reduced distraction and reduced blinding by negative images. These results point to an emotion specific attention reduction and clarify the emotion processing differences that are seen in psychopathy.

Symposium 5- XR in Multisensory Perception

*Peter Wagner, UNSW Sydney
Zhanna Sarsenbayeva, University of Sydney
Kenzo Sakurai, Tohoku Gakuin University
Takayoshi Hagiwara, National Institute of Technology, Nagano College*

*Chair: Harin Hapuarachchi, Kochi University of Technology
Co-Chair: Juno Kim, UNSW Sydney*

This symposium highlights how Extended Reality (XR) technologies are advancing vision and perception research by enabling controlled yet highly immersive experimental environments. By integrating XR with behavioral, physiological, and interaction-based methods, researchers can investigate perception and action in situations that are difficult or impossible to reproduce using conventional laboratory paradigms. The first speaker, Dr. Peter Wagner will introduce recent progress in visual-vestibular integration in Virtual Reality (VR), ranging from vection and perception to cybersickness mechanisms, including approaches involving galvanic vestibular stimulation (GVS). The second talk by Dr. Zhanna Sarsenbayeva will focus on human factors in XR, discussing perception-action relationships in usability tasks involving Mixed Reality (MR) and VR. The third speaker, Prof. Sakurai will discuss how VR is no longer an emerging technology, but a valuable new tool for every day applications in everyday society and perceptual psychology. Final speaker, Dr. Takayoshi Hagiwara will introduce a novel concept of fused body augmentation, addressing the possibility of body fusion among multiple people through virtual co-embodiment in VR and robotics, offering new insights into embodiment and multisensory self-representation. Together, these talks and discussions will showcase the expanding role of XR as a scientific tool for studying multisensory integration, spatial perception, human factors and

embodiment. The symposium aims to stimulate ideas on how XR-based experimental frameworks can open new directions in psychophysics and behavioral research, while also informing the design of safer, more effective immersive systems.

Talk 1: Visual-Vestibular Integration in Virtual Reality: From Vection to Cybersickness

Peter Wagner

Immersive virtual reality (VR) provides a unique platform for investigating how the brain integrates visual and vestibular signals to construct a coherent sense of self-motion. In head-mounted displays, visual motion cues can be precisely controlled, yet vestibular input is often absent or incongruent. Traditional sensory conflict accounts propose that such mismatches directly give rise to cybersickness. However, accumulating evidence suggests that the relationship between visual–vestibular interaction, vection, and discomfort is more nuanced. In this talk, I explore how galvanic vestibular stimulation (GVS) can be used as an experimental tool to systematically manipulate vestibular input during VR exposure. By parametrically varying the timing and structure of vestibular signals relative to visual motion, we probe how multisensory weighting, head-movement dynamics, and stimulus characteristics shape self-motion perception. This approach allows us to examine under what conditions visual–vestibular interactions strengthen vection, alter presence, or contribute to perceptual instability. Rather than treating sensory mismatch as uniformly detrimental, this work considers visual–vestibular integration as a dynamic process dependent on context and signal reliability. The findings contribute to ongoing debates about the mechanisms underlying cybersickness and highlight VR as a powerful method for advancing theoretical models of multisensory perception.

Talk 2: Towards Accessible, Context-Aware and Emotionally Intelligent Devices

Zhanna Sarsenbayeva

In my research I explore how everyday technology can be leveraged not only for interaction, but as powerful tools for sensing and experimentation. My work spans from extending accessibility of everyday technology, to creating immersive environments for inducing emotions, and designing voice assistants that promote empathy. Currently, I focus on multimodal affect sensing in immersive settings, combining physiological, behavioural, and interaction data with machine learning and multimodal language models. Together, these projects reflect my research vision

for designing digital devices that are context-aware, emotionally intelligent, accessible, and designed for real-world use.

Talk 3: From Emerging Technology to Everyday Tool: Virtual Reality in Society and Perceptual Psychology

Kenzo Sakurai

This talk examines virtual reality (VR) from the perspective of the psychology of vision, focusing on its emergence and historical background, the concept of the sense of presence, and future challenges for experimental and perceptual psychology. Since the emergence of VR technologies in the 1980s, beginning with NASA's projects and subsequent commercialization efforts, VR has provided new opportunities for studying perception and action under controlled yet immersive conditions. A key concept in evaluating VR environments is the sense of presence, defined as the subjective feeling of "being there" in a virtual environment. Several factors that enhance the sense of presence, including multisensory integration, self-motion perception, and the sense of agency, have been actively studied, with strong roots in traditional experimental paradigms in vision science. In this context, VR offers a powerful platform for systematically manipulating perceptual cues while allowing observers to engage in active and naturalistic behavior. Although early VR systems were expensive, the widespread adoption of smartphones and consumer-grade head-mounted displays in the 2010s greatly increased accessibility. As a result, VR has become a practical tool for experimental psychology. Finally, this talk discusses key perceptual and methodological issues for further enhancing the sense of presence in VR-based research.

Talk 4: Fused Body Augmentation: The Possibility of Body Fusion among Multiple People

Takayoshi Hagiwara

With the spread of virtual avatars and robots, operating them as one's own body is becoming commonplace. Previously, the common understanding was that one person controlled one avatar, a one-to-one correspondence. However, in recent years, research on multiple people controlling one avatar has flourished. We are researching "body integration," in which two people are embodied within a single avatar. In the body integration experiment using virtual avatars, participants performed a reaching task in which they controlled an integrated avatar to touch objects in the VR space. As a result, it was found that the movements



of the integrated avatar were more linear and smoother compared to controlling the avatar individually. It was also found that the movements of participants controlling the integrated avatar similarly changed. These findings suggest that during integrated avatar control, participants may prioritize the integrated avatar's movements over their own. Furthermore, we also conducted an experiment in which two people controlled a single robot avatar. The results of the pick-and-place task indicated that motor performance improved and that the movements of the two individuals became synchronized. Based on these findings, body integration is expected to become a new method for avatar control in the future avatar society.

Symposium 6- Seeing through noise: Emerging research on Visual Snow Syndrome

Allison McKendrick, University of Western Australia & Lions Eye Institute

Jess Taubert, University of Queensland

Michael-Paul Schallmo, University of Minnesota

Samantha Montoya, University of Pennsylvania

Discussant: *D. Samuel Schwarzkopf*, University of Auckland

Visual Snow Syndrome (VSS) is an understudied neurological condition involving perception of flickering specks across the visual field. The causes of VSS remain unclear, and current treatment approaches are limited. However, recent work has begun to reveal the neural and perceptual mechanisms of VSS. This symposium will bring together experts to present recent findings in VSS, discuss emerging theories, and identify important questions that remain.

Talk 1: Exploring visual snow appearance and contrast processing in visual snow syndrome

Allison McKendrick

Visual snow syndrome (VSS) is a neurological condition characterised by persistent visualisation of "snow", in addition to other perceptual phenomena such as photophobia, palinopsia, and nyctalopia. An obvious explanatory hypothesis for the visual snow percept is hyperexcitability in the visual pathways. In this talk, I will overview several experiments where we: explored for evidence of hyperexcitability in visual contrast processing pathways; and

quantitatively explored the visual snow percept. Using a luminance increment detection task presented with varying levels of added external noise we found that both detection thresholds and internal noise estimates were normal. In a separate experiment in the same individuals, estimates of contrast gain were elevated. These experiments provide support for a model of cortical hyperexcitability in VSS that is related to increased gain rather than elevated neural noise in the visual pathways. In terms of the visual snow percept, using a perceptual matching task, people with visual snow revealed a consistent description of tiny (matched to an external reference ranging from 5.2 to 6.9 arcseconds), tightly packed dots. Denser dots were associated with increased self-reported visibility of the visual snow percept. This talk will also discuss why quantitative estimates of visual snow severity are required and explore potential applications of such measures in both research and clinical settings.

Talk 2: Face Pareidolia Reveals Altered Visual Inference in Visual Snow Syndrome

Jess Taubert

Humans have a strong tendency to detect faces where none exist, especially in ambiguous or noisy visual input. This is a common phenomenon known as face pareidolia. In this talk, I will present recent behavioural evidence showing that individuals with Visual Snow Syndrome experience face pareidolia more frequently and more strongly than neurotypical controls. Using a large-scale online task, we found that participants with VSS consistently rated ambiguous natural images as more face-like than age-matched controls, revealing a systematic shift in perceptual sensitivity rather than idiosyncratic response patterns. This effect persisted even when accounting for common comorbidities such as migraine. These findings support the idea that VSS is associated with altered visual inference, potentially driven by heightened cortical excitability or increased sensory gain in early visual processing stages. I will discuss how exaggerated face pareidolia in VSS provides a novel behavioural marker of altered perception and helps bridge clinical descriptions of VSS with broader theories of perceptual processing and decision making.

Talk 3: Adaptation reveals the feature specificity of visual snow

Michael-Paul Schallmo

Adaptation is an effect in which prolonged exposure to a visual stimulus attenuates responsiveness to subsequent stimuli. Adaptation is feature-specific, and has been referred to as the "psychophysicist's



electrode," as this specificity can be used to investigate the properties of neurons responsible for adaptation effects. I will present findings from a series of experiments from our group that used adaptation methods to examine the neural basis of Visual Snow Syndrome (VSS). We found that adaptation to dynamic noise temporarily alleviated the perception of visual snow. The duration of this effect increased with longer exposure to the adapter, and did not extend to other stimuli (e.g., Gabors). We also found that visual snow is susceptible to the classic motion aftereffect. After adapting to a drifting grating, participants with VSS reported that their visual snow moved in the opposite direction of the adapter. Finally, we found that adaptation of visual snow is retinotopic. Here, participants adapted to dynamic noise with sinusoidal contrast modulation. Adapter wavelength varied across trials. Afterwards, participants with VSS reported weakened stripes of snow for longer adapter wavelengths, but for shorter wavelengths ($\leq 0.5^\circ$), the percept of visual snow was uniformly weakened across the entire adapter region. Together, our findings support the hypothesis that visual snow depends on spontaneous activity in the visual pathways. I will discuss how adaptation provides a useful tool for interrogating the neural mechanisms of visual snow, and potential future applications for this technique.

Talk 4: Photoreceptor Mechanisms of Light-Induced Discomfort: Implications for Visual Snow Syndrome

Samantha Montoya

In visual snow syndrome (VSS), surveys show that photophobia can be more disabling than the visual snow itself. Understanding the mechanisms of photophobia could improve quality of life for people with VSS. We investigated the photoreceptor mechanisms underlying discomfort from bright light. Ten participants from the general population viewed full field binocular modulations targeting different retinal photoreceptor classes. From infrared recordings of the eyelids, we identified an illuminance background (4000 lux) around which small changes in intensity evoked measurable changes in reflexive squinting. Around this background, we presented 1-minute sinusoidal spectral modulations targeting light flux (including LMS + melanopsin), LMS, melanopsin, or S cones. Light flux modulation elicited fluctuations in squint, and, remarkably, melanopsin produced an effect of similar size. LMS modulation had little effect. S cone modulation had a small, soothing effect. Modeling the weights on photoreceptor circuit integration for each participant demonstrated individual differences. This mechanism may explain reported therapeutic effects of personalized spectral filtering in VSS and photophobia.

Oral Presentation Abstracts

Do disgust reactions to a highly disgusting and fearful trauma analogue persist more than fear reactions over time?

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People experience disgust during and following various traumatic events, and like fear reactions—which have been the focus of trauma research—disgust reactions are associated with posttraumatic stress (PTS) symptoms. Interestingly, emerging research suggests disgust reactions to personally experienced traumatic events may persist more (i.e., linger longer) than fear reactions. In our previous work, we observed this greater persistence effect for disgust—relative to fear—in an experimental setting (i.e., using a trauma analogue comprised of negative images). However, we could not elicit highly intense feelings of both disgust and fear in our participants, which is important for simulating disgust and fear reactions to personally experienced trauma. Thus, here, we developed a trauma analogue comprised of negative video clips to evoke similarly, highly intense disgust and fear reactions. In Experiment 1, participants viewed the trauma analogue, and then rated the intensity of their emotional reactions to the trauma analogue—both at encoding and at 24-hour delay. Disgust and fear faded similarly over the 24-hour period. We then wondered whether these emotions might persist differently over a longer delay period; in Experiment 2, we repeated Experiment 1 using a 1-week delay. Understanding disgust's persistence has implications for recognising disgust as a trauma-relevant emotion and treating PTS symptoms in people who primarily experience disgust following trauma exposure.

Temporal Changes in Affect Influencing Efficacy Beliefs

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People often struggle to recognise whether their actions drive changes in others' emotional state, or whether these changes would have occurred

regardless. Accurately judging whether we helped someone requires considering the trajectory of their affect prior to intervention, rather than purely how they feel before versus after. The current study examined whether people rely on this before–after heuristic when judging the effectiveness of emotional advice. Across two experiments, participants were ostensibly paired with a partner experiencing an emotional stressor, first observing their affect before providing advice. Critically, the partner's affect followed a predetermined trajectory, upward, flat, or downward, independent of advice. We found that participants judged efficacy by comparing average affect after helping relative to the average affect before, while failing to account for the trajectory. Consequently, participants concluded they were helping when they were not (Experiment 1), believed they were helping even when their advice worsened their partner's affect trajectory (Experiment 2), and failed to recognise when their advice was beneficial because affect was declining beforehand. This suggests that judgements of advice efficacy are biased by before–after comparisons rather than considering temporal affect dynamics. This has critical implications, particularly in therapeutic and clinical contexts where accurate evaluations of treatment and support are essential.

Angry Faces Bias Attention and Motor Responses Across Peripersonal and Extrapersonal Space in Virtual Reality (VR)

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The study combined immersive VR with an exogenous cueing paradigm to test whether attentional bias and motor responses to angry facial expressions are modulated by spatial proximity. Participants viewed angry and neutral faces as non-predictive cues presented in peripersonal (PPS) and extrapersonal space (EPS), and discriminated orientations of subsequent Gabor targets. Cue validity (valid vs. invalid) and stimulus-onset asynchrony (SOA; 100 ms vs. 350 ms) were manipulated. Importantly, motor conflict (absent vs. present) was also manipulated to examine whether uninformative face cues prime motor responses

irrespective of attentional capture; in the conflict condition, the required response side was incongruent with the target location. A linear mixed-effects model was applied to log-transformed reaction times. As expected, responses were overall faster following valid cues and at the longer SOA, validating the exogenous cueing paradigm in VR. Responses were also faster in PPS than EPS, and when no motor conflict was present, supporting that both depth and response congruency influenced performance. Interestingly, faster responses emerged following invalid angry cues under motor conflict, particularly at the short SOA. This suggests that angry expressions can rapidly prime motor responses and override the time costs of attentional shifting. Moreover, this reversed validity effect was stronger in the EPS, demonstrating that depth also modulates perception–action coupling.

Embodied emotion from body motion: Challenges and Opportunities

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Affective information such as emotion has been recognized as one of the most fundamental capacities for human beings. Affective computing such as emotional intelligence has been identified as the next key milestone for tele-communication development. However, we are still far from understanding the nature of it. There are a few open questions that are very close to our conscious experiences. For example, is your joy the same as mine? Is the joy from vocal expression the same as joy from facial or body expressions? What are the roles of context (e.g. personality, cultural context, situational scenario, etc) that modulate affective perception? What are the scientific approaches to study emotional expressions and recognition? Can AI/Machine understand emotions like us? In this talk, I will introduce a very rich database that we established that allows researchers to use (for free) to study these questions. DIEM-A is a multicultural diverse body movement database for emotions. It includes over 10,000 short animations recorded from two Asian regions depicting 14 emotional categories. I will then show a few studies to showcase the challenges and opportunities in behavioral studies, neuroscience, and machine learning. The goal is to invite researchers to engage in developing new tools and methods to better dissect this long-standing research question.

Visual Sampling Strategies During Emotion Recognition from Biological Motion

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Recognizing emotions from body movements is a fundamental social skill, yet the visual strategies used to decode dynamic emotion cues remain unclear. The present study examined how temporal gaze patterns relate to accuracy and confidence when perceiving emotions from biological motion. Participants viewed point-light displays of actors expressing 12 discrete emotions (joy, anger, sadness, surprise, pride, fear, jealousy, shame, contempt, gratitude, guilt, disgust). Following each video, participants selected the perceived emotion in a 12-alternative forced-choice task and provided a confidence rating. Eye movements were recorded throughout. To identify visual markers of perceptual efficiency, we compared gaze behavior between high- and low- accuracy trials across different emotions. Preliminary results indicate distinct visual sampling strategies based on performance: Low-accuracy trials exhibited significantly higher fixation counts and shorter fixation durations, suggesting a fragmented visual search. Conversely, successful emotion recognition was associated with fewer, longer fixations, indicating more sustained and efficient processing of e. Ongoing analyses are examining saccadic dynamics and how specific gaze trajectories correlate with participants' emotion recognition and metacognitive confidence. These findings indicate that accurate emotion recognition from biological motion depends on temporal gaze efficiency, advancing understanding of dynamic social vision.

Melanopsin and social-affective processing

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Melanopsin pathways sense environmental light to diverse brain targets regulating mood and cognition. To determine contributions to processing of emotional faces and scenarios, healthy observers pre-adapted to ambient photopic task lighting (45 lux) generated by a 5-primary LED system (LEDCube) to achieve 36% melanopsin contrast while controlling cone and rod contrasts $\leq 2\%$. In

Experiment 1 (n=7), morphed neutral-emotion-expressions were presented in a 2AFC task; increased melanopsin excitation reduced emotion detection thresholds (small to medium effects) and increased psychometric slopes for anger, fearful, sadness and happiness (small to large effects). In Experiment 2 (n=6), a 6AFC task on morphed mixed-emotion faces; increased melanopsin excitation biased the recognition toward high arousing emotions (disgust, anger, and surprise) when competing emotional cues were present (small effects). In Experiment 3 (n=6), social-emotional face and video scene rating tasks; melanopsin excitation dampened the influence of affective state on valence and arousal evaluations, promoting stimulus-driven processing (small effects). Overall, melanopsin activation enhanced sensitivity to emotionally salient external signals across perceptual and evaluative processing, while attenuating internally driven biases, especially when stimulus ambiguity was high. These studies provide mechanistic insight into how melanopsin sets social-affective processing.

Deconditioning: Paired presentations of reduced intensity USs early during extinction reduce uncertainty during extinction and impair re-acquisition

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Recent work in rodents suggests that deconditioning, the presentation of reduced intensity unconditional stimuli (US) during extinction, can reduce the return of fear. Here we combined deconditioning with standard extinction in human fear conditioning. In a differential conditioning procedure one conditional stimulus (CS+) was followed by an aversive US whereas a second was presented alone (CS-). During extinction, participants in group Standard received 12 presentations of each CS alone whereas the first three CS+ were followed by a reduced intensity US in group Deconditioning. Groups did not differ during a delayed extinction re-test in either electrodermal responses or US expectancy. During subsequent re-acquisition, US expectancy during CS+ and CS- was higher in group Standard than in group Deconditioning and differential electrodermal responding returned in group Standard whereas it declined in group Deconditioning. At the beginning of extinction US expectancy during CS- increased in

group Standard but not in group Deconditioning and the decline of US expectancy after the first nonreinforced CS+ was steeper in group Deconditioning. This suggests that deconditioning during early extinction reduced the detrimental effects of US omission after CS+ on safety learning to CS- and accelerated safety learning to the CS+. This enhanced safety learning may mediate the between group differences in US expectancy and electrodermal responses during subsequent re-acquisition.

What drives skin conductance responding in fear conditioning?

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When compared to audio or video stimuli, electric shocks produce stronger electrodermal conditioned fear responses. This occurs even if audio or video stimuli are perceived as more intense and aversive, which may not be congruent with theories of emotional fear learning. We re-analysed three datasets that used a combined trauma film/fear conditioning paradigm to test why this effect occurs. We found: (1) evidence that weaker electrodermal conditioning when the unconditioned stimulus (US) is a film clip is unlikely to be due to trace conditioning. (2) Participants viewing both the film clips and experiencing the shock displayed conscious learning of threat contingency, implying that lack of physiological conditioning to film US is not explained by cognitive awareness. However, the effect was driven by heightened arousal, measured by salivary cortisol. (3) In over 1,000 participants, we modelled latent cluster responses and found that high responding was associated with characteristics linked to heightened arousal. This data provides important new information supporting the idea that skin conductance responses during conditioning using electric shock USs might not reflect purely anticipatory fear, at least in the way conceptualised in the literature. This account has potentially critical implications for the interpretation of fear conditioning research using skin conductance responding, the most commonly used measure in the field.

Unpaired US presentations during extinction reduce the return of fear: Does arousal strengthen extinction learning?

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Relapse after successful treatment is common in anxiety disorders. Using human fear conditioning our lab has shown that unpaired presentations of the unconditioned stimulus (US) during extinction can strengthen extinction learning and reduce the return of fear. It remains unclear whether this enhancement of extinction learning is driven by participants learning that CSs and USs are uncoupled or by increased arousal resulting from the unpaired USs. We tested these accounts in a differential fear conditioning paradigm (N=120). One group received standard CSs only extinction (Standard), one received standard extinction in a continuous white noise background (60 dBA; Noise), and one received unpaired US extinction (Unpaired). Relative to group Standard, skin conductance level indicated higher arousal throughout extinction in group Unpaired and during early and late extinction in group Noise. All groups showed renewal in first interval electrodermal responses (FIR), but in second interval responses (SIR) renewal was absent in groups Unpaired and Noise. Critically, group Unpaired showed attenuated reacquisition in electrodermal FIR and SIR, whereas groups Noise and Standard showed robust reacquisition. These findings suggest that unpaired US presentations strengthen extinction learning beyond the effect of merely increasing arousal.

Examination of generalised responses in Pavlovian and trauma film paradigms

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PTSD treatments are effective, yet high relapse rates remain due to its complexity. Intrusive memories are a hallmark characteristic of PTSD, but how they develop and persist is not well understood. Fear generalisation has been proposed as a driver of intrusive memories, thereby contributing to the clinical presentation. This study proposed an adapted trauma film paradigm to explore generalisation in responses to complex stimuli and in intrusive memories. Healthy participants (N = 72) completed a standard generalised conditioning procedure, followed by an adapted trauma film

paradigm. In the latter, participants watched eight neutral clips twice, with an aversive clip and a break in between. The neutral clips were either similar to or dissimilar to the aversive clip. Electrodermal responses and heart rate were recorded throughout. Self-report ratings were also provided. A 4-day digital intrusive memory diary was completed. The physiological and behavioural measures did not yield supporting evidence for the validity of the adapted paradigm, indicating that further exploration is needed. However, findings from reported intrusive memories demonstrated generalisation of sensory content. Namely, intrusive memories of the aversive film and the similar neutral films were of similar frequency. They were also significantly more frequent than intrusive memories of dissimilar neutral films. These findings are promising for adapting the trauma film paradigm to examine generalisation.

From friend to foe: How evaluative conditioning influences fear conditioning and the role of relational information in the transfer of learning.

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Previous learning experiences, such as evaluations formed through evaluative conditioning, where a neutral conditional stimulus (CS+) is presented with a pleasant or unpleasant unconditional stimulus picture (US) and becomes liked or disliked, will likely influence new learning (e.g., fear conditioning, where a neutral CS+ is presented with an aversive shock US and becomes feared). Research has shown this interaction is short-lived, but it is possible that it would be longer-lasting if a stronger evaluation had formed (e.g., via CS-US pairings alongside relational information). We examined how evaluations influence fear conditioning and whether relational information can enhance this interaction. Participants underwent evaluative conditioning where a face CS+ was paired with pleasant or unpleasant images (between-groups) and a face CS- was presented alone. Half of the participants in each valence group viewed the relational information 'This person wants to show you the following image' with each CS-US pairing, while the other half viewed the pairings alone. All groups completed fear conditioning where the CS+ was paired with a shock, and the CS- was presented alone. Evaluative conditioning successfully transferred to fear conditioning, suggesting that evaluations can have a

long-lasting influence on fear conditioning. Relational information did not significantly strengthen evaluative conditioning, although findings suggest further investigation is needed.

Do people assume independent alternative causes when judging contingencies?

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When people are exposed to a series of trials involving the presence or absence of a cue and the presence or absence of an outcome, they often judge a zero contingency between these events as being positive, a so-called causal illusion. Recently we have provided evidence that participants invoke a variety of hidden alternative causes for outcomes that occur on trials where the cue is absent. Our results also raise doubts as to whether participants believe that these causes are also present on trials where the cue is present, a critical assumption made by normative theories of associative learning and causal learning. In the present study we directly assessed these beliefs with two post-experimental questions in a medicine-recovery scenario. First, we asked participants to directly rate the relative strength of alternative causes on cue and no cue trials. Second, we asked them to make a counterfactual rating of outcome probability on the cue-outcome trials they observed, had the cue not been presented. We will present these findings, and consider their implications for the idea that participants may not assume that alternative causes are independent of the cue, hence questioning whether causal illusions are really non-normative.

How does the brain combine sight and sound in speech perception? Insights from a dual-stream network

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Speech perception is an inherently multimodal process, as visual lip movements improve and alter our understanding of coinciding auditory speech (e.g. the McGurk effect). As such, speech perception tasks have been a key testbed for investigating the neural mechanisms underlying audiovisual integration. Advances in computational science have allowed for highly accurate neural networks capable

of identifying human speech. However, the insights such networks may provide on how the brain navigates speech perception remain relatively unexplored. Here, we trained a deep neural network to use both auditory and visual speech cues to investigate how audiovisual information is integrated to improve perceptual accuracy. We created a dual-stream 7-layer residual neural network trained to recognise and classify spoken words from both auditory speech and visual lip movements. The network was trained on an audiovisual speech database, under audio-only, visual-only and audiovisual training conditions. The results of the network matched canonical features of biological speech perception. Accuracy was highest when the network had access to both auditory and visual cues, compared to either alone. Network predictions also displayed phoneme and viseme recognition, and speaker independence. By examining how the network uses related visual information to improve accuracy, we explore potential parallels for how the brain may integrate audiovisual information to support perception.

Semantic Modulation in Audiovisual Postdictive Illusions Depends on Fixation

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Auditory beeps can retroactively alter visual perception. In the audiovisual Rabbit illusion, two flashes paired with three beeps (2V3A) induce the illusory perception of a third flash, whereas in the Invisible Rabbit illusion (3V2A), a physically presented flash can go unnoticed when not paired with a beep. In our previous study, when we adapted these illusions to Japanese word stimuli, disrupting lexical meaning by reversing character order increased the strength of the Rabbit illusion for Kanji. However, participants often identified the characters above chance, unlike in earlier studies in which identification remained at chance, raising the possibility that explicit awareness affected the observed semantic modulation. In a subsequent experiment, we imposed strict fixation and restricted the analysis to participants whose character identification remained at chance. Under these conditions, both illusions were reliably observed across Kanji, Hiragana, and Katakana. Critically, meaningful sequences reduced the Rabbit illusion strength relative to meaningless sequences. Although this differed from our earlier replication, it

aligns with the broader observation that meaningful content suppresses illusory flash perception. To directly test the contribution of eye movements, we are conducting a follow-up test using eye tracking. Together, these findings suggest that semantic influences on audiovisual postdiction depend critically on gaze stability and perceptual awareness.

A neural signature of susceptibility to involuntary experiences of imagined sounds

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People can have imagined experiences of hearing music by volition, or involuntarily after hearing a 'catchy' song. A great deal is known about the neural correlates of volitional imagined music. Less is known about correlates of involuntarily imagined music. What makes people susceptible to involuntary experiences of imagined music? To investigate, after hearing snippets of catchy songs we challenged people to either wipe these from their minds (Don't Imagine trials), or to try to imagine hearing these continue (Imagine trials) – both while we recorded their brain activity using EEG. We found that people who are susceptible to involuntary imagined experiences of re-hearing songs had heightened alpha-band activity when they tried to suppress these imagined experiences. This was an opposite effect relative to people who were less susceptible to these involuntary imagined sensations. This effect could not be a simple consequence of susceptible people imagining music on Don't Imagine trials, as these people still reported imagining music more often on Imagine trials. We obtained the same qualitative pattern of results in a re-analysis of a published dataset, concerning involuntary imagined experiences of non-musical sounds. We suggest that in people who are susceptible to involuntarily imagining sounds, a failure to consciously regulate information processing results in a suppression of their visual brain activity when they try to suppress these imagined experiences.

Tracking global neurodevelopmental variation via conscious access to subtle pitch differences

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Neuroimaging has become an essential tool for basic and clinical studies of the human brain. However, the complexity of brain scanning technology trades off with cost and practicality—brain scans are expensive and globally inaccessible. Here, we introduce a cheap, low-tech measure of neurodevelopment based on a behavioural measure of a person's ability to discriminate subtle pitch differences. Using data from 1.2 million participants from 208 countries and territories, we show that this approach almost perfectly predicts developmental variation in white matter at the population level, and systematically tracks environmental and social inequalities within and across countries. In this talk, I will make the case for the identification pathway that explains how such a simple behavioural measure can indirectly reflect broader neurodevelopmental variation.

Foetal Heart Rate Responses show Timbre and Harmony Perception during Late Gestation

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Studies have shown that some musical processes are present before birth. Fetal timbre (T) and harmony (H) perception have not yet been investigated, but newborns can already discriminate different timbres and harmonies. Given the prenatal origin of many neonatal competences, these musical abilities might also start before birth which is the objective of the present study. So far, 79 fetuses (gestational age: M = 251 days; SD = 4.06) have taken part, with a target recruitment of 84. Exp. 1 uses a clarinet, a trumpet, and a violin timbre while Exp. 2 uses major and minor chords. Both experiments are divided into sound and silence blocks. Fetal heart rate (FHR) is measured with a cardiotocograph and 2D-ultrasound is used to monitor foetal movements. Preliminary results support two out of three hypotheses. 1. Fetuses show an initial FHR drop in the first 5-10 seconds after stimulus onset (T: M = 3.22; SD = 0.22; H: M = 3.08; SD = 0.27; all $p < .001$). 2. Current results do not show a significant decrease of this orienting response over sound blocks of the same stimulus, indicating an absence of habituation. 3. FHR increases in the first 5 seconds when a new stimulus is being introduced (T: M = 3.13; SD = 0.31; H: M = 2.65; SD = 0.32; all $p < .001$). This shows fetal discriminatory abilities between stimuli. Future studies will be able to determine how prenatal music exposure affects (early) development and how we

can utilise music to help fetuses at risk for atypical development.

Effective Connectivity Reveals a Shift to Left-Hemisphere Dominance for Spatial Attention during sleep onset

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Every night when we go to sleep, we drift into an altered state of consciousness. Intriguingly, healthy righthanders demonstrate a rightward bias in spatial attention as they become drowsy. But how the brain supports alertness and spatial attention remains contested. Competing theories propose that attention is governed either by the interaction of two bilateral networks (dual-network model) or by a dominant right hemisphere (right hemisphere dominance model). We investigated how effective connectivity within the auditory cortical hierarchy is modulated by drowsiness. We recorded high-density EEG in 32 healthy participants performing an auditory localisation task in awake and drowsy states. We used Parametric Empirical Bayes and Dynamic Causal Modelling to map arousal-dependent changes in effective connectivity between left- and right-sided auditory stimuli. Consistent with the right hemisphere dominance model, right-sided stimuli elicited stronger bidirectional information flow between bilateral inferior frontal gyri (IFG) during wakefulness. In line with the dual-network theory, we observed that during drowsiness there was a significant reduction in right-hemispheric frontoparietal connectivity alongside a strengthening of a left-hemispheric pathway from the inferior parietal cortex to the IFG. Overall, our findings provide a mechanistic account of how diminishing arousal shifts cortical processing from a bilaterally integrated network to a left-lateralised state.

Trigger Warnings Attract People at Risk of an Eating Disorder to Eating Disorder Related Content

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Trigger warnings—alerts that upcoming material is

potentially distressing—for eating disorder (ED)-related content are a common practice. Although well-intentioned, a growing body of research suggests that trigger warnings do not reduce emotional reactions or deter engagement with distressing content. However, existing research has primarily focused on populations exposed to trauma. No studies to date have investigated the efficacy of trigger warnings for people with ED symptoms. Therefore, across two studies, we investigated whether ED-related trigger warnings cause people at risk of an eating disorder (vs. those not at-risk) to avoid or approach eating disorder content. In both experiments, we randomly assigned an ED related trigger warning to a mock film poster and asked participants to select which film trailer they would like to view. Across both experiments, we found that elevated weight-concern scores were associated with a higher likelihood of selecting a film with an ED warning. Therefore, at best, we can conclude that ED trigger warnings are not promoting higher levels of avoidance in participants who are at higher risk of an ED (vs. those not at-risk). At worst, warnings may attract participants who are at-risk of an ED towards ED related content. Our results have implications for online platforms and policymakers, suggesting that trigger warnings alone are unlikely to protect users at risk of EDs and may even increase engagement.

Self-Triggering in Eating Disorders

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Eating disorders (EDs) are severe, treatment-resistant mental health conditions affecting up to 20% of the global population. We conducted two observational studies to investigate a behaviour known as self-triggering—the deliberate seeking of stimuli that cause urges to engage in disordered eating behaviours. Together, our provide empirical foundations for future experimental investigation of self-triggering processes. Study 1 recruited adults at risk of an ED who reported self-triggering. Participants completed measures of self-triggering frequency, compulsivity, distress, ED symptom severity, and emotion regulation difficulties, alongside qualitative questions assessing motivations, methods, and subjective experiences. Up to 40% of at-risk individuals reported engaging in self-triggering. Greater self-triggering was associated with elevated ED pathology and emotion regulation deficits. Qualitative findings suggested

self-triggering functions as both a general emotion regulation strategy and a means of avoiding negative affect. Participants reported mixed emotional experiences, describing self-triggering as distressing but also describing perceived benefits such as “getting back on track”. Study 2 extends this work by examining self-triggering on social media among younger adults above the clinical cutoff on the ED-15, as well as including non-self-triggering participants to enable between-group comparison.

How much detail should we share? Instructions to minimize aversive details may not reduce the ‘disturbing’ details people disclose about negative experiences

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There is growing concern that talking about traumatic events may cause post-traumatic stress symptoms (PTS, e.g., intrusive images, thoughts) to develop in people who listen to negative events being shared but did not experience the event (i.e., listeners). One recommendation to prevent listeners developing PTS symptoms involves asking people who talk about negative events (i.e., sharers) to minimize the ‘disturbing’ and ‘upsetting’ details they disclose. We tested this recommendation by exposing participants to a trauma analogue and randomly allocating participants to either withhold aversive details (i.e., limited-disclosure instructions) or not when writing an SMS message about the film. Those who received limited-disclosure instructions were similarly likely – compared to those without limited-disclosure instructions – to disclose aversive details that they later indicated would be the most disturbing and upsetting for the listener to hear. Among participants who self-reported withholding many details, receiving limited-disclosure instructions prior to sharing reduced PTS symptoms compared to not receiving limited-disclosure instructions. However, when participants self-reported withholding minimal details, receiving limited-disclosure instructions increased PTS symptoms compared to those who did not receive such instructions. Taken together, while future research is needed, our results suggest that endorsing strategies such as limited-disclosure could be problematic.

Punishment Sensitivity in Individuals with Problematic Alcohol Use

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Punishment insensitivity plays a crucial role in the development and persistence of alcohol use disorder. Research using a human conditioned punishment task Planets & Pirates has identified key cognitive mechanisms underpinning punishment insensitivity in healthy samples, yet it is unclear whether these patterns generalise to individuals with problematic alcohol use. The present study investigated punishment insensitivity in a community sample reporting problematic alcohol use. Participants completed the Planets & Pirates task alongside questionnaires assessing alcohol use and dispositional traits. Consistent with prior work, three behavioural phenotypes were identified based on differences in causal knowledge acquisition and behavioural updating: a “sensitive” phenotype showing experience-driven learning, an “unaware” phenotype showing information-driven learning, and a “compulsive” phenotype who persisted in harmful behaviour despite awareness of consequences. Notably, the “compulsive” phenotype constituted the majority of the sample and was more prevalent than in previous healthy samples. However, phenotypes did not differ significantly in self-report measures. These findings suggest punishment insensitivity may be more prevalent in individuals with problematic alcohol use and support the utility of Planets & Pirates for examining cognitive mechanisms relevant to addiction. Further research is needed to clarify how these processes relate to clinically meaningful outcomes.

Investigating recall accuracy for medication side effects across age and likelihood/severity categories

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Accurate recall of medication side effects is a critical determinant of medication safety (WHO), yet little is known about the extent to which patients can readily report these details from brief telehealth settings. Across two studies, we assessed the effect of medication side effect likelihood on recall accuracy, while considering the role of age. We

analyzed data from two Australian samples—156 adults aged 40–65 and 181 adults aged 18–44—both key user age-groups for telehealth. In Phase 1, participants listened to 12 individual recordings of a GP describing medication side effects drawn from one of four likelihood categories (with likelihoods ranging from very rare, occasional, may occur, to very likely). After a two-day delay, in Phase 2, participants were asked to report side effects from Phase 1 in a free recall test. We examined recall accuracy for each item by likelihood category and age. While preliminary results suggest no effect of age on recall accuracy, accuracy differs significantly across items. We found mixed results regarding the role of item likelihood on recall accuracy. Participants also made intrusion errors—items that were not presented in Phase 1 but were recalled by participants during Phase 2—which we also explore. These initial findings suggest that simply testing recall for presented side effects may not be sufficient for safety thresholds, where an understanding of intrusions may also contribute to a broader conceptualisation of medication safety.

A Multisensory Database of Tropical Urban Green Space Stimuli: Effects on Perceived Restorativeness and Cognitive Performance

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Urban green spaces (UGS) have been shown to be an accessible alternative to remote nature, especially in rapidly urbanizing regions. However, most restorativeness research focuses on Western, temperate climates rather than tropical environments (consistently warm and humid climates). We thus developed a standardized database of tropical UGS stimuli (nature, urban, and mixed urban-nature scenes) in audio, visual, and bimodal formats. Across two studies, we evaluated both perceived restorativeness and cognitive outcomes. In Study 1, participants rated nature and mixed urban–nature scenes as more restorative than urban scenes, with mixed environments rated most highly in the visual-only modality. Notably, perceived restorativeness for nature scenes was comparable across audio, visual, and bimodal presentations. These findings suggest that small pockets of urban nature or high-quality natural sounds can be beneficial in the absence of “raw” nature. In Study 2, participants were exposed to nature or urban stimuli to test executive function, attention, and working memory. While no effects were observed for

executive function or attention, working memory (DSB) improved selectively following exposure to bimodal nature videos, with no comparable benefits for visual or audio-only presentations. These findings suggest that nature's benefits generalize to tropical contexts, though the effects depend heavily on the sensory modality and the specific cognitive outcome measured.

Lay Forensic Science: the Illusion of Explanatory Depth in the Forensic Domain

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Exposure to a process—how rainbows form, how a toilet flushes or how the heart pumps blood—can systematically inflate perceived knowledge while leaving actual understanding relatively shallow (e.g., the Illusion of Explanatory Depth; Rozenblit & Keil, 2002). Across three experiments we explore whether a similar effect occurs when people are exposed to crime media depicting forensic science processes (cf. the “CSI Effect”; Schweitzer & Saks, 2007; Alldredge, 2015). Participants rated their knowledge of forensic DNA analysis (Forensic domain) and how the heart pumps blood (Natural domain) before and after completing one of three knowledge elicitation tasks: a free-form description, a structured step-by-step account, or a multiple choice test. We show a significant reduction in knowledge ratings pre to post knowledge elicitation task for both topics, demonstrating an Illusion of Explanatory Depth across natural and forensic domains. We also find some evidence that crime media consumption moderates this effect within the forensic domain. We will discuss implications for juror understanding and evaluation of forensic evidence in legal settings.

How do people evaluate disclosures of artificial intelligence (AI) use in forensic expert evidence?

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Computer algorithms and, increasingly, artificial intelligence (AI) systems are embedded in forensic workflows, yet their role is rarely visible to legal decision-makers. When forensic evidence is described as AI-assisted, does it change how convincing that evidence is? We examined this

question using a 3 (Analysis Source: Human-Led, AI-Assisted, AI-Led; between-subjects) × 3 (Domain: DNA, Fingerprints, Shoeprints; within-subjects) mixed design (N = 315). Participants read three fictional crime scenarios with mock forensic expert reports, providing guilt ratings before and after each report, and ratings of expert credibility, evidence credibility, domain familiarity, and perceived AI reliability after each report. Individual differences in machine heuristic beliefs (Yang & Sundar, 2024) were also measured. AI disclosure reduced perceived evidence credibility and expert competence but had little impact on trustworthiness and no significant overall effect on post-evidence guilt. Once the drop in perceived competence was statistically controlled, a suppressed appreciation effect emerged where post-evidence guilt ratings were significantly higher in the AI-led than the human-led condition. Machine heuristic beliefs moderated this effect in the DNA domain only. We interpret these findings through exemplar, dual-process, and moral responsibility accounts, and discuss implications for how AI involvement in forensic science might be disclosed to courts.

A range-frequency examination of the effects of payoff structure in a communication game

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Evidence from a variety of domains suggests that when rating perceptual or evaluative stimuli, people give some weighting to both the range of the stimuli in the set being considered, and the rank of each stimulus in that set. Allen Parducci (1995), who developed this range-frequency theory, noted that one explanation for this theory is that ratings can be treated as a communicative act, and that if the payoff structure relating to communication game is changed, so should the rating. In a series of three experiments, we asked participants provide ratings of square sizes to another person (Experiment 1), themselves (Experiment 2), or an artificial agent (Experiment 3), the other agent then being required to reconstruct the original stimulus based on the communicated rating. Across three experiments, the relative weighting of range and frequency was not sensitive to whether points were earned only for a correct response, or a more continuous payoff function was instructed. We discuss the results with reference to range-frequency theory and rate-distortion theory. Parducci, A. (1995). Happiness, pleasure, and judgment: The contextual theory and

its applications. Happiness, Pleasure, and Judgment: The Contextual Theory and Its Applications., ix, 225–ix, 225.

Filtering the Evidence: How Communicative Goals Shape the Balance of Opinion About Health Claims on Social Media

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Increasingly, social media users are exposed to health-related claims made by others. In the face of much conflicting information, the question of how people select which information they pass on is important. Selective sharing (e.g., sharing only posts that support a claim) may distort subsequent perceptions of what other people think. Across two experiments, we asked people to share information with different communicative goals in mind to examine the relationship between such goals and information sampling. In Experiment 1, we found distinct sharing behaviours across these goals, and that when given no explicit goal, people tend to share as if they were advocating for their preferred stance rather than representing the balance of opinion in a more nuanced way. Experiment 2 replicated these results even when the balance of opinion opposed people's own beliefs. This research highlights the importance of understanding how information sampling biases may systematically distort social learning.

AI-Podcast Misinformation: Testing Active versus Passive Inoculations

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Realistic AI-generated audio content is a new format of persuasive information that can be used to mislead audiences. This study examined the cognitive impact of an AI-generated podcast falsely raising concerns about nanoparticles in sunscreen and tested source-focused inoculation strategies. Participants (N = 500) either received a neutral podcast (control), a misleading article, or a misleading podcast preceded by either a passive inoculation explaining how AI-generated information can deceive, an active inoculation that added an educational activity, or no intervention. The podcast and article produced comparable

increases in misinformed beliefs. Only passive inoculation significantly reduced general trust in AI-generated information; while both interventions attenuated the podcast's impact on beliefs, neither eliminated misinformation effects. Results demonstrate that AI-generated audio can influence health-related beliefs as strongly as text-based misinformation, and that brief source-focused inoculations can mitigate but not eliminate its persuasive impact. Findings inform interventions targeting emerging forms of AI-driven misinformation.

The role of the visual periphery in perceptual and social development

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Almost all vision-based research during infancy concentrates on foveated space. But the majority of visual processing occurs outside the fovea. Importantly, models of exogenous light penetration to the uterus indicate that it is not dark during development. Given evidence for light in the womb, what does this mean for the development of the visual system? First, we must consider the role of light in the formation of the visual system. I will present new monte carlo modelling exploring how light interfaces with different layers of maternal tissue. This work shows that there is sufficient light in the uterus to enable a visual experience by the fetus during the third trimester. I will outline the methods that I have been developing based on well-established infancy paradigms to explore fetal visual functionality, as measured by ultrasound and behavioural response. Postnatally, our understanding of the visual periphery during infancy is relatively limited. I will outline experiments indicating that the extreme visual periphery for an infant is different to that of an adult. Despite this, I will illustrate how peripheral space is flexible as a function of stimulus, with face-like stimuli and emotional content changing how information is processed. By the end of this talk, I hope to have convinced you that understanding the development of the visual periphery is a critical aspect of psychological development from fetus to infant.

Neural responses to emotional auditory stimuli in toddlers: An exploratory ERP study of the Kia Tīmata Pai (Best Start) Brain and Behaviour Development Substudy.

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The ability to recognise and discriminate the emotions of others is essential for an array of social-cognitive skills. In preschoolers, this socioemotional understanding is closely linked to the development of oral language and self-regulation. This study examined preschool children's neural responses to happy and angry auditory stimuli using EEG data from 154 participants aged 24.4–38.7 months of age from the Kia Tīmata Pai (Best Start) Brain and Behaviour Development substudy. Some of these children were receiving an oral language intervention. Participants were presented with five common household commands in either a happy or angry voice. Event-related potentials (ERPs) were time-locked to indicate neural responses to these stimuli. We hypothesised that angry stimuli would elicit greater attentional responses than happy stimuli, and that differentiation in ERP components would vary by intervention status and language ability. The results of this study did not support these hypotheses. No differences were observed by condition, intervention group, or vocabulary level. Possible explanations are discussed, including the challenges of ERP research with this age group and the limitations inherent in the study design. Future analyses of this data might benefit from an event-related oscillation approach, which is less sensitive to latency variability and may be able to index neural responses in the absence of precise time-locking.

Results from an interactive facial emotion recognition task with a digital child.

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Research has shown that emotion recognition abilities change across development and that, regardless of age, people perform better when stimuli are dynamic rather than static. Although videos improve recognition relative to photos, they are not interactive, leaving a gap in understanding emotion recognition in everyday contexts. In this study we used an AI powered digital child (DC) to examine whether caregiving experience influences adults' capacity to recognize changes in the DC's emotional expressions. A key methodological

advantage of the DC is that it provides a standardized stimulus, presenting identical emotional expressions across all participants, while still allowing for naturalistic, individualized interaction. This balance between experimental control and ecological validity is difficult to achieve with per-recorded video stimuli. We programmed the DC's face to randomly morph among 6 standard emotions. Two groups of adults, 40 parents and 40 students, conversed with the DC and indicated its emotion using a response time clicker. In addition to behavioral measures of accuracy and response time, we will present results from event related heart rate and skin conductance data to investigate participants' physiological responses to facial emotion changes. This study showcases the potential of an interactive, controllable digital child as a research tool to investigate social contingency. And advances our understanding of people's facial emotion recognition abilities.

What Kind of Mind? Mind Attribution to a Digital Simulated Child

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As social beings, we immediately assess potential interaction partners for presumed mental capabilities. We have strong intuitions about the minds of other humans (including infants) and other animals. However, recent developments in Artificial Intelligence (AI) raise questions about how we perceive the minds of beings that are non-biological, yet share linguistic and cognitive abilities with us. This is particularly relevant for our novel research tool, BabyX. BabyX is a digital simulation of a young child, powered by generative AI and computational models of emotion, behaviour, and learning. BabyX presents an interesting contradiction: a highly sophisticated piece of technology that looks and acts in a very child-like manner. This preliminary study asks: based on a photo and description, what kind of mind do participants perceive BabyX to have? 356 participants from Australasia, North America, and Europe rated the mental capabilities of eight entities, based on a picture and description of each (including an adult, child, BabyX, robot, ChatGPT, dog, stapler, and houseplant). Participants perceived BabyX to have a mind similar to ChatGPT, and different to all other entities. BabyX's mind perception ratings did not differ significantly between caregivers (N=179) and non-caregivers

(N=177). These findings provide a baseline of perceived mental characteristics for BabyX. Upcoming studies will explore how these ratings may change following observation and interaction with BabyX.

Exploring Parent-Child Play Experiences with Preschool-Aged Neurodivergent Children

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Play is widely positioned as central to children's development and as a key context for strengthening parent-child relationships. However, for neurodivergent children and their families, play is often examined through a deficit-based lens, with lived play experiences underrepresented in the literature. This qualitative study examines parents' perspectives on play with their neurodivergent preschool aged children. Semi-structured interviews with 13 mothers explored factors influencing enjoyment, engagement, and connection during play. Findings indicate that child led play, predictable sensory input, and bodily movement often supported engaging parent-child play experiences. Although dysregulation during play was identified as a challenge, parents also described these moments as important opportunities for learning and connection. Parents emphasised the value of being present during play, either through direct participation or parallel play, while respecting their child's autonomy. Therapeutic guidance (e.g., Occupational Therapy, Speech Pathology) increased parents' confidence to engage in play that was individualised to their child's needs. Together, these findings underscore the need to reconceptualise neurodivergent play as a meaningful, relational, and adaptive process, and to foreground parent-child play as a central site for support, understanding, and connection within neuro affirming practice.

The role of music in mitigating feelings of loneliness in older adults

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Loneliness in later life has been linked to accelerated cognitive decline (Samtani et al., 2022), spurring interest in accessible coping strategies such as music listening (Schäfer et al., 2020). Yet, the reasons for

choosing music to alleviate loneliness remain unclear. In two studies, we explored older adults' reasons for choosing music to cope with loneliness. Study 1 (N = 35) employed reflexive thematic analysis to identify key themes in participants' explanations for their music choices, while Study 2 (N = 118) applied structural topic modelling with a Bayesian Dirichlet regression to assess topic weights by loneliness levels and language groups (English, German, Spanish). More than 54% of participants indicated using music to reduce feelings of loneliness at least occasionally. Findings from Study 1 revealed themes including memory and engagement, and coping mechanisms including wellbeing and mental imagery. In Study 2, loneliness-alleviating music, compared to liked-only music, was characterised by greater engagement with autobiographical memory, positive affect, and personal meaning-making (Post.Prob $\geq .9999$). The findings differed with loneliness levels and language group. Altogether, the role of music listening during periods of loneliness may extend beyond hedonic enjoyment by engaging memory- and meaning-based processes, which in turn may foster social connection and promote healthy ageing.

Sharpening or dampening? Task demands determine the representational consequences of expectation

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Expected stimuli often elicit reduced sensory responses, referred to as expectation suppression; yet it remains unclear whether this phenomenon reflects sharpened or dampened stimulus coding of predictable input. Here we use a learned, biologically inspired computational model in which sensory activity is shaped by ecological factors including top-down context, task objectives, and activity costs. The model shows that expectation does not lead to a single representational outcome. When optimization calls for efficient suppression of redundant input, expected stimuli lead to dampened population responses and weaker stimulus readout. When the system must preserve fine-grained sensory information under task pressure, expectation instead sharpens the population code, improving discriminability despite reduced overall activity. We further show that the same trained model can appear to support opposite conclusions depending on how it is probed; different readouts and expectation regimes reveal either sharpening or

dampening. These results suggest that conflicting empirical findings may reflect differences in task regime, measurement strategy, and the computational role assigned to prediction. Rather than a single universal mechanism, the model predicts that sharpening dominates when expected features are behaviourally relevant, whereas dampening dominates when predictable input is redundant, allowing metabolic resources to be redirected toward surprising information.

Predicting Fast and Forward: Dual Expectation Mechanisms Supporting Adaptive Efficiency

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The brain processes continuous sensory inputs efficiently and flexibly by leveraging spatiotemporal regularities in the environment. However, it remains debated whether this efficiency arises from prioritizing reliable, expected events or informative, unexpected ones, as they offer contextual adaptive advantages. Previous findings have also questioned that earlier reported expectation effects could be inadvertently influenced by several factors, e.g., inadequate establishment of expectation, low-level sensory adaption and selective attention. Thus, to isolate genuine expectation effects, here we developed a new experimental paradigm that facilitated exposure to thousands of probabilistic visual events (spatially defined targets), while allowing for separation of adaptation, attention, and expectation. To assess the influence of expectation on sensory processing, observers were tasked with reporting and reproducing the location of (expected/unexpected) targets while their neural activity and pupil diameter were recorded with electroencephalography and eye tracking. Our pupillometry measures confirmed that unexpected events elicited surprise, while our behavioural and neural recordings provided complimentary evidence that expected events were represented with reduced fidelity compared to those that were unexpected. These findings support the dampening account of expectation, which may serve to prioritize unexpected events.

Decoding distraction: An EEG study of value-modulated attentional capture

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Resisting distraction is essential for successful behaviour. Past research has shown that distraction can be driven by prior experience. For example, individuals are slower to respond to targets in the presence of distractors which have previously signalled high-value rewards. Here, we used EEG and representational similarity analysis (RSA) to test whether reward learning also modulates the neural representation of task-relevant variables necessary for successful performance, namely target location, response selection, and S-R mapping rules. Participants (N=39) responded to a target according to a pre-cued response rule while ignoring a distractor. During the Reward Phase, the distractor colour signalled the reward available (high vs. low) for a correct response. In the Extinction Phase, the high-value colour was devalued to the level of the low-value colour, allowing us to examine the effect of abolishment of reward contingencies. Distractor value significantly impacted behaviour during the Reward Phase, and this effect disappeared during the Extinction Phase, demonstrating flexible updating of attentional priority. The RSA analysis revealed that distractor value also altered the neural representation of target location during the Reward Phase. Our results thus suggest that distraction driven by reward learning perturbs the brain's representation of task-relevant spatial information, providing new insights into the neural consequences of experience-driven distraction.

Cognitive Failures and Distraction-Induced Quitting During Visual Search

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The distraction-induced quitting effect occurs when salient distractors presented during visual search tasks cause increased target misses and faster target-absent response times (Moher, 2020). Here, we explored the relationship between individual differences in self-reported cognitive failures and the magnitude of this quitting effect. Correlational analyses were conducted on data from 114 participants who completed several measures, including the Cognitive Failures Questionnaire (CFQ) 2.0 (Goodhew & Edwards, 2024) and a visual search task measuring distraction-induced quitting. Although no relationship was observed between

cognitive failures and distractor-induced target misses, there was a positive relationship between self-reported cognitive failures and the magnitude of distractor-induced speeding on target-absent trials. That is, on average, the more cognitive failures an individual reported, the greater their distraction-induced speeding effect. Importantly, these findings are consistent with a recent explanation for the distraction-induced quitting effect which posits that cognitive effort associated with distractor suppression during search is a key driver of phenomenon (Shaikh et al., 2026).

How long does it take to recover from an interruption? Examining the resumption lag in dynamic task

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Modern environments abound with interruptions. In particular, we seem to be willing to let devices intrude at any time or place, including in high-risk situations such as driving where even momentary lapses in attention can have fatal consequences. In this pre-registered study, we examined the effect of irrelevant phone-like vibrations on performance during a dynamic sustained attention task, with a specific focus on how long it took participants to recover from any disruption. We also investigated whether these costs reflected basic exogenous attentional capture or were amplified when vibrations were attributed to participants' own smartphones. Different groups of participants completed the task either with their phone on the table next to the hidden vibration source, or without their phone. Both groups completed the task for 14 minutes during which phone-like vibrations were unpredictably presented in half the blocks. We found that vibrations impaired performance for four times longer than the duration of the vibration (relative to no-vibration blocks) and induced oculomotor capture, primarily in the group with phones. Developing an understanding of the timecourse of distraction is critical for developing theories of how we recover from interruption, and public awareness of the costs. Funding: ARC DP220101067 to ANR & DS, Future Fellowship FT230100119 to ANR.

Dynamic competition between bottom-up saliency and top-down goals in early visual cortex

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Task-irrelevant yet salient stimuli can elicit automatic, bottom-up attentional capture and compete with top-down, goal-directed processes for neural representation. However, the temporal dynamics underlying this competition, and how they influence early visual processing, remain poorly understood. Here, we combined electroencephalography (EEG) with Rapid Invisible Frequency Tagging (RIFT) to non-invasively and simultaneously track early visual cortex responses to target and distractor. Both target and distractor evoked stronger initial RIFT responses than nontargets, reflecting top-down and bottom-up attentional effects on early visual processing. Importantly, the presence of a distractor attenuated the initial RIFT response to the target, reflecting competition during the initial stages of visual processing and predicting subsequent behavioral performance. RIFT responses to the distractor eventually even decreased below responses to the target and nontarget, representing active suppression of task-irrelevant but salient stimuli. We show that the dynamic interplay between top-down control and bottom-up saliency directly impacts early visual responses, thereby illuminating a complete timeline of attentional competition in visual cortex.

I'd know that face anywhere: The effect of scene context on unfamiliar face recognition

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Efficient face recognition facilitates connection and cohesion in our daily lives, enabling us to form relationships with new acquaintances, recognise old friends, and navigate dynamic social environments. Prior work demonstrates that unfamiliar face recognition is better when faces appear in the original scene context, compared to a changed context. What is unclear, however, is whether such effects reflect context's capacity to facilitate vs interfere with face recognition, and whether they

vary as a function of individual face recognition abilities. Here we addressed this question by tasking super-recognisers and control participants with selecting which of two faces they had previously seen during an incidental learning phase. Both the target and foil faces were superimposed on the same scene background; the critical manipulation was whether this scene was the same context in which the target face originally appeared, or a switched context that had originally belonged to another face. Preliminary results suggest that observers of all face recognition abilities are sensitive to a face's context. Both participant groups recognised unfamiliar faces better when they appeared in the same scene context as they had during learning, compared to a switched scene context. These results provide insight into the role of the relationship between faces and their visual environments, and how it may vary as a function of individual differences in face recognition ability.

The impact of backward masking on pareidolia detection

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The brain often identifies familiar patterns in ambiguous stimuli. A common example of this is face pareidolia, where people report seeing faces in a diverse range of ambiguous objects (e.g., in pieces of fruit or electrical outlets). Recent EEG findings suggest differences in the early neural responses to pareidolia-inducing images compared to non-pareidolia images. Multivariate pattern analyses of these data suggest the brain undergoes a non-linear shift between responding to pareidolia-images as real faces or as objects. Here, we investigated the temporal dynamics of early changes in the perception of pareidolia-images. To do this, we employed a backward masking paradigm where people were asked about either the face-like or object-like properties of pareidolia and non-pareidolia images across a range of mask onset delays. We found that people were generally better at identifying face-like than object-like properties in backward-masked images across mask delays, and even at very brief delays that can disrupt clear perceptual experiences. However, this advantage was not constant –suggesting an evolution of interactions between separable face and object-centred analyses of a common set of inputs. We discuss how this pattern might reflect on a dynamic competition between bottom-up sensory

responding to inputs and top-down expectations, with perceptual outcomes emerging from a non-linear resolution of this conflict.

An item response theory analysis of the 20-item prosopagnosia index

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The 20-item prosopagnosia index (PI20) is widely used as a practical screening tool to assess developmental prosopagnosia (DP) in experimental psychology. While previous studies have reported variability in item performance using classical test theory across various language versions of the PI20, item-level properties using item response theory have not been evaluated. This study aimed to examine the item properties of the PI20 using item response theory. A sample of 599 adults from the general population completed the Japanese version of the PI20 using a 5-point Likert scale. Marginal reliability was high, and global fit and local independence indices generally supported unidimensionality. A unidimensional graded response model revealed heterogeneity among items in terms of discrimination, difficulty, and item information. Specifically, items describing the increased cognitive effort and social impact associated with difficulties in face processing exhibited high discrimination and item information. In contrast, the item related to the recognition of distinctive faces (Item 3) and the item related to one's own face (Item 13) exhibited low discrimination and item information. These findings suggest that while most PI20 items adequately capture the characteristics of DP, certain items may not sufficiently represent the underlying construct of DP. These findings contribute to refinement of PI20 and the conceptualization of DP.

Picture-plane rotation dissociates facilitation and interference in holistic face processing

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Whether holistic face processing reflects orientation-specific face representations or flexible attentional strategies remains a central issue in face

perception. Recent work suggests that holistic processing is not unitary but comprises two dissociable components: facilitation and interference. The present study tested whether these two components rely on distinct mechanisms by examining how picture-plane rotation affects them in the complete composite task. If interference depends on face templates, it should change nonlinearly as orientation departs from upright. By contrast, if facilitation relies more on attentional strategies, it should be less disrupted by rotation. Across two experiments, rotation influenced holistic processing primarily through interference rather than facilitation. In Experiment 1, composite effects were observed at orientations up to 90°. Facilitation did not vary reliably across rotations, whereas interference was stronger at smaller rotations and declined abruptly at larger rotations. This pattern was replicated in preregistered Experiment 2, which prevented head tilting. Polynomial contrast analyses further revealed nonlinear effects of rotation on interference, but not on facilitation. These findings suggest that interference, but not facilitation, is constrained by orientation-specific mechanisms, supporting that face templates selectively underlie interference, whereas facilitation appears to rely more on attentional strategies.

Robust categorical organisation of face space in healthy ageing

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Adult ageing is associated with complex changes in how facial information is perceived. Yet our understanding has relied almost exclusively on studies which ask participants to apply discrete emotion labels to tightly controlled posed facial expressions. Here, we used a data-driven behavioural similarity approach to map perceptual judgements across 108 adults aged 60-98 using 75 naturalistic face images from the Wild Faces Database (Long, Peluso, et al., 2023, Scientific Reports). Using Representational Similarity Analysis, we found that older adults' perceptual similarity judgements were most strongly predicted by independent stimulus-derived models of facial action unit detection (OpenFace) and colour, as well as our data-derived models of familiarity and genuineness. Multidimensional scaling and hierarchical clustering revealed a rich underlying geometry with pronounced categorical organisation, with clustering organised primarily around facial

gesture underpinned by stable demographic cues such as age, gender, or ethnicity. Together, these results indicate that healthy ageing is associated with a sophisticated organisation of naturalistic face space in favour of highly variable social cues. They further highlight the importance of ecologically valid stimuli and task design to understand how ageing influences real-world face perception.

Following the Algorithm: When Automation Reliance Overrides Individual Differences in Face Matching

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In many applied settings that require identity verification, Automated Facial Recognition (AFR) systems have been installed as they do not suffer from the same operational limitations as humans. Humans often provide oversight of these AFR system decisions, yet their face matching accuracy is typically worse than that of the AFR system. The current study investigated whether personality traits or cognitive control affect human reliance on automated decisions in a face matching task. Participants ($n = 154$) completed a face matching task by first submitting an initial unassisted identification decision (same, different), before viewing the identification from a simulated AFR system and submitting a final decision. Participants then completed a personality trait questionnaire and the Stroop task (cognitive control). We found that during unassisted face matching, cognitive control and personality traits of extraversion, conscientiousness, and neuroticism, were associated with performance differences. But when participants were assisted by the simulated AFR system, those individual differences largely disappeared because almost all participants improved. While higher cognitive control was associated with increased task accuracy, it did not assist with detecting AFR system errors. Therefore, algorithm assistance may reduce the influence of individual differences on face matching performance, by changing the cognitive demands of the task.

Boosting the memorability and effectiveness of fact-checks

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Fact-checks can reduce belief in misinformation, but their effects often fade over time—a phenomenon known as belief regression, where corrections weaken as people forget them. Across three experiments, this study tested whether making fact-checks more memorable could improve their long-term impact. Participants rated true and misleading claims, received fact-checks under different conditions, then reassessed beliefs and memory immediately and up to four weeks later. Experiment 1 tested mnemonic imagery, where participants linked fact-checks to the image of a “liar” or “truthteller.” This was compared with reading, intentional study, summarising, and simple imagery. Stronger memory predicted more lasting belief change, but only the written-summary condition reduced belief regression after one week—likely because summarising is a familiar skill, unlike the mnemonic. Experiments 2 and 3 examined adding graphs to fact-checks. Graphs improved memory but did not consistently improve the ability to distinguish true from false claims. However, when paired with multiple-choice questions to encourage active engagement, graphs improved discernment immediately and after four weeks. Overall, strategies that promote active engagement—such as summarising or interacting with visuals—enhance memory for fact-checks and help sustain their effects over time.

Examining the Effectiveness of Safeguards for Protecting Against Misinformation in AI-Generated Police Reports

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Generative AI systems are increasingly used to generate police reports from audio sources, such as body-worn camera footage. AI report-writing tools are marketed to improve report-writing efficiency; however, initial evidence suggests that they do not increase report-writing speed and instead contaminate officers' reports with misinformation. In this study, we examined how a misleading, AI-generated incident report influences memory and perceptions of a police incident, and whether current safeguards are effective at reducing those impacts. Participants read a summary of police responding to an alleged domestic-violence incident; 24 hours later, they read an AI-generated

report that did or did not contain misinformation. Two safeguards were tested: (1) actively identifying and correcting errors, and (2) watching the associated body-worn camera footage. Participants completed cued-recall and recognition memory tests and rated their perceptions of the incident, as well as their identification with police. The misleading report significantly impaired memory and distorted perceptions of the incident, especially among participants who reported high levels of identification with police. Safeguards were largely effective at reducing the impact of the misinformation on memory and perceptions. Our findings highlight the risks of using generative AI in legal systems and the importance of employing appropriate safeguards to protect against error and bias in AI-generated content.

Examining Hyper-Binding in Ageing: An Individual Differences Approach

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A critical function of episodic memory is the ability to form associations between contextual elements of an experience. While the age-related decline in episodic memory has traditionally been attributed to an associative binding deficit, it has more recently been suggested that older adults may actually bind too much information and recall it in a later memory task – a phenomenon known as hyper-binding. In the current study, we examined the extent to which normal ageing and attentional control independently contribute to hyper-binding. Older ($n = 96$) and younger ($n = 81$) adults completed a standard hyper-binding paradigm involving a 1-back task and paired associates memory task to assess implicit associative memory. During a 10-minute filled delay, participants also completed several tasks serving as both fillers and measures of individual differences in attentional control. As predicted, older adults' attentional control was substantially worse than that of younger adults. Bayes Factors revealed extreme for hyper-binding in both age groups; however, evidence for an age-related difference in hyper-binding was equivocal, and age did not appear to moderate the relationship between attentional control and hyper-binding. We also found evidence against a correlation between individual differences in attentional control and hyper-binding. Together, these findings question whether hyper-binding is an age-related effect, and the role of attentional control in hyper-binding.

Disentangling the role of semantic priors and sensory details in autobiographical memory retrieval

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Although there is evidence of stable individual differences in whether episodic memories are recalled in terms of specific detailed events or more general summaries over multiple events, we still lack a full theoretical explanation for why these differences exist. Episodic memory retrieval is often viewed as a reconstructive process combining semantic knowledge and sensory information; thus, greater reliance on summary information could trade off against detailed processing of sensory information. How might this trade-off occur? One recent suggestion is that people adaptively compress episodic information into semantic knowledge based on how surprising new events are in a way that approximates Bayesian inference (Nagy, Orbán, & Wu, 2025). Here we test this possibility using two primary behavioural tasks (a sentence comprehension task and a probabilistic learning task) which vary in modality and also permit us to systematically manipulate the strength of prior knowledge and the noisiness of the sensory evidence. We correlate Bayesian measures of reliance on prior knowledge in both tasks with a measure of autobiographical memory specificity using the Autobiographical Memory Test.

Investigating the Neural Correlates of Automaticity in Procedural Category Learning using EEG

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Procedural category learning provides a useful framework for investigating how skills become automatic with extended practice. One influential account proposes a single-stage model in which early learning depends on dopamine-dependent synaptic plasticity within cortico-basal ganglia circuits. With practice, control shifts from subcortical to direct cortical pathways as performance becomes automatic. However, the single-stage model cannot

account for key behavioural findings in procedural category learning. This led to the development of a two-stage model of initial learning, in which learning is supported by two cortico-basal ganglia circuits connected in series, with dopamine-dependent synaptic plasticity occurring at both stages. If initial learning is best characterised as a two-stage process, theories of automaticity may likewise require two stages rather than one. The present study aims to address this possibility. Participants will complete a procedural category learning task across 21 days, with five EEG sessions distributed across training. One- and two-stage models of automaticity will be implemented as biologically detailed spiking neural networks and used to derive predictions about the development of automaticity, both at the behavioural and neurophysiological levels, in the same task performed by human participants. Model-based analyses will compare human data with model predictions to determine which account better explains the development of automaticity.

Pareidolia and Visualisations

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Differences in the conscious experience of imagery intensity may give us insight into the underlying mechanisms of consciousness in general. One unanswered question is the degree to which the vividness of visual imaginations can alter our perceptual experiences of the world. To this end, we wanted to determine if the vividness of different people's visual imaginations would be associated with susceptibility to pareidolia (seeing faces in objects). Participants reported on the typical vividness of their visualisations and rated how face-like an image was. They rated images of non-face objects known to elicit pareidolia, images depicting non-face objects that do not tend to induce pareidolia, and images of human faces. There was no robust relationship between the vividness of people's visualisations and face-likeness ratings for images known to elicit pareidolia. However, there was a positive inter-relationship between face-likeness ratings of non-face objects and imagery vividness ratings. Our data suggest that people who report having more vivid visualisations are more likely to perceive faces in images of non-face objects. Our data suggest that people with vivid visual imaginations have visual experiences of the physical world that are more governed by internally

generated expectations than is the case for other people.

Adapting to seen and imagined faces

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Adapting to one face reliably influences the next face we see. If a morph blends the features of the adaptor face with a new one, visual adaptation makes the new features more likely to be perceived as dominant. But would imagining someone's face have the same after-effect as looking at it? If mental imagery is functionally equivalent to weak perception, it should follow that it can lead to (attenuated) adaptation. However, different imagery studies show contradictory results: some show adaptation and others - priming of subsequent perception. To address common limitations of imagery studies, such as subjective measures and response bias, we designed a new task based on psychophysical methods. Using a between-subjects design, we compared a Baseline condition (in each trial participants reported which identity dominated in a morph) to Perception (in each trial the morph task was preceded by a real image of one of the two blended faces) and Imagery (in each trial the morph task was preceded by an instruction to imagine one of the two faces). Using the point of subjective equality (PSE) in each condition as a dependent variable, we demonstrate that Imagery leads to an attenuated but significant adaptation effect (the Imagery PSE is lower than the Perception condition but significantly higher than Baseline). This supports a view of imagery as a form of weak perception and poses important questions about the interaction between imagery and face perception.

Predicting imagery vividness relative to perception with EEGNet

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Previous studies suggest that visual mental imagery (VMI) acts as a weaker form of top-down visual perception (VP), with the two becoming more similar as VMI vividness increases. However, this relationship remains ill-defined, and it is unclear precisely how much weaker VMI is relative to VP. Here, we introduce an original probabilistic deep

learning approach to quantify vividness at the neural level. Thirty-four participants either imagined or perceived stimuli presented at varying levels of vividness and provided trial-by-trial, picture-based vividness ratings. EEG activity recorded during VP was used to train a convolutional neural network (EEGNet) to predict perceived vividness from eight posterior electrodes. A leave-one-subject-out procedure with k-fold cross-validation showed that the model generalised across participants with above-chance accuracy. On VP trials, predictions tracked vividness labels, with reliable interpolation to new vivid labels not included during training. Applied to VMI trials, mean predicted VMI vividness correlated with predicted VP vividness but remained substantially lower, consistent with “barely-pictorial imagery”. For 91% of participants, mean predicted VMI vividness was also lower than, yet scaled with, mean subjective VMI vividness. This framework provides a principled way to quantify and compare VMI and VP on a shared neural-behavioural scale, with implications for studying individual differences and aphantasia.

Semiotic System—Unitisation Membership Model of Induction in Synaesthesia

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Synaesthesia involves stable concurrents triggered by specific inducers, yet existing models do not fully explain both selective (e.g., grapheme-colour) and non-selective (e.g., sound-or affect-colour) forms. We propose that induction is gated by membership in representational (semiotic) systems. Crucially, neither low-level sensory features nor semantic content alone is sufficient to induce synaesthesia. A structured system is a (semi-)closed set of categorically differentiated units within a rule-governed domain. Inducers are therefore system-defined units: letters, phonemes, musical or calendar elements, affective states, or perceptual profiles, whose recognition elicits concurrents. Symbolic and perceptual domains alike are treated as experience-led unitisations within structured systems. Concurrents generalise across sensory variants, depend on categorical recognition, and form stable mappings at the system level. Non-selective forms cluster along perceptual dimensions, and intermediate types rely on categorically organised percept-like units. Inducer systems operate independently of referential meaning and are perceptually automatised. Developmentally,

early onset and stability reflect entrenched system representations. Neurocognitively, the model predicts rapid induction via system recognition rather than direct sensory cross-activation. This framework unifies synaesthesia types and provides a testable, integrative account grounded in perception and categorisation.

Mental Rotation is Unaffected by Acute Stress Induction or Schizotypy

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Prior research demonstrates that schizophrenia populations have significant visuospatial challenges. However, mental rotation findings among non-clinical populations with high schizotypal traits are mixed. Further, whilst schizotypy is associated with alterations in stress, the influence of stress on mental rotation is yet to be explored. This study investigated the effects of acute stress induction and schizotypy on mental rotation in a non-clinical sample. Twenty-two participants (8 male, 14 female) aged 18 to 30 completed the Maastricht Acute Stress Test involving hand immersion in ice-cold water and a no-stress condition with lukewarm water. Mental rotation stimuli (modelled from the Shepard and Metzler [1971] figures) were presented. Pairs of objects were presented side-by-side, which were either the same exemplar or mirrored exemplars. Their orientation differed by either 0, 50, 100, or 150 degrees. Participants were tasked to mentally rotate one of the objects to indicate whether it could align with the other via button-press response. Replicating classical effects, participants were slower ($p < .001$) and less accurate ($p < .001$) the larger the differences in angular rotation. However, stress induction and levels of schizotypy did not affect performance on mental rotation (all $p > .388$). Our findings suggest that the visuospatial differences seen in schizophrenia populations are not replicated in non-clinical groups with high schizotypy.

What Crowdsourcing and AI Reveal Tell us About How Humans ‘See’ Foods

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How does the human brain represent foods from

vision alone? We used an odd-one-out triplet similarity task with crowdsourcing ($N = 294$) to map the mental representation of 350 food images. On each trial, participants selected the item that “didn't belong” from three foods, free to use any basis for their choice. Aggregated responses (141,600 trials) revealed a low-dimensional similarity space structured by two dominant axes: savoury–sweet and health–indulgence. We then tested a range of models to explain this structure, including human perceptual ratings, AI-generated ratings, food category labels, and image-derived visual features. Food category was the strongest predictor, matching the predictive power of ten continuous human-rated dimensions combined. Semantic properties, savouriness, sweetness, healthiness, and calorie density, further explained how foods were arranged within and across this categorical scaffold, whereas low-level visual features contributed minimally. Interestingly, AI-generated ratings outperformed matched human ratings for flavour dimensions such as savouriness and saltiness. We argue that this reflects AI's ability to draw on broad semantic consensus about what foods typically taste like, a richer signal than can be inferred from a single image alone. Together, these findings reveal a hierarchical structure in visual food perception, in which category provides the dominant scaffold and continuous semantic properties refine it.

Real or Generated? Testing signal detection models of realism across visual scene categories

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AI-generated images are now so realistic that they can be indistinguishable from real photographs. Despite the difficulty, it remains unclear how humans make real-vs-generated judgments. To address this question, we focused on the underlying perceptual processes by sampling across a variety of visual scenes. We collected 720 real photos from online databases, 60 from each of 12 categories: face, body, group, pet, wildlife, nature, wearable, food, tools, indoor, building, and tourist spot. For each photo, an image-to-text LLM first generated a scene description, which then served as the prompt for a text-to-image LLM to create a theme-matched generated image. We ran 3 online experiments on Prolific where observers made real-vs-generated judgements on images and then rated their confidence. In Exp 1 ($n = 200$), 2AFC discriminability and metacognition varied substantially across scene

categories, e.g., {mean d' & Z-confidence} for face: {0.80 & 0.10}; for indoor: {0.50 & -0.09}; but for food: {0.96 & 0.04}. Interestingly, 2AFC d' was higher when the real and generated images matched in theme (Exp 1: $M = 0.72$, $SD = 0.13$) than when they were mismatched (Exp 2: $n = 197$; $M = 0.29$, $SD = 0.20$), suggesting that observers relied partly on theme-based information. Finally, Yes/No d' (Exp 3: $n = 232$; $M = 0.37$, $SD = 0.15$) systematically underpredicted 2AFC d' (predicted $M = 0.52$ vs measured $M = 0.72$), indicating that standard equal-variance SDT cannot fully account for realism perception.

Strategy Frequency Biases Metacognitive Beliefs About Efficacy

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Metacognitive beliefs about the effectiveness of learning strategies play a critical role in guiding study behavior, yet learners often misjudge which strategies are most effective. We propose that such inaccuracies arise in part from frequency-based biases in causal learning: strategies that are used more often may be perceived as more effective, independent of their actual impact on performance. Across three experiments, we tested whether the frequency of strategy use influences perceived efficacy. Participants completed a classification task in which two strategies were presented at different frequencies while objective accuracy was either equated or manipulated. In Experiment 1, when performance was matched, participants rated more frequently encountered strategies as more effective, particularly when accuracy was manipulated to be at or above chance. Experiment 2 showed that while participants were sensitive to true differences in efficacy, frequency continued to exert an independent bias on judgments. Experiment 3 demonstrated that these biased beliefs translated into behavior, with participants preferentially selecting previously frequent strategies in a subsequent choice phase without feedback. Together, these findings indicate that metacognitive strategy beliefs are shaped by frequency-based heuristics, revealing a novel mechanism contributing to persistent inaccuracies in self-regulated learning

Effects of unconscious information on perceptual and metacognitive judgments

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Metacognitive evaluations of confidence are typically assumed to reflect the quality of evidence supporting perceptual decisions. However, the role of unconscious sensory signals in this process remains unclear. This study employed a dichoptic random-dot-motion task, in which suppressed motion information preceded visible motion. In each trial, participants underwent a prime phase, in which motion information was interocularly suppressed, and then a target phase with motion at different levels of coherence was presented binocularly. Participants reported motion direction, confidence level, and prime visibility. Trials were categorized by the congruency between suppressed and visible motion. Congruent signals improved discrimination performance (d'), indicating that unconscious information influenced perceptual decisions. In contrast, confidence ratings did not vary reliably across conditions. Meta- d' showed a similar pattern to d' , with higher scores observed in the congruent condition relative to the other comparison conditions. However, this effect was not supported when accounting for performance using metacognitive efficiency (meta- d'/d') and hierarchical model, suggesting no reliable group-level change in metacognitive sensitivity. The results suggest a dissociation between perceptual performance and metacognitive evaluation, whereby, unconscious signals can bias first-order decisions without necessarily improving subjective confidence or metacognitive efficiency.

Development of adaptive behavioural adjustments in arithmetic and spatial compatibility rule switching tasks

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Metacognitive regulation is a higher order thinking process that enables individuals to monitor and control their behaviour during a task, by adjusting cognitive control when performance is not optimal. After making an error, individuals usually slow down, a phenomenon called post-error slowing (PES). Research suggests that PES during slow, high conflict, or difficult tasks, in which participants can improve their performance, is an indicator of metacognitive regulation. This study measures adaptive behavioural adjustments, including PES, in

arithmetic and spatial compatibility rule switching tasks to investigate the development of metacognition. Children aged 7 to 13 years old and adults complete two blocks of each switching task, with differing instructions – one emphasising accuracy, the other both speed and accuracy. We hypothesise that greater PES and accuracy will be observed in the blocks emphasising accuracy and that there will be developmental differences in block-level and trial-level adaptive behavioural adjustments. Further analyses compare behavioural adjustments in the two tasks to investigate whether there is evidence of the development of domain general processes underlying PES over late childhood and early adolescence. These findings will help to understand the development of PES, how it is moderated by task and difficulty level, and the conditions in which it may reflect the engagement of adaptive metacognitive monitoring and control.

Endurance exercise reduces motivation for physical and cognitive effort without impairing cognitive performance

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Prolonged physical exertion can reduce the capacity (physiological fatigue) or willingness to exert further effort (motivational fatigue). While prior work has shown that physical exertion diminishes motivation for physical effort, it remains unclear whether these effects generalize to cognitive effort. Here we tested whether endurance exercise alters motivation in a domain-general manner. In two experiments using within-subjects crossover designs ($n = 30, 32$), participants completed 50–60 minutes of cycling at “somewhat hard” (physical exertion condition) and “extremely light” (control condition) perceived intensity levels, followed by effort-based decision-making tasks that revealed preferences for additional physical or cognitive effort. Physical exertion led to steeper discounting of rewards offered for both effort types. Such effects were observed when choices were hypothetical (Experiment 1) and when participants enacted a randomly selected choice (Experiment 2). Critically, motivation for cognitive effort declined despite unchanged cognitive performance. Mathematical modeling showed that exertion shifted the point at which effort was no longer worth exerting, and heart rate analysis suggested that bodily exertion signals

influenced the magnitude of these shifts. We conclude that physical endurance exercise affects effort valuation without measurably affecting cognitive performance capacity, resulting in domain-general reduction in motivation for further effort.

Perceived effectiveness versus actual use of music performance anxiety mitigation strategies among Australian tertiary music students

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Psychological challenges are common among student musicians. Understanding the relationship between perceived treatment effectiveness and actual intervention use is crucial for addressing barriers to mental health support, yet little is known about how these align in practice. Music performance anxiety (MPA) provides a valuable context to examine this perception-behaviour gap, because students utilise multiple mitigation strategies with varying accessibility. This study examined perceived effectiveness and usage of mitigation strategies among 132 Australian tertiary music students. Participants completed questionnaires assessing MPA severity, strategies effectiveness, and usage patterns. Results revealed a systematic dissociation between perceived effectiveness and usage across multiple strategies. Counselling demonstrated the largest discrepancy (Post.Prob = 0.98*) where students rated it as highly effective, yet utilisation rates remained comparatively low. Prescription medications showed the inverse pattern (Post.Prob > 0.99*), with students using pharmacological aids more frequently than their perceived effectiveness would suggest. These findings indicate that accessibility barriers, including stigma surrounding psychological support, drive treatment choices. Results emphasise the need to integrate evidence-based psychological training (e.g., mental imagery interventions, psychoeducation) and improve access to specialised mental health services for music students.

Diversity in neurodiversity can disrupt interpersonal coordination

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As a foundation for social interaction, interpersonal coordination functions to instantiate a common ground on which goal-directed activity can unfold. Accordingly, researchers have sought to identify factors that impact coordination and in turn the efficacy of social exchange. Individual differences in traits associated with psychopathology have emerged as robust predictors of disruptions to coordinated behaviour. Surprisingly, however, little work has considered the impact of symptoms associated with attention deficit hyperactivity disorder (ADHD) despite strong arguments for similar effects. To address this gap, we considered how subclinical variation in ADHD traits impacted interpersonal coordination during a collaborative task. Pairs of participants worked together on puzzles modelled on an escape room while their movements were unobtrusively tracked. Contrary to expectations, there was no impact of cumulative ADHD symptoms on interpersonal coordination. Notably, however, within-pair differences in symptom levels showed reliable effects – pairs more closely matched in ADHD spontaneously coordinated to a greater extent than those with disparate levels of symptom. These results highlight the importance of considering how the context provided by an interaction partner constrains the dynamics of interpersonal behaviour and underscore the utility of a strengths-based approach when considering the influence of neurodiversity on key interpersonal processes.

Lost Focus, Found in VR: Enhancing ADHD Assessment Through VR-Based Attention Network Test

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The attentional network system comprises three distinct networks: alerting, orienting, and executive control. The Attention Network Test (ANT) has been used to assess these networks in individuals with ADHD. However, recent meta-analyses reported inconsistent findings regarding ANT performance in this population. Critically, none of the studies across the meta-analyses reported reliability metrics. This is concerning, as the ANT generally produces reliability estimates below the level needed for applied research. The current study recruited 80 participants aged 18-25 years, with and without

ADHD, to perform a VR-based ANT, with hand and eye movements recorded. Preliminary analyses revealed robust alerting and orienting effects in movement initiation times and gaze behavior, along with robust executive effects across all hand-tracking measures. Split-half reliability scores were moderate to acceptable for alerting and orienting networks (.64 to .72), and strong to excellent for the executive network (.86 to .94). For participants diagnosed with ADHD, reliability was low for alerting network (.56), and strong to excellent for orienting and executive networks (.86 to .97). Additionally, a significant overall RT difference was observed between formally diagnosed, unmedicated participants and controls, consistent with prior meta-analytic findings. These findings suggest that the VR-ANT may provide a richer, more reliable tool for investigating attentional control in ADHD.

Postural Sway and Cognition in Elderly People with Dementia

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Current diagnosis of dementia relies heavily on subjective clinical judgement, which undermines diagnostic accuracy. Measures of postural control – i.e. postural sway – offer a depth of highly sensitive data that have been shown to correlate with dementia severity. Currently, no research has examined the direct relationship between cognition and postural sway in people with dementia. A more robust understanding of this relationship could contribute to dementia related diagnostic research. This study uses a cross-sectional experimental design to examine the relationship between cognition and postural sway. 15 elderly participants with dementia and 19 aged-matched peers took part in the study. Participants completed the Montreal Cognitive Assessment as well as a postural sway assessment using a force plate. Dementia participants displayed significantly higher postural sway than controls. Age, gender, and diagnostic status accounted for a significant 33.8% of variance explained in postural sway area. The inclusion of MoCA score improved the model by an additional 10.5%. Postural sway area was moderately correlated with MoCA score in analysis for dementia participants and strongly correlated for whole cohort analysis. Postural sway path length was moderately correlated with MoCA score for whole cohort analysis. Metrics of postural sway have the potential to offer useful clinical information and

represent a promising candidate for future objective dementia related diagnostic tools

Brainstem control dysregulation in late-life depression revealed by pupillometry and microsaccades

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Late-life depression (LLD) is a heterogeneous neuropsychiatric condition in which affective, cognitive, and autonomic symptoms overlap with normative ageing, complicating diagnosis. Evidence implicates dysregulation within brainstem control systems, particularly the locus coeruleus–norepinephrine (LC–NE) network, which modulates arousal and autonomic balance. The superior colliculus (SC), a midbrain hub integrating cortical and neuromodulatory inputs to generate eye movements, provides a sensitive readout of these dynamics. Because pupil responses and microsaccades reflect LC–NE activity via SC pathways, eye tracking offers a mechanistic window into circuit dysfunction in LLD. Across a series of studies, we examined pupil light and darkness reflexes, task-evoked pupil dilation, blink rate, and microsaccade dynamics in older adults with LLD and age-matched controls. LLD showed attenuated pupil constriction, increased reflex variability, elevated blink rates, and impaired microsaccadic inhibition and rebound during luminance transitions. In emotional face–word Stroop tasks, LLD exhibited blunted sympathetic-linked pupil components and altered microsaccade rate modulation during emotional conflict and valence processing. These findings indicate disrupted visual–autonomic regulation and altered neuromodulatory control in LLD, highlighting eye tracking as a scalable and neurobiologically interpretable approach for probing circuit dysfunction in clinical ageing.

Prediction-based motor attenuation in schizotypy

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Neural responses to sensory input are weaker when that input is expected compared to when it is unexpected. This process of sensory attenuation is

blunted in individuals with schizophrenia and those high in schizotypy, and this deficit has been linked to the experience of positive symptoms. We have reliably demonstrated that the response of the motor system to direct input — achieved by applying transcranial magnetic stimulation (TMS) to motor cortex — displays similar properties: motor evoked potentials elicited by expected stimulation are attenuated relative unexpected stimulation. Notably, individuals covary in the degree of attenuation across sensory and motor domains, suggesting there may be individual differences in predictive processing. The current experiment investigated whether motor attenuation is also blunted in individuals high in schizotypy. Participants learned to expect motor stimulation either through self-generated key presses that triggered TMS, or through visual cues that preceded TMS. Schizotypy traits were uncorrelated with the magnitude of motor attenuation from visual cueing, but individuals high in schizotypy showed blunted motor attenuation from self-generation. The results extend existing evidence of motor impairments in schizophrenia. The findings have important implications for understanding schizophrenia symptomology, classification, and diagnosis, and for how predictive mechanisms are related across different neural systems.

Rapid, Robust, and Reliable Assessment of Contrast Sensitivity in Augmented Reality

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The Pelli-Robson chart, clinical gold standard for contrast sensitivity (CS), has coarse step sizes (0.15 log), practice effects, and moderate test-retest reliability. We developed a novel, gamified Virtual Reality (VR) assessment and evaluated efficiency, reliability, and structure-function associations with Optical Coherence Tomography (OCT). 94 participants (188 eyes) completed both Pelli-Robson (48 Sloan letters) and VR (40 Sloan letters with temporal dithering for contrast resolution beyond display limits, staircased sampling, and psychometric fitting). 30 participants repeated all sessions twice for test-retest analysis. Ganglion cell complex (GCC) thickness was measured via OCT (Optovue Solix); linear mixed-effects models linked CS to GCC. Despite fewer responses, VR showed superior test-retest reliability: Bland-Altman 95% CI ± 0.17 vs ± 0.24 logCS; $r=0.80$ vs 0.49 (both $p<0.0001$), indicating reduced measurement variability. Critically, VR-

based CS was predicted by GCC thickness in the nasal macular region (1-3mm annulus, marginal $R^2=0.1$, $pFDR=0.001$), whereas chart-based CS showed no significant association in any retinal region. Adaptive VR assessment thus provides efficient, reliable CS estimates and reveals spatially specific structure-function relationships invisible to gold-standard charts. VR-based measures offer improved sensitivity for linking retinal integrity to visual function, and may enable early detection and tracking of structural and functional changes.

Can Psychology Explain Where Mathematics Comes From?

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Although mathematics origins have been a perennial question for philosophers, psychology must be part of any genuine answer because mathematics is human cognition. This talk will describe a new approach to mathematical cognition that my colleagues and I have pioneered, in which mathematics and psychology are used jointly and in parallel to develop explanatory theory. Questions such as “Why is arithmetic based on addition and multiplication”, or “Where do the natural numbers come from?” are posed in meta-mathematical terms and answered via formal proof. The key steps in the proof then provide a structural analogy or roadmap for a psychological theory. Using this approach, we have shown that principles of perceptual organization shared with nonhumans are sufficient to identify addition and multiplication as operations, thus implying a biological basis for arithmetic. We have also proposed a developmental theory of children's numeracy learning that aligns with a formal construction of natural addition and resonates with practice in early childhood education. Our results show that mathematics is both discovered and invented – a ‘mirror of symbols’ that reflects the fundamental nature of the mind. Clarifying the role of human cognition helps to explain many puzzling phenomena about mathematics, including the appeal of Platonism and its ‘unreasonable effectiveness’ in the physical sciences.

Temporal aspect of ‘Aha!’ experience

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People occasionally experience "Aha!" moments—a sudden flash of insight during problem-solving. Previous studies suggest that different mental states are associated with the "Aha!" moments: the immediate process leading up to an "Aha!" moment and a more general mental state conducive to insight. To investigate these two states, we analyzed temporal changes in facial expressions, EEG signals, eye movements, and pupil sizes during two types of tasks: the Japanese Remote Associates Test and Matchstick Arithmetic problems. Participants reported "Aha!" experiences approximately half of the trials. A machine learning classifier was constructed using two distinct datasets: data from 2s to 1s before the solution (Aha! Moment, AM, dataset:) and data from the beginning of the trial to 1s after (Trial Start, TS, dataset). The results demonstrated that facial features, but not pupil size and gaze distribution, are effective indicators for classifying "Aha!" experiences both at the moment of insight and at the start of the trial, although the specific facial features involved are somewhat different between these periods. Moreover, temporal changes of the classification accuracy showed quick reduction of effect to the change level for the AM dataset whereas accuracy remained relatively stable for the TS dataset. These findings confirm that there are different mental states associated with the "Aha!" moments.

Communicating forensic evidence in court: Do interpretation aids help or hinder?

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Statistical estimates such as likelihood ratios are used to convey the strength of forensic evidence in court, yet legal decision-makers often struggle to interpret them. Numerical presentations may impose cognitive load that further undermines evidence evaluation. This study investigated whether presenting a likelihood ratio with a numerical or verbal interpretation scale would reduce these burdens and improve evidence evaluation, compared to a numerical likelihood ratio alone. Participants read three mock forensic DNA reports with likelihood ratios of varying strength (moderate, strong and very strong) presented either as a numerical likelihood ratio alone, or with a numerical or verbal scale. Before and after each report, participants rated guilt, cognitive load and maths anxiety. Contrary to predictions, presenting

likelihood ratios with the scales did not reduce cognitive load or anxiety. Instead, cognitive load was predicted by maths anxiety, time spent reviewing the reports and was significantly lower for stronger evidence. The scales did, however, lower guilt ratings and perceived evidence strength relative to the numerical likelihood ratio alone, suggesting they may bias decision-makers toward more conservative evidence evaluations. These findings challenge the assumption that interpretation aids, such as verbal equivalent scales, improve understanding of statistical evidence. Implications for communicating likelihood ratios in expert testimony will be discussed.

Task Structure and Numerical Complexity in Bayesian Reasoning

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Natural frequencies are widely reported to improve Bayesian reasoning compared with probability formats. However, format effects often coincide with differences in inferential organisation and numerical demands, making it unclear whether representational format itself drives performance. The present research advances a task-structure explanation, testing whether apparent format advantages reflect the structural and computational properties of problems rather than the assumed privileged status of representational format. Two experimental studies manipulated sources of task difficulty while equating the number and type of computational operations required across conditions. Study 1 isolated numerical complexity by varying reference-class (base-10/non-base-10) and magnitude (small/large), while equating inferential structure between frequencies and probabilities. A simplified probability condition provided joint-event information, removing transformation steps that typically inflate computational demands. Study 2 manipulated inferential organisation using standard and short-information problem structures and sequential questioning to examine how reasoners construct key reasoning components. We used Bayesian analyses to assess the strength of evidence across conditions. Together, these studies clarify the boundary conditions of format effects and have implications for theories of human rationality and methods for supporting reasoning about uncertainty in applied settings.

A Transition-Based Multi-Stage Architecture of Haptic Enumeration

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Enumeration is a core cognitive function with complex dynamics; judgments of how many items are present? are not a unitary process. They may rely on subitising, counting, or estimation, and are shaped by sensory modality, attention, and working memory. In haptics, it remains unclear whether enumeration reflects stable organization or flexible transitions across numerosities. Participants scanned parallel 1–12 raised-dot arrays with the index or middle finger, while temporally structured distractors were encountered by the other finger. Bayesian multilevel piecewise models revealed a two-transition organization of haptic enumeration in objective performance and subjective confidence. The range $n = 1-3$, inclusive, formed a stable advantage regime with near-lossless processing and tight accuracy–confidence coupling. At 4, the system entered a reorganization regime marked by declining accuracy, confidence and rising error. Beyond a second transition (~ 7), enumeration entered a low-efficiency maintenance regime with elevated error but attenuated change. These transitions were stage-dependent and modulated by finger use. In accuracy, middle-finger scanning advanced the second transition, compressing the reorganization window. Distractor effects emerged at higher loads, and significant interactions concentrated within this regime, indicating context-dependent reconfiguration. These findings suggest a functional architecture that future work could investigate neurophysiologically.

Do Higher-Order Statistics Matter for Visual Averaging? Testing the Equivalent-Noise Model with Non-Gaussian Distributions

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The visual system is thought to extract summary statistics from groups of elements, supporting rapid perception of scene “gist” without the need to encode the details of individual features. Judgements of orientation statistics, particularly mean orientation and orientation variance, provide a canonical example of such processing.

Performance in these tasks has been modeled using an equivalent-noise framework in which limits are determined by (a) stimulus noise (orientation variability), (b) internal noise (precision of estimating individual elements), and (c) sampling limits (the number of elements effectively averaged). Within this framework, internal and external noise combine (via variance additivity under convolution) such that performance depends only on second-order statistics. The equivalent noise approach predicts that changes in the shape of the underlying distribution of orientations should have no effect once variance is controlled. Here, we test this prediction by systematically manipulating the skewness and kurtosis of the stimulus orientation distributions, allowing us to assess whether higher-order distributional properties influence the estimation of orientation statistics.

Serial Dependence: perception or decision-making? Probing the neural mechanisms underlying attractive and repulsive bias.

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It is well known that our perceptual histories play a role in our current perception, sometimes biasing perception towards past stimuli (i.e., attractive) or away (i.e., repulsive). One phenomenon that is often associated with an attractive bias is serial dependence, where observers report stimuli to have features (e.g., orientation, facial emotion, colour, size, duration) closer to those of recently presented stimuli despite the increased error introduced. Whether this bias in report is the result of erroneous perception of stimuli or bias in behavioural responses remains a point of contention. While serial dependence is observed when referencing the previous stimulus value, there is a stronger effect when referring to the previous response. Furthermore, a repulsive bias (i.e., negative serial dependence) is seen in the decoded neural representations during the early response, which is associated with perceptual processing. Only during later time points, associated with decision making, does positive serial dependence manifest. Using triplet presentations of randomly located wedge stimuli, we found negative serial dependence in the early neural representations of target stimuli (i.e., the second stimulus) location decoded from electroencephalography recordings regardless of the direction in behavioural response biases. Crucially, we were able to observe the changes in

bias over time, mirrored the biases found in behaviour.

Rhythmic visual perception arises from a surround modulation mechanism

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When attending to the visual world, perceptual ability often shows rhythmic variability that may be explained by underlying oscillations in neural excitation. While neural oscillations are studied widely in neuroscience, there is little understanding of how such neuronal dynamics affect the computations that produce visual experience. Here we tested whether perceptual rhythms are produced by surround modulation, a property of early visual neurons where neural and perceptual responses are suppressed by stimulation outside of the receptive field. We used an oriented surround stimulus to reset endogenous oscillations at the start of each trial and then probed detection of a central stimulus at various latencies across trials. Using signal detection theory, we found a 5 Hz oscillation in perceptual sensitivity (but not decision bias) when the surround was matched in orientation to the central target stimulus. No such oscillation was observed when the target and surround orientations were orthogonal. We modelled these results using a simple network oscillator model with lateral inhibition between orientation-tuned neurons. The model captures key dynamics such as phase-resetting of oscillations by surround stimulation and an orientation-tuned rhythmic suppression of stimulus-driven activity. Our results shed light on how rhythmic perception can arise from inhibitory neuronal interactions and provide a mechanistic basis for understanding how neural oscillations shape perception.

Dissociable effects of element-lifetime and stimulus-duration on local and global motion processing: An equivalent noise study

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Human visual motion processing is thought to involve two-stages: local motion processing and global pooling of local motion signals. We used an

efficient equivalent noise paradigm to examine temporal aspects of motion processing by manipulating element-lifetime and overall stimulus-duration, targeting local and global processing, respectively. Participants judged whether a moving dot pattern was clockwise or anti-clockwise of a reference-direction. Adaptive staircase estimated (a) the minimum direction offset required for reliable judgement of direction when dots moved in a similar direction and (b) the maximum directional noise tolerated to tell if a stimulus was moving either $\pm 45^\circ$ from the reference direction. These thresholds allowed estimation of local directional precision and global sampling (effective number of samples integrated). We tested various dot lifetimes (33.36, 66.72, 133.4, and 266.8ms) with a stimulus-duration of 1000ms, and various stimulus-durations (62, 125, 250, 500, 1000, and 2000ms) with a dot lifetime of 133.4ms. Longer element-lifetimes improved local precision without influencing global sampling. Conversely, longer exposures did not influence local precision but enhanced global averaging by an average of 13% for every doubling of stimulus-duration. Thus element-lifetime and stimulus-duration have dissociable effects on motion perception improving local and global motion processing, respectively.

Decomposing the Flash-Lag Effect: How Temporal Uncertainty Contributes to Extreme Foveal Biases

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In the flash-lag effect, a moving object is typically perceived ahead of a spatially aligned flash. Despite extensive study over the past three decades, existing accounts struggle to explain a robust directional asymmetry: the effect is substantially larger when motion is directed toward the fovea than when it moves away, where the illusion is reduced or absent. Here we decompose the illusion into separate localisation estimates for the flash and the moving object. We replicate the directional asymmetry, finding that motion toward the fovea yields a large effect, whereas motion away from the fovea yields a slightly negative effect, such that the flash is perceived ahead of the moving stimulus. Some of this asymmetry, but not all of it, can be explained by a general bias to localise objects closer to the fovea than they are. To explain the remainder, we invoke temporal uncertainty about the flash and the moving object. Using a Bayesian framework, we

explain the full asymmetry with a model that combines this temporal uncertainty with spatial uncertainty and a foveal prior. These results add to the evidence that temporal uncertainty or variability plays a large part in various flash-lag findings.

Motion and position: Reconciling representational momentum with immediate perceptual judgments

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A moving object suddenly disappears. Do people see its final position correctly, or shifted in the direction of motion? One set of published studies on the flash-lag effect finds that the answer is no. Studies of “representational momentum” (RM) instead find that the answer is yes, and some suggest that it reflects a distortion in memory. We hypothesized that the contradiction arises from a difference between immediate perception and delayed recall of the moving object’s final position. In FLE paradigms, the task often requires the observer to report the relative position of the moving object with respect to a contemporaneous reference (the flash); in RM paradigms, the observer often compares the remembered position of the target with that of a delayed probe. It is possible that the spatial relationship between the moving object and the reference is encoded rapidly upon disappearance and remains stable, whereas memory of absolute positions is susceptible to forward shifts. We tested the potential task dissociation by asking observers to judge the relative alignment between moving objects and to compare the remembered positions of moving objects with probes. To our surprise, there was no difference in displacement between the task types, and observers showed veridical localization across both tasks. We discuss this in terms of variable results in the published literature and suggest that RM is not robust for displays with continuous motion.

Visual–Vestibular Contributions to the Motion Aftereffect in a Hexapod Motion Simulator

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Prolonged exposure to visual motion produces the motion aftereffect (MAE), in which a stationary

pattern is perceived as moving in the opposite direction, reflecting adaptation in visual motion mechanisms (Anstis et al. 1998). Although usually studied visually, natural motion perception depends on visual–vestibular integration for estimating object motion and self-motion (DeAngelis & Angelaki 2012). Vestibular stimulation also adapts: prolonged body rotation can elicit vestibulo-ocular responses, post-rotatory nystagmus, and perceived turning sensations (Howard et al. 1998). Previous studies suggest that vestibular self-motion signals can modulate visual motion perception, and that visual–vestibular aftereffects may be context-dependent rather than simply additive (Hogendoorn et al. 2017). Here, we tested whether vestibular stimulation during visual motion adaptation modulates the visual MAE. Participants sat in a six-degree-of-freedom motion simulator and viewed moving random-noise stimuli during passive body rotation. Across conditions, visual adaptation was presented alone or paired with vestibular rotation in the same or opposite direction. After adaptation, participants reported the perceived direction and duration or strength of the MAE in stationary and dynamic random-noise test patterns. Preliminary results indicate that vestibular adaptation influences the perceived motion aftereffect, affecting both MAE duration and perceived direction.

Long-Term Experience with Visual Structure Distorts Psychophysical Time

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Domain experts, such as radiologists and fingerprint examiners, accumulate extensive visual experience, enabling superior processing of stimuli. Studies of laypeople suggest that vision and time perception are intertwined: the more visually ‘structured’ a stimulus is, the longer it seems to last. Our research explores whether this distortion also emerges when domain experts view highly structured domain-specific stimuli. Put simply: does being an expert distort your sense of time? In a psychophysical experiment, we showed 30 professional police fingerprint examiners and 57 laypeople a series of faces and fingerprints for very brief durations (32–80ms). By manipulating the amount of visual ‘structure’ (via inversion) in each image, we tested whether expertise makes highly structured images (i.e., upright fingerprints) appear to last longer. We found that the most experienced fingerprint examiners (17–32 years) reliably judged highly

structured fingerprints to last longer than less structured fingerprints ($d=2.03$) and, crucially, we did not find this effect in laypeople. We also found that experienced fingerprint examiners judged highly structured fingerprints to last longer compared to laypeople ($d=1.20$). Our findings show that with many years of experience (i.e., 17+), expertise can influence the flow of subjective time. Moreover, these distortions are consistent and robust — suggesting that they can be used as a novel, sensitive index of expertise across different fields.

Early Perceptual Mechanisms Shape Boundary Extension

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Errors are common at both perception and memory stages, and can result in visual memory errors. One error, boundary extension, leads people to recall more of a scene than was actually presented. This error can occur almost immediately, (42ms; Intraub & Dickinson 2008), suggesting it may occur in iconic memory. Across 2 experiments, we aimed to replicate this effect, test if it is stable over time, and test the effect of highly attention-grabbing stimuli (arousing images). In Experiment 1 ($N=72$), participants viewed neutral scenes in a within-subjects design, (250ms), interrupted by a visual mask (42ms), and followed by an identical test image. Participants judged whether the test image appeared closer or farther. Memory was tested again after 10 minutes. Boundary extension occurred at both time points, with no change in magnitude or direction of errors, indicating that the effect is established extremely rapidly and remains stable across longer retention intervals. Experiment 2 ($N=140$) used an identical procedure but manipulated stimulus arousal, in a between-subjects design (image type: neutral, arousing). Again, neutral scenes produced consistent boundary extension at both tests. In contrast, high-arousal scenes resulted in significantly reduced boundary extension, and this pattern was maintained across the delayed test. These results support the idea that early perceptual and attentional mechanisms contribute to shaping predictive scene representations in memory.

Modal Completion based on Linguistic Knowledge: A Cross-cultural Study

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Visual completion is a fundamental organisational principle of vision. Although it has been studied for decades, it remains unclear whether cognitive factors can shape the phenomenology of modal completion; i.e., a genuinely “seen” fill-in. Here we report a new illusion of hidden Kanji and test whether learned knowledge can alter the visible outcome of modal completion. When Japanese or Chinese characters are heavily occluded by rectangular bars, experienced readers not only can “read” the characters, but report a vivid sense of “seeing” strokes in regions lacking physical stimulation. Unlike standard subjective contours, which typically require nearby inducers, many contours in this illusion appear to be completed horizontally without clear local triggers. We investigate this with a psychophysical paradigm invoking a staircase method to estimate the PSE, so that we may quantify completion strength and compare it with stimuli where predictive contributions should be minimal. Preliminary results suggest a marked group difference. Participants literate in Kanji show robust completion effects, including systematic luminance shifts under occlusion, whereas non-readers show substantially weaker or absent effects. This pattern suggests that learned visual expertise modulates early completion processes, blurring the boundary between perceptual organisation and cognitive effect, and raising questions about the putative cognitive impenetrability of visual completion.

Dogs Don't Drive: Constellation Semantic Categorisation Drives Verb Selection for Narratives in Novel Star Fields

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A plethora of cultures tell a strikingly similar story about a specific pocket of stars: a young man (Orion) chases young women (the Pleiades), and the Elder (the Hyades) intervenes. Anthropological explanations cannot fully account for these cross-cultural similarities, sparking interest in the role of perceptual cognition. Previous research has shown

that visually salient features predict common star groupings, constellation shapes, and their semantic categories. Yet similarities in narrative arc, i.e., why Orion chases the Pleiades, remain unexplored. Linguistic research has established that words act as cues: a subject noun (dog) prefers prototypical verb pairings (dog-chase) over non-prototypical ones (dog-drive). We hypothesise that participants' semantic categorisation of their constellation will constrain verb choice, producing convergence across narratives. Across $N = 289$ participants and 1,136 submissions, we derived 3,642 subject-verb pairs. A chi-square test of independence showed that semantic category significantly constrained verb usage, $p < .001$, Cramer's $V = .50$, a large effect. Keyness analysis returned 422 significant category-verb pairs at $p < .05$, 134 reached $p < .001$. Pairings were predominantly prototypical: kite-fly, fish-swim, cat-chase, all $p < .001$, though not always: heart-differ, $p < .001$. These findings support our hypothesis that constellation shape constrains verb usage, emphasising the role of cognition in cross-cultural night-sky traditions.

Does respiratory phase predict judgements of agency?

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The sense of agency—the feeling that one's actions cause external events—is thought to depend on the match between predicted and actual sensory feedback. Respiratory phase influences voluntary action timing and motor preparation, but its role in subjective agency remains unclear. We tested whether respiratory or cardiac phase at action or sensory feedback predicts agency ratings in a voluntary action–outcome timing task. Participants ($N = 18$; target $N = 40$) made voluntary key presses while viewing an upward-moving object that jumped after delays of 0–1000 ms in 100 ms steps. They then rated their sense of agency over the jump on a 4-point scale. Respiration and ECG were recorded continuously, and instantaneous phase at key press and jump onset was estimated using the Hilbert transform. Preregistered cumulative link mixed models compared phase-based models with a baseline model including delay only. Preliminary analyses suggest that respiratory phase at feedback onset interacts with delay in predicting agency ratings, indicating that the effect of breathing depends on the action–outcome interval. No reliable effects were detected for action-locked

respiratory phase or cardiac phase. These findings suggest that respiration may shape agency mainly during sensory feedback processing, consistent with comparator accounts.

Event Segmentation in Virtual Reality

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Behavioural demonstrations of memory encoding and organisation tend to rely on simple stimuli, such as words and pictures, presented on a computer screen. While foundational to our understanding of memory, the lack of realism and immersion within the experience separates these memories from those formed in our everyday lives. Further, the button-press responses used in these investigations provide a restricted view of the processes underlying memory decisions. Virtual Reality (VR) provides an ideal means of constructing immersive experiences to study memory, and rich behavioural measures can be obtained in VR using reach tracking and eye tracking. In this talk, I will present an overview of how I have investigated memory organisation across two experiments in VR, with 83 and 45 participants, designed to target different aspects of event segmentation theory (Swallow et al., 2011; Zacks et al., 2007). In these paradigms, participants engage with everyday objects across different spatial contexts, and are tested on correct object recognition, recall of object locations, and memory of presentation order. The results show clear effects of event boundaries on memory access and organisation, and I will argue that the nature of these effects are better understood using continuous performance measures.

Using Co-registered Eye-Tracking and MEG to Identify the Eye-Mind Link in Reading

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A core assumption of serial-attention models of reading is that the completion of an early stage of lexical processing initiates the programming of a saccade to move the eyes to the next word (Just & Carpenter, 1987; Liu et al., 2024; Reilly, 1993; Salvucci, 2001; Veldre et al., 2023). To test this assumption, an experiment was completed using co-

registered eye-tracking and MEG. During each trial of the experiment, participants made lexical decisions about pairs of simultaneously displayed letter strings. One of the letter strings was always displayed in central vision and the other was randomly displayed in left or right peripheral vision, with the letter strings being high-frequency words, low-frequency words, or non-words. Participants' eye movements were recorded to identify the onsets of the saccades from the central to peripheral letter strings, allowing for the interpretation of the MEG-measured cortical activity associated with processing the centrally displayed high- versus low-frequency words prior to saccade onset. The results of these analyses provide physiological evidence for a strong eye-mind link, consistent with the assumption of serial-attention models that lexical processing is the “engine” driving eye movements during reading (Reichle, 2011).

Using MEG and eye-tracking to understand the cortical systems that support Chinese reading

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One of the most important observations in reading science is that fixation durations on words reflect their lexical processing, indicating that lexical processing drives eye-movement control. For this hypothesis to hold, however, lexical processing must be underway ~125 ms before the saccade off a word to accommodate the saccadic latency. However, in written Chinese, where words consist of 1-4 characters and lack word boundaries, readers must somehow segment characters into words, making it unclear if/how lexical processing influences oculomotor programming, and whether such modulation reflects word- and/or character-level processing. In this study, participants completed three tasks while their eye movements and MEG-measured brain activity were recorded: (1) Landolt-C scanning; (2) lexical decision; and (3) sentence reading. By time-locking neural activities to saccade onset, we predict that word frequency will modulate neural activities ~125 ms before saccade onset. And by time-locking neural activities to fixation onset, we predict word-frequency effects on early MEG components (e.g., M100). Both results would support that lexical processing is rapid enough to influence saccade programming. Finally, although we are more tentative about if/how properties of characters (e.g., their frequency) will impact eye-

movement control, our results will help understand how the cortical systems that support vision, attention, and language are coordinated to support Chinese reading.

Interocular and interhemispheric transfer of adaptation to symbolic numerals

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While visual perception of symbolic numerals is essential for everyday tasks such as reading and performing calculations, its underlying mechanisms remain poorly understood. A recent study (Luo et al., 2024) demonstrated that partially occluded digital numerals can elicit bistable perception and that adaptation to symbolic numerals biases the interpretation of these ambiguous stimuli. However, it remains unclear at which stage of visual processing this effect arises. Here, we investigated whether symbolic numeral adaptation reflects early or higher-level visual processing by examining transfer across eyes and hemifields. In experiment 1 (N = 26), we tested interocular transfer by presenting the test stimulus to either the same or the opposite eye as the adaptation stimulus. In experiment 2 (N = 23), we examined interhemifield transfer by presenting the test stimulus in the same or the opposite hemifield as the adaptation stimulus. In experiment 3 (N = 23), we tested whether adaptation restricted to the upper parts of digital numerals transfers across hemifields. We found that adaptation effects to whole digital numerals transferred significantly across eyes and hemifields. In contrast, adaptation confined to the upper parts of numerals did not show significant interhemifield transfer. These results suggest that symbolic numeral perception involves intermediate or higher-level visual processing stages that integrate information across eyes and hemifields.

Transcranial magnetic stimulation impairs the inhibitory role of the right inferior frontal gyrus in bilingual language control

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The causal role of the right inferior frontal gyrus

(RIFG) in inhibitory control has previously been identified at the behavioral level using transcranial magnetic stimulation (TMS). To further explore the underlying neural mechanisms, we combined TMS with functional magnetic resonance imaging (fMRI) in bilingual language switching. Consistent with the behavioral performance in TMS research, our results showed reduced asymmetric switching costs in RIFG activation following continuous theta-burst stimulation (cTBS) compared to sham stimulation, while intermittent theta-burst stimulation (iTBS) caused no improvement. These results suggest that cTBS disrupts the RIFG's ability to inhibit the dominant language by attenuating its activation during switches back to that language. This study is the first to integrate TMS and fMRI to shed light on the neural mechanisms underlying the causal involvement of a specific brain region in bilingual language control.

Revisiting the family size effect: Systematic form-productivity mappings influence lexical processing

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Lexical processing is influenced significantly by the set of all words that contain a particular root morpheme, a phenomenon known as the "morphological family size effect". Explanations for this effect with monomorphemic words have invoked semantic mechanisms, to the extent that morphological family size has been proposed to be a proxy for the richness of a word's semantic domain. Yet, family size is a measure of the productivity of a morphological root, i.e., its ability to be combined or transformed with recurring sequences of phonemes in affixes and interfixes and with other words (compounding) to convey more meanings. Whether the phonological features of root forms might be non-arbitrarily related to their capacity for morphological productivity has yet to be explored. The present study reports a corpus analysis of 4326 English monomorphemic words confirming that phonological features predict a significant proportion of the variance (17%) in morphological family size. A series of experiments with megastudy datasets demonstrates that these systematic form-productivity mappings have a strong influence on comprehension and production compared to other lexical and semantic variables. These findings suggest that the sublexical structure of root morphemes plays an important role in facilitating their productivity and so might be a design feature

of the mental lexicon. Implications for current accounts of the family size effect based solely on semantic similarity are discussed.

The N400 is Dead! Long Live... Naive Baselineing Undermines Inferences and Obscures Associations.

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The canonical N400, one of the most widely used ERPs in EEG research, is touted as a measure of semantic processing. In reality, it is the difference between two measures, both of which contain one or more semantic ERP components. Minimally, the typical N400 is the difference between raw target word N400s and pre-target word N400s. This is a priori true for any experiment using a 500ms stimulus offset asynchrony (SOA) and a 100-200ms baseline. Further, this N400 difference measure can include variance from pre/pre-target word P600s/PNPs. Problematically, ingredients of this 'component soup' may be systematically related to the variables of interest. In a new N400 dataset we use 1400 SOA with 100ms baseline to demonstrate a novel effect of "Constraint" (Entropy / Mode Probability). By shifting the baseline back to the pre-target word N400 we replicate previous non-effects. At the single trial level, we show that baselines are the most effective predictor of N400s and that the sign of the coefficient depends on the underlying component(s) sampled by the baseline. Consequently, N400 inferences using unanalyzed baselines may no longer be valid. Nevertheless, most established N400 associations such as Cloze probability, surprisal, and concreteness remain in the raw EEG. However, the effect/non-effect of Constraint is largely baseline dependent. We argue that the "effect" represents the real neural activity of interest and that the non-effect is noise and/or confounding.

Word- and Constituent-Frequency Effects in German Compound Reading: Implications for Language Generality and Specificity

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The frequent usage of long, complex compound words poses a great challenge for readers of German

texts. Despite this, few studies have investigated how German compound words are processed during reading. Previous research suggests that both the overall frequency of a compound and the frequency of its constituent morphemes may affect processing, but the precise nature of this relationship remains unclear. In this study, we examined the eye-movement patterns of 90 native German-speaking adults as they read sentences containing target compound words. Compound word frequency and the frequency of their first constituent were orthogonally manipulated, while other linguistic properties, including the frequency of the second constituent, were carefully controlled. Our results revealed a robust word-frequency effect across the early and late stages of processing. Interestingly, a three-way interaction emerged between the two frequency conditions and word length in early processing: for short compounds, a high-frequency first constituent slowed processing of the entire compound relative to a low-frequency first constituent, and this inhibitory effect stabilised and extended to all compounds in the later processing stage. These findings shed light on the mechanisms of compound word processing in German and, more broadly, across languages. Cross-linguistic findings (e.g., German vs. English vs. Chinese) and their implications for models of compound word identification will be discussed.

Wrap-up effects in reading under Auditory Perceptual Simulation

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Although readers often report an “inner voice” during reading, research suggests key differences between default silent reading and the deliberate simulation of a speaker’s voice, or Auditory Perceptual Simulation (APS). During APS, readers adjust their reading speed to match the simulated speaker (Gunraj & Klin, 2012) and show improved text comprehension (Zhou & Christianson, 2016), possibly because APS helps generate a more defined prosodic contour that supports reading. To test this account, we conducted two eye-tracking experiments using clause wrap-up effects as indices of internal prosody at marked (e.g., commas, periods) and unmarked clause boundaries. Reading mode (normal silent vs. APS) was manipulated within-subjects using either 1) explicit instructions (Exp. 1) or 2) indirect and direct quotations (Exp. 2).

Prior research shows that visual markers at clause boundaries typically yield more regressions and longer processing times than unmarked boundaries during normal silent reading (Andrews & Veldre, 2021). We predicted that this effect would be reduced under APS, because richer, internally generated prosody should signal a natural pause at clause boundaries, reducing reliance on visual cues. Consistent with the hypothesis, we replicated standard wrap-up effects in silent reading and found evidence of reduced wrap-up effects under APS, suggesting that APS may support reading through prosodic cues. Differences between the two APS manipulations will be discussed.

Translation Strategy and Reader Cognition: Effects of Foreignisation and Domestication on Character Representation

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Foreignisation and domestication are often treated as opposing strategies for translating culture-specific items. While cognitive approaches to translation increasingly examine reader response, existing studies rarely control for individual differences, nor do they extend beyond lexical manipulation to narrative-level features such as characterisation. This study examines how translation strategy and reader transportability jointly shape character-related responses. Drawing on psychonarratology, two English translations (foreignised vs. domesticated) of a Chinese short story were constructed by manipulating characterisation-related cues. Australian participants (N = 42) were randomly assigned to one condition and completed measures of perspective taking, empathy, and narrative transportation, alongside a transportability scale. Transportability strongly predicted all outcomes, while translation strategy showed limited main effects. However, readers with lower transportability reported greater engagement in the foreignised condition, whereas highly transportable readers showed little difference. Both groups identified similar numbers of foreign elements, suggesting that extensive domestication may produce foreignising effects. Findings highlight the central role of reader cognitive traits and suggest translation effects are contingent rather than uniform, bridging translation studies and cognitive science.

Does prediction error in reading vary with task demands and across individuals?

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There is robust evidence of processing benefits for words that are predictable from prior context. This facilitation appears to support a 'strong' model of prediction which assumes that expected continuations are preactivated before they are encountered in text. However, research to date has provided inconsistent evidence of the processing costs assumed by such a model when readers' expectations are violated. The current study assessed whether prediction error in reading varies with task demands and across individuals. The eye movements of a sample of adult participants were recorded as they read strongly and weakly constraining sentences containing either a predictable word, unpredictable related word, or unpredictable unrelated word. To determine whether prediction error costs are more likely to be observed in a prediction-encouraging task, a separate group of participants were instructed to proofread the sentences for transposed-letter lexical errors (e.g., sign instead of sing) which were present in intermixed filler sentences. To test the role of individual differences, all participants completed tests of language proficiency and working memory. Linear mixed models assessed the relative contributions of task demands and individual differences to prediction benefits and costs in reading. We interpret our results within a hierarchical generative framework of language comprehension and discuss their implications for current models of predictive processing.

Limits on the Precision of Orthographic Prediction during Reading

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Skilled reading is facilitated by both contextual information from the preceding sentence and orthographic information from upcoming words in parafoveal vision. However, it remains unclear whether, and how, readers use context to generate specific predictions about orthographic form ahead of bottom-up input. We addressed this question in two eye-movement experiments using the gaze-

contingent boundary paradigm. Parafoveal preview validity of a target word was manipulated with identical, transposed-letter nonword (TL), and substituted-letter nonword (SL) previews. Contextual predictability was manipulated in two ways across experiments: by varying the constraint of sentence context preceding the target (Experiment 1), and by manipulating whether the target was the most expected continuation or an unexpected but plausible continuation of a highly constraining sentence (Experiment 2). Across both experiments, first-pass measures showed robust facilitatory effects of predictability and preview validity (Identical < TL < SL). Critically, however, there was no evidence that parafoveal orthographic sensitivity was greater for expected than for unexpected words. These findings suggest that readers generate only coarse predictions about upcoming orthographic input, and are consistent with graded pre-activation accounts of prediction in reading.

Revisiting Language Switching Costs in Reading Comprehension: A High-Powered Replication Examining the Role of Word Concreteness

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Debates persist about bilingual control in comprehension due to inconsistent findings on switching costs. A recent study (Wu, Zhao, Wu, Liu, Su, Ji, & Wang, 2025) attributed these discrepancies to word concreteness, reporting switching costs for concrete but not abstract words. However, its concreteness ratings were narrowly spaced, the trial numbers were limited, and the results remain unreplicated. To address these, Experiment 1 preregistered a replication using 28 word pairs with distinctly high and low concreteness in 70 unbalanced Chinese–English bilinguals. Unlike Wu et al., we found switching costs for both concrete (8 ms) and abstract (11 ms) words, slightly larger for the latter, implying a complex and potentially non-linear relationship between concreteness and switching costs. Experiment 2 extended this by testing 100 participants with 100 word pairs spanning the full concreteness range across 600 trials per condition, modeling concreteness continuously. Results revealed a significant but small switching cost (5 ms) and no significant linear, quadratic, or cubic effects of concreteness, challenging its moderator role. We also observed no mixing costs but mixing benefits. Overall,

comprehension control demands appear minimal and globally more cooperative than competitive. This study provides the first preregistered replication of bilingual control, underscoring the value of open-science practices and replication for establishing robust evidence in the field.

Haptic Color Wheel as a Tactile Interface for Color Cognition and Artistic Participation in Individuals with Visual Impairment

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This presentation introduces the Haptic Color Wheel (HCW), a tactile color system co-designed with congenitally and adventitiously blind adults to support color cognition, communication, and artistic expression. Drawing on questionnaire data from 24 blind participants and iterative testing with visually impaired users, the HCW maps red, yellow, and blue onto distinct line and shape textures and organizes 12 hues on a clock-based circular layout to encode color relationships and mixing logic. Learning performance was evaluated through a color-mixing task in which participants created a 12-color wheel using only primary color paints, revealing that even congenitally blind learners could internalize and apply abstract color concepts through touch. The findings highlight how tactile color interfaces can expand access to art education, everyday color information, and cultural participation for people with visual impairment, suggesting broader applications in inclusive curriculum and exhibit design.

Representational dynamics of naturalistic text processing in blind braille readers

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In the absence or insufficiency of vision, blind individuals use nonvisual senses for activities typically mediated by vision. For example, braille readers integrate tactile input and motor actions to build fluent text percepts. Here, we present time-resolved multivariate analyses of EEG recorded during naturalistic braille reading, a process that transforms low-level sensory signals of embossed letters into the high-level linguistic representations

underpinning fluent reading. Blind participants read grids of random single letters and 1-page standardized prose passages. Using synchronized finger tracking to estimate stimulus onsets from the EEG signal, we decoded letter identity, as well as each word's length, part of speech, and surprisal (estimated from computational language models). We observed significant letter- and word-level decoding across linguistic levels in blind readers by ~100 ms post-onset. Sighted controls, who performed the same finger movements without reading, showed significant decoding only for word length, suggesting that the higher-level decoding is specific to linguistic representations rather than artifacts of motor or spatial confounds. These results demonstrate that naturalistic braille reading elicits neural signatures that are decodable at multiple levels of linguistic representation, and that time-resolved methods synchronized to the reader's own motor behavior can capture the brain's real-time construction of meaning from touch.

Under the radar: The prevalence of echolocation use among the visually impaired

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Human echolocation – using sounds reflected off objects to navigate – is an under-recognised mobility strategy among the visually impaired and is not routinely included in orientation and mobility training (O&M). To date, research has focused on a small number of expert echolocators, primarily measuring on the extent of their abilities. However, the prevalence of echolocation use within the broader vision-impaired population remains unclear. A prior study (Thaler et al 2013, n=37) found that 27% of their respondents use echolocation; however, this figure relies on self-report and may underestimate true prevalence, as individuals may engage in echolocation without realising it. To gain a clearer picture of prevalence we conducted a survey which asks vision-impaired individuals about their navigational, spatial and object recognition abilities; whether they use sounds to navigate; and whether they use or know of echolocation. The questions were constructed in a way as to gauge whether respondents show behaviours consistent with echolocation use (e.g., using sounds to navigate), irrespective of if they identified as echolocators. Although data collection is ongoing (target n=66), preliminary results (n= 35) indicate 31% of respondents knowingly use echolocation, however,

in total, 94% show behaviours consistent with echolocation use, suggesting prevalence based on self-report may underestimate true prevalence. Furthermore, only 17% of respondents learnt echolocation through O&M.

Do anxious people see the world differently? The visual behaviours associated with general and social anxiety in virtual environments.

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The experience of anxiety can be characterised by a multitude of symptoms, one of which is the attentional bias towards threat. Past research has consistently shown that anxious individuals have an attentional bias for threatening stimuli in multiple sensory domains. In the domain of visual perception, research has found that individuals with high social and general anxiety exhibit increased vigilance and avoidance of social threat. One behavioural correlate of vigilance is thought to be hyper scanning - an excessively long visual scan path created by longer saccades between fixations. However, evidence for this is limited and mixed. One possible explanation is that hyper scanning is better framed as an avoidant behaviour that changes depending on context. The present study therefore aims to determine whether anxiety is related to differences in visual scan paths in realistic virtual environments. Additionally, it attempts to establish whether hyper scanning is correlated with other avoidant visual behaviours, and whether these behaviours differ between social and general anxiety. Taken together, these results will show whether social and general anxiety exhibit attentional biases (vigilance, maintenance and avoidance) in realistic settings, and potentially inform how these biases in visual processing sustain the negative symptoms of anxiety. Note: Data collection for this study is still in progress but is expected to be concluded by June 2026.

Sensory Processing Sensitivity and Perceptual and Affective Evaluations of Image Complexity

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In recent years, scientific interest in sensory processing sensitivity (SPS), often conceptualised in

terms of hypersensitivity, hyposensitivity, or sensory-seeking behaviour across sensory domains, has increased. Despite growing research, there remains limited conceptual integration between SPS and sensory-perceptual processing, particularly in response to precisely quantified and parametrically manipulated stimuli. This study examined relationships between SPS, self-reported autistic-like and ADHD traits, and perceptual and affective responses to abstract visual stimuli varying in physical complexity. Participants rated preference, discomfort, and perceived complexity of images differing in spectral-scaling properties and completed self-report measures of autistic-like traits, ADHD traits, and SPS. Discomfort ratings closely tracked perceived complexity, with both decreasing linearly as physical complexity decreased, while preference peaked at intermediate levels of complexity. Higher levels of autistic-like traits and SPS were associated with differences in perceived complexity and discomfort, particularly for more complex stimuli. These findings suggest that elevated neurodivergent traits may be linked to lower tolerance for visually complex stimuli, and contribute to a clearer understanding of how individual differences in sensory processing sensitivity relate to liking and (dis)comfort in response to visual stimuli.

Healthy ageing disrupts saccade sequencing during a model copying task.

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Goal directed movements require coordination of both eye and hand and the gathering of information to guide complex sequential movements such as those associated with activities of daily living. Healthy ageing brings about changes to sensorimotor control and sensory processing but sensory and motor performance are typically studied with simple tasks. More complex tasks may be more challenging for older adults due to declines in cognitive resources and sensory information processing. We investigated age-related changes to sensorimotor control during a complex sequential task, where the coordination of a sequence of eye and hand movements were required to successfully reconstruct models with blocks from a reference image. Saccade characteristics and the main sequence were compared between older and younger participants. The results demonstrate inefficiencies in saccade sequencing and visual

processing that affected reaching and grasping movements of older participants. The decreased ability of older participants to use relevant visual information across multiple saccades led to more overall saccades, longer fixations, hand dwell times, and overall task time. Older participants carried out additional saccades that were less selective, exhibiting disorganised sequencing. The results show that healthy ageing leads to significant changes in eye-hand coordination linked to limits in sensorimotor processing and arguably cognitive resources.

Learning What Others Like and the Role of Feedback Noise

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We investigated whether people can learn others' preferences through binary feedback and how the reliability of that feedback shapes learning over time. Across two studies, participants made repeated multi-attribute choices on behalf of a hypothetical friend and received feedback indicating whether the friend liked or disliked their selection. Study 1 used an extended task to examine learning under deterministic versus stochastic feedback, revealing rapid performance adjustments early within each phase and substantially reduced accuracy when feedback was noisy. Study 2 systematically varied feedback stochasticity across five levels and focused on behaviour surrounding a condition change, allowing learning trajectories to be compared under increasing uncertainty. Accuracy generally decreased with increasing feedback noise, and learning over time was evident only when feedback was sufficiently reliable. Random utility modelling further showed that reliable feedback enabled participants to increasingly weight desirable attributes, whereas high feedback noise attenuated attribute utilities and limited preference updating. Together, these findings demonstrate that people can infer others' preferences from binary feedback, but that learning is strongly constrained by feedback reliability. The results highlight the dynamic nature of preference inference and the importance of considering feedback uncertainty when studying social and preferential decision-making.

Killing the Wrong Monster: A Time and Effort Paradigm for Measuring Sunk Cost Behaviour

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Cognitive biases influence everyday decisions. The sunk cost fallacy, where one perseveres with a suboptimal choice due to previously invested resources, is one such bias and influences people's investment decisions, gambling behaviour, and product usage. Previous efforts to measure vulnerability to the sunk cost bias include hypothetical scenarios and behavioural tasks, with mixed results. We propose a behavioural measure of sunk cost bias using a time and effort paradigm, avoiding the financial confounds common to prior approaches. Participants completed a monster shooting task, similar to that of Devoto and DeFulio (2022), where participants were required to continue with an existing strategy or abandon it for new strategy. A logistic regression indicated that time in trial predicted probability of continuing with the existing strategy, with participants choosing to persevere even when this was not the fastest way forward. This suggests that this task may be a suitable behavioural measure of the sunk cost fallacy.

People Place Larger Bets When They Can Control the Decision to 'Cash Out' of a Risky Choice

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People derive utility from feelings of control over their decision-making process and often prefer environments that allow them to amend or undo an initial choice (e.g., refundable goods, flexible investments). The gambling industry leverages this tendency through 'cash out' products, which allow users to settle their bet before the relevant sporting event has concluded in exchange for a guaranteed payout, the value of which is discounted relative to the bet's true value. Despite this discount, experimental research indicates that people place larger bets when they know cash out is available. The current research tests a hypothesis about the psychological mechanisms of this effect – that cash out increases people's risk tolerance by increasing perceived control. Across two experiments, participants completed an online card-betting task;

on some trials, cash out was available but the decision to accept or reject the offer was made by the experiment's programming. Participants placed smaller bets on these trials relative to when they had control to decide for themselves to cash-out. Post-experiment surveys indicated that control over cash out increased participant enjoyment and fostered the (erroneous) belief that they could use the feature to increase their winnings. Overall, results suggest that control over revising an initial risky choice increases people's risk tolerance, potentially due to enjoyment or a misperception of the advantages conferred by such revisions.

Dynamic Preferences for Control in the Choice Abdication Task

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Individual differences in desire for control influence a range of health and well-being behaviours, yet their measurement is constrained by reliance on a self-report, trait-level measure. To account for this, we recently developed and validated a novel behavioural measure – the Choice Abdication Task (CAT) – to capture desire for control in a dynamic decision-making context. The current study explored how within-task features influenced individuals' preferences for being in control of decisions in the CAT. In the task, participants repeatedly chose whether to control the order in which they completed a set of simple motor skill tests ('spinner' stimuli) or defer this decision to a computer. 150 participants completed the CAT. Logistic regression analyses were used to assess the influence of task-related predictors on desire for control. Results indicated that participants were more likely to exert control as they progressed through the task and within individual trials, when greater variability existed between displayed options, and following a win on the previous trial. In contrast, previous trial expected value did not significantly predict behaviour, suggesting no evidence for an effect of reward prediction error. Overall, our results demonstrate that desire for control may be more dynamic than current theoretical perspectives acknowledge, highlighting the utility of the CAT as a measure which can be used to study the effects of context on preferences for being in control.

Exploiting the dynamics of gaze to modulate the evaluation of risky prospects

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Two incentivised experiments (N=217) examined how visual attention contributes to the construction of risk preference. Using a staircase procedure in which participants' choices were titrated to an indifference point between a sure and risky prospect, we find that a gaze-contingent prompt procedure can influence participants' risk appetite. Our findings show that, on average, a sure offer of 100 points would be viewed as equivalent to a 50% chance of 266 points when gaze is biased toward the risky option, versus a 50% chance of 283 points when biased toward the safe option. Further aspects of our results and procedure confirm that participants genuinely evaluated risk and reward values, with the influence of the gaze-contingent prompt superimposed on this unfolding process of preference construction. Together our results reinforce the importance of last-fixations for driving preference and as such appear inconsistent with mechanistic accounts that rely solely on 'mere exposure' or 'gaze cascades', since such accounts see the relationship between gaze and choice as mediated by differences in total dwell time – which was not a pattern supported by our data. By contrast, the current findings could be accommodated by sequential sampling models that propose faster accumulation of evidence for attended options.

Individual Differences in Domain-Specific Risk-Taking

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Previous work suggests that people often underweight rare events in decisions from experience. In "rare disasters" tasks, where choices frequently lead to small positive outcomes and infrequently lead to large negative outcomes, underweighting can produce suboptimal levels of risk-seeking. In "rare treasures" tasks, where the valence of frequent/infrequent outcomes is reversed, underweighting leads to risk aversion. Two experiments (N = 340) examined risk-seeking and risk aversion under each reward structure, and whether suboptimal decision-making was accentuated in those with elevated depressive and

anxious symptom severity and associated cognitive-behavioural tendencies, or moderated by self-reported risk-taking perceptions and propensity. In Experiment 1, the choice task involved earning points to receive a financial bonus. In Experiment 2, we designed a social variant with the choice to attend or avoid events to receive peer appraisals. In both experiments, risky choices were greater for rare disasters compared to rare treasures. This effect was larger in the social variant. We observed weak associations between social task performance and symptoms of depression, stress, and anxiety, but no such relationships emerged in the financial version. The implications for theories of under/over-exploration of decision options in people with different symptom and risk-taking profiles will be discussed.

LLMs forecast a caricature of human emotional experience

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Large Language Models (LLMs) mimic human responses in moral judgement, problem-solving, and visual processing tasks. LLMs thus seem to “know” what humans think, but do they know how humans feel? Here, we used human self-report data from a Virtual Reality (VR) experience in which participants walked a narrow plank at great height, rating the intensity of various emotions (e.g., fear, anxiety, happiness) at various points. LLMs cannot walk the plank, so we compared like with like by obtaining emotional forecasts about how one would feel in this scenario, using a text description (in a separate validation study, participants confirmed that the prompt described the VR experience accurately). We obtained emotional forecast ratings from both humans and several LLMs (GPT, Claude, and Gemini, each prompted multiple times). Human forecasts showed similar mean ratings to those of humans who underwent the VR experience, and had similarly diverse distributions. In contrast, LLMs' ratings, while following similar trajectories (e.g., greater fear at height compared to ground level), were exaggerated and largely uniform – a caricature of human experience. LLMs' underestimation of response variance may reflect a fundamental limitation of their operating principles, as their responses are governed by the underlying structure of their training set – in this case, the internet, which may contain skewed representations of the human psyche that underestimate its diversity.

Friend or Foe? Cross-Cultural Expression, Perception, and Model Decoding of Embodied Social Intention

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Distinguishing friend from foe is a fundamental survival instinct for human, particularly when facial or verbal cues are absent. While bodily emotion recognition is well-studied, the expressing and perceiving principles underlying "Friend vs. Foe" social intentions remain under-explored. We recorded 80 performers (Japan, Taiwan) expressing friendly and hostile intentions using motion capture system. We then presented these actions as point-light displays to 77 cross-cultural observers (Japan, Taiwan, China) for intention discrimination. Motion Energy Analysis revealed hostile movements exhibit significantly higher energy in low-frequency bands (0.25-1 Hz). Perception results showed high cross-cultural agreement ($r > .82$), alongside an in-group advantage where Japanese hostility was best recognized by Japanese observers. Qualitative reports indicated this human consensus relies heavily on movement dynamics and induced mental states. Finally, we tested a spatio-temporal graph convolutional network (ST-GCN). While the model achieved above-chance accuracy (69%), it trailed human performance (78%) and correlated poorly with human judgments ($r = .26$) comparing to the cross-cultural agreement. Our research establishes a foundation for embodied social intention, demonstrating that human biological motion perception relies on cognitive inference rather than mere feature detection, exposing a human-machine alignment gap.

The Role of Complementarity in Human-Machine Teaming

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Effective teamwork is critical, and artificial agents are increasingly functioning as teammates rather than tools. Yet Human-Machine (HM) teams often underperform Human-Human (HH) teams because

machine partners do not always support the coordination processes that underpin teamwork. Team cognition theories suggest that successful teams rely on anticipating one another, understanding roles, and coordinating behaviour in real time. One possible solution is complementarity, where teammates have different strengths and weaknesses, making each member better suited to particular task demands. By making these differences explicit, complementarity may help teams coordinate effectively and partly compensate for weaker team cognition. This study examined how a complementary task structure influences performance and behaviour in HH and HM teams. Using a two-player arcade-style task, we compared a standard version, where targets were equally valued, with a complementary version, where teammates were rewarded for intercepting targets matched to their strengths. Complementarity improved reward-based performance, particularly for HM teams, reduced the HH-HM performance gap, and promoted selective, reward-sensitive behaviour. Overall, complementarity may help HM teams perform more effectively by focusing teammates on their strengths, thereby partly compensating for weaker team cognition.

Eye Movement Kinematics as Late-Stage Social Signals in Human–Robot Interaction

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Gaze is a powerful social attention cue; however, the role of fine-grained eye-movement kinematics in social cueing remains understudied relative to facial morphology. This EEG study investigated how anthropomorphic eye-movement kinematics modulate social attention during face-to-face human–robot interaction. Participants performed a gaze-cueing task with four faces varying in human-likeness (from a mechanical robot to a human), displayed either human-like or mechanical eye movements, across short and long SOAs. A gaze-cueing effect emerged but was not modulated by facial human-likeness or kinematics. In contrast, subjective ratings confirmed that perceived animacy was jointly shaped by both factors. EEG results revealed a temporal dissociation: target-locked N2pc were linked to gaze direction rather than kinematics; whereas later posterior and frontoparietal activity was selectively modulated by kinematics, particularly at the longer SOA. Multivariate pattern

analysis further showed that the neural encoding of eye-movement kinematics depended on facial appearance for more human-like robot faces. These findings indicate that eye-movement kinematics serve as social signals primarily during late-stage processing rather than early attentional capture. Critically, facial anthropomorphism gates the social interpretation of biological eye movements, suggesting that dynamic kinematics become socially meaningful only when paired with a sufficiently human-like robot facial structure.

Authenticity Detection and Trustworthiness Ratings of Real and AI-Generated Faces Across Diverse Racial Groups: Effects of Simultaneous Presentation and Own-Race Advantage

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AI-generated faces have become hyperrealistic, often indistinguishable from real ones and perceived as trustworthy, posing a deception risk. Using three computerized tasks and a post-experimental survey, we investigated how Taiwanese, South Asian, and Black adults distinguish real and synthetic faces of four races (White, East Asian, South Asian, and Black). In the Face Authenticity Judgment Task, participants judged individual faces as real or synthetic, with performance near chance across all groups (Taiwanese: $M=.515$, South Asian: $M=.517$, Black: $M=.519$). In the Simultaneous Presentation Task, participants chose the real face from a real-synthetic pair, and without feedback, accuracy significantly improved across all groups — Taiwanese ($M=.577$), South Asian ($M=.581$), and Black ($M=.609$). South Asian and Black participants showed an own-race advantage, while Taiwanese participants showed a near-race effect for East Asian and South Asian faces. Overall, synthetic faces were rated as more trustworthy and preferred than real faces, except Black participants, who showed an own-race advantage in trustworthiness towards real Black faces (real: $M=4.14$ vs. synthetic: $M=3.90$). Post-experiment Surveys revealed smooth skin and perfect symmetry appeared artificial, while visible texture and clear eye details demonstrated realism. Overall, synthetic faces are perceived as more trustworthy, simultaneous presentation improves detection, and racial familiarity shapes perceptual sensitivity.

50 Shades of Empathy and Psychopathy

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People high in psychopathic personality traits are described as less empathetic, but findings across physiological, behavioural, and self-report assessments are inconsistent. This study investigates how three psychopathy dimensions, coldheartedness, self-centred impulsivity, and fearless dominance, relate to empathy facets and physiological arousal. In addition it considers potential mediation by alexithymia and moderation by gender. In the current data collection, first-year psychology students complete psychopathy and alexithymia questionnaires before viewing emotional video clips while providing affective, cognitive and concern empathy ratings while physiological activity is recorded. Linear mixed effects models examine dimensional associations and test whether alexithymia mediates psychopathy-empathy relationships differently across genders. In line with previous findings, we hypothesise that coldheartedness will be associated with lower affective and cognitive empathy, reduced physiological reactivity, and decreased empathic concern in response to emotionally negative narratives. Additionally, we hypothesize a partially mediating role of alexithymia and stronger associations for female compared to male participants.

Commitment to pro-democratic action durably reshapes democratic attitudes

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Democratic backsliding and rising partisan animosity pose urgent threats to liberal democracies. Yet interventions to reduce the antidemocratic attitudes that help facilitate democratic erosion typically yield only modest, short-lived effects. Across large-scale experiments in Australia and the United States ($N \approx 1,800$), we tested a seven-step intervention grounded in a commitment-based theory of attitude change in which inducing commitment to pro-democratic action serves as a pathway to changing democratic attitudes. Participants were screened for elevated baseline antidemocratic attitudes,

eligibility to vote, and willingness to take a pro-democratic pledge. The intervention produced large and lasting reductions in support for undemocratic practices (Australia: Cohen's $d = -0.77$ immediate, -0.45 at two months; USA: -1.03 immediate, -0.36 at two months) and reluctance to engage across the partisan divide (Australia: Cohen's $d = -1.39$ immediate, -0.61 at two months). These effects were larger and persisted beyond that observed in prior studies, providing a generalizable model for reducing entrenched attitudes harmful to democracy in the target population.

Gluckschmerz and the downvoting of the successful plagiarising professor.

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Social media now allow the evaluation of people's reputations online (e.g. upvotes and downvotes) and facilitate the communication of censure. Psychological mechanisms (Deservingness, Rivalry) underpinning these evaluations were probed by considering reactions to vignettes outlining the success or failure of an honest or plagiarising professor. Using Qualtrics, a between-subjects design randomly presented parallel forms of the vignettes online to 109 participants who provided their reactions to the vignettes on 5 point Likert scales, rating their Satisfaction, Amusement as well as attributions of Responsibility and Fairness, and willingness to support (Upvote or Donate). 2x2 Outcome (success/fail) by Context (original/plagiarist) Multivariate Analysis of Variance indicated significant disapproval (Gluckschmerz) of the successful plagiarist, and approval when the plagiarist failed (Schadenfreude). The strongest reactions elicited involved satisfaction and attributions of fairness. Downvoting was more likely when dishonesty was documented. Strength of effects indicated that Deservingness was an important determinant of people's reactions. People were more concerned when a vignette suggested a breakdown of the social order. Our findings are relevant given recent social media bans in specific jurisdictions.

Inflexibility and Identity Fusion: Predicting Willingness to Fight and Die under Uncertainty

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Identity fusion, a visceral sense of oneness between personal and group self, is a strong predictor of extreme ideological beliefs and self-sacrificial tendencies, beyond traditional social identity theories. However, less is known about the cognitive mechanisms that differentiate these forms of group affiliation and influence their consequences. The present study examined whether the executive functions cognitive and affective flexibility differentiate identity fusion from group identification, and whether these flexibilities moderate the relationship between fusion and willingness to fight under conditions of uncertainty. Using a sample of 235 US participants, identity fusion and group identification toward political groups were measured alongside flexibility behavioural tasks. Participants were randomly assigned to either a neutral or uncertainty priming condition to approximate contexts in which group affiliation most strongly predicts self-sacrifice. Results indicated that fused participants demonstrated significantly higher willingness to fight and lower cognitive and affective flexibility than group identified participants. Moderation analyses suggested that flexibility processes had greater influence on the relationship between group affiliation and willingness to fight under uncertain conditions. Overall, the findings indicate that the stronger predictive power of identity fusion may partly reflect reduced cognitive and affective flexibility among fused individuals.

The Company Consensus Keeps: How Connections Between Social Media Users Shape Responses to Agreement

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Consensus among social media users can be a powerful cue for belief revision, but its value as evidence depends not only on how many users agree, but on whether their opinions were formed independently. Agreement among socially or demographically connected users, for example, may reflect shared information or influence, reducing its value relative to independent agreement. Although sensitivity to the number of agreeing others is well established in the literature, responses to socially or informationally connected agreement remain less understood. Across two studies, we examined how

people infer and use the informational dependence of others' opinions. In Study 1, participants judged whether demographically similar, highly connected users were likely to hold similar views, testing whether social and demographic cues inform perceived informational dependence. In Study 2, we tested whether these inferences shaped beliefs by comparing responses to consensus from a repeated user, multiple connected users, or unconnected users. Findings suggest that people use demographic similarity and online connection cues to judge the independence of others' opinions. When updating beliefs, people discount shared opinion when informational dependence is easily inferred, with unconnected users producing larger belief change than a repeated user or connected users. However, they may do so inconsistently, and often only partially. Implications for online influence and misinformation are discussed.

The influence of social group membership on pain recognition.

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Facial expressions of pain are critical social signals that guide caregiving and clinical decision-making, yet observers may differ in their sensitivity to these signals depending on social group membership. The present study examines whether recognition of pain from facial expressions is modulated by perceived gender and ethnicity of the person in pain, as well as observer characteristics. Participants completed a detection task in which they viewed naturalistic facial images, one at a time, and indicated whether they were in pain or not. Stimuli were drawn from a large, independently validated face set with established behavioural pain ratings (Buckland & Taubert, 2025, *The Journal of Pain*). This experimental format allowed us to measure how sensitive each participant was to pain-related facial expressions. Following the task, participants completed demographic and empathy questionnaires. Analyses examined whether sensitivity to pain expressions varied as a function of perceived gender, and ethnicity of the faces, and whether in-group versus out-group membership predicted performance. By characterising systematic biases in pain recognition across social groups, this work aims to clarify how social factors shape the perception of suffering in others. These findings have implications for clinical assessment and

healthcare equity, where misrecognition of pain may contribute to disparities in treatment and outcomes.

The limits of repetition in the illusion of consensus

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Humans rely on social agreement to assess the credibility of information, but an illusion of consensus can arise when people repeatedly encounter a claim from the same source (dependent consensus), thereby inflating perceived credibility. We studied the limits of this illusion by changing how often participants saw claims with either independent or dependent consensus. In two studies (N = 1015), participants rated their belief in a claim after seeing different numbers of consensual claims in a simulated social media setting. Patterns emerged in how participants responded to independent versus dependent consensus, and these effects shifted with repeated exposure. Notably, our analyses revealed distinctions in belief updating, raising new questions about how social information shapes credibility judgments. Our results suggest that the illusion of consensus may be less concerning than previously thought, especially when repeated exposure is common. We also find evidence for a new mechanism: repeated claims by secondary sources are seen as supporting credibility.

The role of visual awareness and specific phobias in physiological reactions to evolutionary threatening animals

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Do snake and spider images get processed preferentially in the subconscious? To answer this question, we used the "breaking Continuous Flash Suppression" technique to subliminally present images of spiders and snakes for extended periods, alongside their phase-scrambled versions as control stimuli. We recorded the time required for the stimuli to break through suppression, as well as various physiological indices, including skin conductance, pupil dilation, and facial electromyography. We also measured participants'

levels of specific phobias using the Spider Fear and Snake Anxiety questionnaires. We found faster breakthrough times for snake stimuli compared to spider stimuli, with faster responses for intact images than their scrambled versions. Although spiders did not demonstrate a similar advantage in visual processing, they still influenced autonomic arousal. Specifically, both snake and spider stimuli elicited stronger electrodermal responses and greater pupil dilation compared to their scrambled counterparts, even before the stimuli reached conscious awareness. Notably, the spider phobia group exhibited a higher electrodermal response to spider stimuli than to scrambled images, but this occurred only after the stimulus reached conscious perception. Overall, our findings support the existence of a subcortical pathway that facilitates pre-attentive processing of phobic stimuli, and they reveal different processing styles in individuals with specific phobias.

Sex dependency of subconscious visual perception

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Subliminal visual cues can be processed outside conscious awareness and subsequently bias decision making, yet it remains unclear whether this subconscious perception differs between sexes. Previous evidence suggests that males may be more vulnerable to neurodevelopmental deficits in visual processing. Subjects performed a two-choice target detection task with four conditions, Baseline, supraliminal (conscious) and subliminal (subconscious), to examine the emergence of subliminal perception. In the Baseline condition subjects relied solely on target detection. In the Cued-conscious condition, a visual cue (250ms) showed the correct location of an upcoming target. In the Subliminal-same condition the cue (16ms) correctly showed the target location, however in the Subliminal-opposite condition the cue provided incorrect information. Performance was significantly enhanced in the Cued-conscious relative to Baseline and subliminal conditions. Accuracy increased in the Subliminal-same and decreased in the Subliminal-opposite condition versus Baseline, indicating that subliminal cues influenced subsequent decisions. These effects were significantly greater in males, suggesting increased

sensitivity to subliminal visual information. Electrodermal activity showed distinct autonomic responses to supraliminal versus subliminal cues, with sex-dependent acoustic modulation seen only in supraliminal. These findings reveal distinct sex dependence in subliminal visual information processing.

Ensemble Perception with Unconscious and Conscious Faces

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Ensemble perception refers to the sensory system's ability to rapidly extract summary statistics from multiple stimuli, facilitating perceptual organization. Whether consciousness is necessary for this process is still debated, as early studies indicate that summary representations may emerge even when people fail to reliably identify individual elements. We investigated this question by using interocular suppression with four concurrent facial expressions. Stimuli consisted of NimStim faces expressing fear, happiness, and anger across fifty graded intensity levels. On each trial, three faces were presented visibly, while one additional face with the highest emotion intensity was suppressed by Mondrian patterns. Participants judged the mean emotion of the faces. In the first two experiments (N=33/32), responses were significantly higher than the average of visible faces, indicating a pulling effect from the unconscious face. In the third experiment, to ensure that this result was not due to task demands driven by suppression failure, we included either the most neutral or the most emotional faces as unconscious stimuli. Even when the emotion of unconscious face was unpredictable, the results (N = 26) showed that responses remained significantly different from the average of visible faces, and the direction of the effect depended on the unconscious face. Our findings thus show that human visual system effectively forms an ensemble with both conscious and unconscious faces.

Unseen peripheral color information facilitates visual localization by supporting figure-ground separation

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Human visual experience often appears rich across the visual field, yet a recent virtual-reality study showed that observers fail to detect peripheral color changes. Here, we asked whether subjectively unseen peripheral color supports visual localization. In Experiment 1, participants explored panoramic scenes in which peripheral color was gradually removed and responded to briefly presented targets. Peripheral color improved localization performance, producing faster responses and higher accuracy, even when participants could not reliably detect the color changes. This raised the question of how unseen peripheral color contributes to vision. In an ongoing experiment, we tested whether peripheral color facilitates object-based segmentation. Individual detection thresholds for peripheral desaturation were first measured, and targets were then presented beyond these thresholds to ensure minimal conscious awareness to color changes. Peripheral regions were either saturated or desaturated, and targets appeared inside an object, on an object boundary, or outside an object. Preliminary data from six participants showed that reaction times tended to be shorter in the saturated condition, particularly when targets appeared on object boundaries. These findings suggest that peripheral color information may enhance visual localization by supporting figure-ground segmentation.

Unconscious extraction of implied destinations in goal-directed motion under discontinuous flash suppression

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Previous research has suggested that extracting the implied destination of a moving stimulus may require visual awareness. We tested whether goal-directed event structure can nevertheless be extracted from naturalistic dynamic scenes under discontinuous flash suppression (dCFS), and whether it biases spatial priority. Observers viewed brief goal-directed motion clips under dCFS and were instructed to report the breakthrough. On fully suppressed trials, a Gabor patch appeared either at the implied destination of the motion event or at a control location, and observers performed an orientation-discrimination task. Breakthrough reports were significantly biased toward the implied destination, indicating that the direction and destination structure of the motion event influenced

where suppressed information entered awareness. In the Gabor task, mean accuracy did not differ significantly between the implied-destination and control locations. However, accuracy at the implied destination showed significantly lower between-observer variability than the control. Our findings suggest that motion-implied event structure can be processed under suppression and can bias the spatial priority of information. The absence of a mean accuracy benefit indicates that this effect may not simply reflect enhanced perceptual sensitivity. Instead, the reduced variability at the implied destination raises the possibility that unconscious event processing stabilizes the spatial readout of attention.

Early Visual Influences on 'Suppression Depth' Using tracking-Continuous Flash Suppression

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Tracking-Continuous flash suppression (tCFS) is a interocular conflict paradigm where one eye views a dynamic high-contrast mask, and the other views a contrast-ramping target that enters and exits conscious awareness. While previous research investigates how the early visual system impacts the duration of suppression, tCFS also assesses the time it takes for an image to be re-suppressed. The difference between these dominance and suppression thresholds is defined as suppression depth – that is, how much change a stimulus requires for a change in conscious awareness. We assess if mask contrast, mask size, retinal adaptation, colour, eye dominance, and participant expectations impact both suppression and target-dominance duration using the tCFS paradigm. We observe that mask contrast may increase suppression duration, but with no impact on suppression depth. Mask size did not appear to affect suppression duration or suppression depth. Changing the location of a suppressed target also did not seem to impact suppression depth, but modulation of a visible target does appear to have an impact. A colourful mask seems to be more powerful, therefore altering suppression depth. We incorporate eye-tracking data to support our findings, which reveals a significant increase of saccade occurrence before a target breaks into awareness, and gives us insight into participant attention.

Bayesian Orientation Biases in Human and Machine Vision

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The brain allocates its limited resources strategically, focusing on key features to resolve the inherent ambiguities of uncertain environments. In early vision, this principle is exemplified by a well-known cardinal bias, whereby horizontally and vertically oriented visual information is prioritised due to its overrepresentation in natural scenes. However, recent evidence suggests this bias is anisotropic, favouring horizontals over verticals. In the present study, we examined the perceptual implications of this horizontal-vertical asymmetry using a Bayesian observer framework under two types of uncertainty: internal and external noise. Our results (N=60) reveal a preference for horizontal orientations, with external noise inducing an attractive bias (pulling percepts toward horizontals) and internal noise eliciting a repulsive bias (pushing percepts away from verticals). We then compared the biases to the tuning properties of three computer vision models. All three models displayed a moderate horizontal bias; however, the transformer model, which uses attention mechanisms, exhibited the strongest correspondence to human performance under external noise. These results suggest that neural architectures may contribute to horizontal biases beyond the mere acquisition of natural scene statistics. Our findings provide psychophysical evidence for anisotropic horizontal biases and demonstrate distinct mechanisms for bias amplification under different forms of uncertainty.

Local orientation asymmetries in V1 depend on global context

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Goal: fMRI responses in V1 vary with orientation, yet most studies focus on single effects (e.g., cardinal vs. oblique) using one stimulus type (e.g., Cartesian gratings). We investigate orientation asymmetries and their context dependence by measuring BOLD responses to multiple orientations using 2 configurations: 12°-radius Cartesian (horizontal, vertical, oblique) and polar (pinwheel, annular, spiral) gratings. Methods: To test whether V1 responses to the same local orientation depend on

the global pattern, we analyze V1 activity at 4-8° eccentricity, matching local orientation and spatial frequency across configurations. Results: We identify 4 orientation asymmetries, all strongly context-dependent: For Cartesian gratings, responses are greater for vertical than horizontal, and oblique than cardinal orientations; these asymmetries are absent for polar gratings. For polar gratings, responses are greater for radial than tangential, and polar cardinal (radial/tangential) than polar oblique orientations; these effects are weak or absent for Cartesian gratings. Conclusion: These results confirm orientation asymmetries in V1 and reveal that these asymmetries are context-dependent. Asymmetries are largest when local orientations are consistent with the global stimulus structure, such as radial vs. tangential orientations in a polar configuration. We conclude that despite the small classical receptive fields, V1 responses are highly sensitive to global stimulus configuration.

Overrepresentation of cardinal orientations in the middle layer of V1 suggests bottom-up priors

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Predictive processing accounts often conceptualise predictions as top-down expectations generated by higher cortical regions. However, predictions may also arise from hardwired bottom-up structural constraints embedded in the architecture of sensory systems. Here, we tested this using the oblique effect, the perceptual advantage for cardinal over oblique orientations, as a candidate example of a bottom-up prior. Using ultra-high field 7-Tesla laminar fMRI, we examined the proportion of cardinal- and oblique-preferring voxels across cortical layers in the human primary visual cortex (V1). Voxelwise encoding analyses revealed a depth-dependent bias in orientation tuning. Across participants, all layers contained a mixture of cardinal- and oblique-preferring voxels, but the proportion of cardinal-preferring voxels varied by layer, with a higher proportion found in the middle layer compared with the superficial layer ($p = .0157$). This is consistent with a feedforward model, as the middle layer predominantly receives thalamic input, suggesting that the cardinal bias is embedded in early sensory encoding. Our findings support the

presence of a bottom-up structural prior hardwired within V1.

Neural origins of hue asymmetries

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Colour coding in the retina and geniculate is depends on two opponent dimensions encoding the differences in LvsM or SvsLM cone signals. However, colour percepts cannot be accounted for by these independent dimensions, suggesting later transformations of chromatic information. For example, hues change most rapidly with chromatic angle around the yellowish quadrant of the LM vs S cone-opponent plane. The basis for this asymmetry and where it arises in visual coding remain uncertain. We investigated the magnitude of these hue differences across cortical regions using fMRI. Stimuli consisted of two different chromatic angles presented as circular 1 c/deg gratings in a 10-deg tapered aperture, and counterphased at 1 Hz. The component colours were equal in chromatic contrast but varied from 0 to 90 degrees in angular separation, or “hue contrast,” centered on each of the four diagonals in the LvsM and SvsLM plane. We used representational similarity analysis to compare which models best predicted pairwise classification of the stimuli from neural responses: colour quadrant, irrespective of contrasts; cone-opponent contrast (LvsM and SvsLM); and perceived contrast, based on behavioral measures of the hue differences. Colour quadrant predicted responses similarly across all cortical ROIs. However, perceived rather than cone-opponent contrast predicted responses better in early cortical regions. This suggests that the asymmetry in hue percepts in colour coding arise as early as V1.

Reframing Prestimulus Occipital Alpha Activity Through an Event-Based Lens

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For over a century occipital alpha activity has been associated with fluctuations in visual perception. If a near-threshold visual stimulus is presented during states of increased alpha power, the observer is less likely to perceive the stimulus. Virtually every study,

however, analyses alpha by averaging the frequency/time-frequency representation of the scalp signal across many trials. Although ubiquitous, this procedure assumes that alpha activity is consistent across trials, an assumption that should be validated. In this talk, I introduce a novel image-segmentation method developed to quantify alpha activity from single trial scalograms and present the results of the application of this method to data from a visual detection task. Specifically, I will show that in un-averaged data, pre-stimulus alpha activity is not sustained. Rather, it appears as events of variable duration and number (alpha events), meaning that the sustained activity observed in averaged data arises as a by-product of averaging shorter, variable events across trials. Exploiting the richer set of features offered by parametrising alpha as events, namely power, duration, frequency, onset, offset and bandwidth, I will answer three main questions. First, which features of alpha affect visual sensitivity and response bias? Second, is the time between alpha events and stimulus onset relevant for the perception of the stimulus? Finally, are alpha events generated by a rhythmic process?

Modeling Fixational Microsaccade Transient Motion in the Human Eye

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Fixational microsaccades were investigated through a quantitative modeling framework that captures their full transient dynamics in the human eye. High-speed, wide-field adaptive optics retinal imaging (100 fps; 5°×5° field) was used to acquire retinal image sequences at cellular resolution, thereby recording the fine motion of the eye during steady fixation. Eye movements were measured via high-precision substripe-based motion estimation algorithm. This approach enabled reconstruction of microsaccade waveforms with ~1/6000 s temporal and ~0.007° spatial resolution. The transient motion was modeled as the response of a second-order dynamical system to an impulsive input, allowing direct estimation of physically meaningful parameters, including damping ratio and natural frequency of the oculomotor system. Across 37 microsaccades from six eyes, amplitudes ranged from 0.29–1.82° and durations from 6.5–34.3 ms, with peak velocities up to 316.7°/s and accelerations up to 1.60×10⁶ °/s². The model accurately

reproduced key transient features, including overshoot (0.02–0.48°; 6.5–30.0 ms) and post-saccadic oscillations (0.002–0.089°; 7.0–76.2 ms; 1–5 half-cycles), with high goodness-of-fit ($R^2 = 0.95–0.99$). Estimated parameters (damping ratio 0.381–0.622; frequency 12–24 Hz) reveal consistent dynamical behavior across events. These results provide a preliminary mechanical description of microsaccade transients, supporting quantitative modeling of oculomotor control.

Visual search behavior is determined by the geometry of visual representations

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Mental representations are the key explanatory construct of the cognitive sciences, but there is no widely accepted characterization of their structure (geometry), nor of how they cause behavior. Visual representational geometry can be determined by measuring the psychological similarity between objects. Multiple methods exist to gather similarity scores from human observers, but all require an explicit judgment. To examine the potential influence of task demands on representations, a task must be combined with a similarity-judgment task, leading to troublesome dual-task interference. To eliminate interference, this study develops the use of scanpaths as a similarity measure. Observers searched for a target amongst distractors. If visual search is guided by the mental representation of the target, then the number of times a distractor is fixated may reveal the similarity, in mental space, between distractor and target. To validate the method, observers performed a classic triplet odd-one-out task, and results were compared with similarity ratings obtained from a different set of participants on the same visual objects (Jiang et al. 2022). Representational geometries between the three tasks were remarkably similar. A generative model based on scanpath behavior was able to predict first fixations in novel data. This validation of the scanpath method opens the door to examining the causality of representations by determining if and how mental geometry varies with task demands.

Inhibitory Tags Do Not Reduce Stimulus Salience, but Rather Bias Spatial Orienting

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Attentional shift has traditionally been viewed as being accompanied by a reduction in the salience of previously attended locations via an inhibitory mechanism, such that attention is redirected toward the next most salient position. This study critically examines this assumption through four systematic experiments using a cueing paradigm. Experiments 1, 2, and 3 demonstrate that attentional shift leaves fine-grained saliency computations intact, as evidenced by preserved discrimination accuracy (Experiment 1 and Experiment 2) and unaffected response speed (Experiment 3). Only in Experiment 4, when the task required spatial orienting rather than saliency-based selection, did clear inhibitory effects emerge. These findings reveal an important dissociation: although the inhibitory mechanism underlying attentional shifts influences spatial attention, it does not uniformly diminish target salience. The results challenge existing computational models and suggest that the role of inhibitory mechanisms in attentional control is more specialized than previously believed, primarily affecting spatial orienting rather than saliency representations.

Measuring Attentional Flexibility in Dynamic Environments

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The capacity to update attentional priorities in changing environments is assumed to be a key component of flexible, goal-directed behaviour. Yet existing assessments of attentional control, such as the Stroop, Flanker, and Simon tasks, are largely static; the same task is performed repeatedly with no requirement to adapt priorities over time. Whether such static measures of control predict attentional flexibility when contingencies change and must be learned from experience remains unknown. To test this, participants performed a target detection task where colour cues signalled high and low reward values. The cue-reward contingency was then reversed, such that previously high-value cues become low-value and vice versa. For each participant, this reversal procedure was repeated across multiple colour pairs, providing reliable estimate of the speed and extent to which attentional priority updates in response to current contingencies. Performance on this attentional-

updating index was compared with performance on an established battery of static attentional control tasks to determine the correspondence between measures of static and adaptive control. This approach potentially reveals a dimension of attentional control not captured by existing batteries: the ability to update, rather than merely maintain, attentional priorities. More broadly, this work invites consideration of how individuals learn as a central yet currently underappreciated component of attentional control.

Attention reshapes the representational geometry of a perceptual feature space

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Our perception of the world is transformed by attention, both in terms of the efficiency of information processing and the appearance of attended stimuli. A standard theory is that attention regulates how competing stimuli vie for resources. However, an alternative perspective is that attention alters the representational geometry of stimulus spaces, such that changes in processing are not isolated to the particular competing stimuli, but are reflected across the entire perceptual space. To test this representational hypothesis, we conducted an experiment in which participants reported the perceived similarity of orientations spanning the full stimulus space when attention was directed or not directed to specific orientations ($+45^\circ$ or -45°). We used these similarity judgments to measure the representational geometry of orientation, finding that attention reliably expanded the representational space in a narrow range around the attended orientations. We also found evidence for compression of the representational space in a broad range around unattended orientations. Further, we show that expansion and compression induced by attention can be accounted for by a model of neural populations incorporating attentional gain and normalization. Our findings support the idea that attention acts to reshape the representation of entire perceptual spaces in a way that supports processing of relevant stimulus features.

Reward-related attentional capture shapes fast decision-making

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TV instead of working out, takeaway instead of cooking, driving instead of walking: we have all made choices that offer immediate reward even when they don't align with our broader goals. But under which circumstances does our knowledge about the reward structure of the world lead to these goal-incongruent decisions? The attentional economics account posits that fast decisions should be most affected by reward: because attention is initially captured by reward-signalling stimuli, insufficient time is available for any goal-driven reallocation to occur. Although past work has reliably demonstrated that reward-related stimuli capture attention, this has not translated to biases in decision outcomes, likely because the free-response paradigms used in this work only gauge decisions made after goal-directed reallocation of attention. Here, we employ a forced-response paradigm that samples performance across a range of processing times in a conflict task. We find that rapid responding amplifies the impact of reward-signalling stimuli on decision accuracy. Critically, the time course of this effect varies as a function of reward magnitude, indicating that higher-value stimuli exert stronger and more persistent impacts upon fast decisions. These findings demonstrate that the influence of reward history on decision-making is temporally mediated, emerging most strongly when cognitive control cannot be effectively engaged.

Predictiveness enhances orienting without amplifying multisensory integration

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A multisensory orienting advantage is observed at short cue–target onset asynchronies (CTOAs; 50 ms), but not at longer intervals (150 ms), suggesting a temporally constrained benefit of audiovisual cues in exogenous attention. Recent work indicates that multisensory integration (MSI) can be modulated by reward, in some cases, gating behavioural effects. Such reward manipulations are typically explicit and goal directed. A typical attention manipulation, cue predictiveness, may represent an implicit form of value, whereby cues that more reliably precede targets gain increased functional relevance. The present study examined whether implicit predictiveness enhances multisensory orienting advantages. Participants performed a speeded

orientation discrimination task following visual, auditory or audiovisual cues. Predictiveness was manipulated implicitly across blocks (50% vs. 75% valid; where valid indicates the cue appears on the same side of the screen as the target). Bimodal cues produced a larger validity effect than unisensory cues at 50 ms CTOA under non-predictive conditions and predictiveness increased validity effects overall. However, the magnitude of the multisensory advantage did not selectively increase when predictive. These findings ask whether implicit predictiveness modulates attentional allocation independently of MSI and suggest this influence is predominately driven by top-down allocations of attention.

Driving with Future-Oriented Thoughts: Exploring the Influence of Prospective Memory Representations on Driving Performance

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Driving integrates motor, perceptual, and cognitive processes, with prospective memory (PM) enabling the execution of delayed intentions such as taking exits, slowing near school zones, and locating parking. While PM research shows that maintaining delayed intentions can impair ongoing-task performance due to monitoring demands, the extent to which these costs emerge in dynamic, safety-critical contexts such as driving remains unclear. The present study introduced a Prospective Memory Parking Paradigm (PMPP), embedding parking-related intentions within a simulated vehicle-following task to examine how focal, non-focal, and time-based PM demands influence driving performance. In a within-subjects design, participants ($n = 11$) completed baseline, focal (responding to parking signs), non-focal (searching for available spaces), and time-based conditions. PM accuracy differed significantly across conditions, with highest performance in the non-focal condition. However, this was accompanied by reduced vehicle-following coherence and greater lateral lane displacement. These findings suggest that searching for parking spaces imposes greater monitoring demands than responding to explicit cues, reflecting prioritisation of intention execution at the expense of vehicle control. Results align with capacity-based accounts of PM, including PAM theory, highlighting trade-offs between intention fulfilment and driving

performance, offering practical implications for improving road safety.

Controlling a nonrigid object in a coordination task: Is learning guided by perceptual information or movement feedback?

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Controlling nonrigid objects, which undergo shape change when force is applied, is an important skill that is adept in human adults but difficult for animals or robots. We investigate how adults learn to control a nonrigid response dot (RD) to produce 0°/90° phase relation with an oscillating target dot (TD). Unlike in classic bimanual coordination tasks, Ps move a joystick that is nonlinearly related to RD's movement. The nonlinearity is emulated by van der Pol Equation. From an ecological psychology perspective, coordination is guided by perceptual information, which is TD and RD's phases and their relative phase. From a computational perspective, the internal model of control is tuned by movement feedback. To differentiate whether learning to control nonrigid objects is an ecological or computational process, we provide phase and relative phase information where Ps see two dots' oscillation in real time (Exp 1), or movement feedback where Ps only see the moving TD that changes color when RD is in the correct phase relation (Exp 2), or both perceptual information and movement feedback (Exp 3). Results showed when controlling nonrigid RD, Ps easily produced 0° coordination; they could learn to produce 90° in all experiments but learning was faster and better with perceptual information than with movement feedback. Thus, although learning is more efficient with perceptual information, human motor control is flexible enough to resort to feedback when information is lacking.

Investigating the Globality of GABAergic Inhibition during an Oculomotor Stop-Signal Task

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When stopping a planned action, inhibitory control is thought to be engaged in ways that are either

highly selective to the specific effector or global across the motor system, with some research suggesting that global inhibition is faster and requires less planning. Using transcranial magnetic stimulation (TMS), prior work has linked successful stopping of manual actions with rapid increases in short-interval intracortical inhibition (SICI) in primary motor cortex, a marker of GABA-A activity. However, the extent to which these GABAergic changes reflect global or selective inhibition is not fully known. In this study, we measured SICI by applying paired-pulse TMS to left motor cortex (recording motor-evoked potentials in the right hand) while participants completed a stop signal task. We varied the effector that participants used to respond to go cues in the task (e.g., saccade eye movement), thereby creating conditions in which the right hand was engaged in the task or completely at rest. We test the hypothesis that SICI increases on stop trials irrespective of effector engagement, consistent with a global inhibitory mechanism; modulation restricted to the engaged condition would instead support selective control. The results provide key insights into how global and selective inhibition contribute to the efficient inhibitory control.

Error Monitoring: Feedback-Driven Modulation of the ERN in Partial Responses

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The error-related negativity (ERN) is an electrophysiological marker of error detection that occurs immediately following an incorrect response. Most ERN research relies on a binary distinction between correct and incorrect actions, leaving it unclear how the ERN responds when an incorrect response is initiated but successfully stopped (partial inhibition). This research examined how motor output, indexed by response force, relates to ERN amplitude during partial inhibitions, and whether external feedback modulates this relationship. Across two experiments, participants completed an anticipatory stop-signal timing task. In Experiment 1, partial inhibitions were followed by negative feedback, with participants informed their response was incorrect. In Experiment 2, the same partial inhibitions were followed by positive feedback, with participants informed their response was correct. ERN amplitude was compared across feedback conditions. Negative feedback did not significantly alter ERN amplitude for partial inhibitions. In

contrast, positive feedback was associated with a larger ERN. This suggests that ERN amplitude is sensitive to feedback context rather than motor output alone. One explanation is expectancy violation, whereby positive feedback conflicted with participants' internal evaluation of their performance. These findings indicate that the error-monitoring system integrates cognitive interpretations of action outcomes beyond the physical execution of an error.

Domain-general and Domain-specific Mechanisms of Visual Perceptual and Motor Learning: An EEG study

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Whether visual perceptual and motor learning are supported by shared or dissociable neural mechanisms remains a central question in cognitive neuroscience. We combined behavioral assessment with 32-channel EEG in 26 participants performing two paradigms: the Texture Discrimination Task (TDT), indexing visual learning, and the Visuomotor Adaptation Task (VAT), indexing error-based motor learning. At the behavioral level, TDT learning gains did not correlate with VAT adaptation rates, indicating domain-specific acquisition. The neural picture, however, diverged. Using spectral Granger causality, we found that both tasks produced learning-related modulations within overlapping alpha and delta networks. Critically, cross-task correlation analyses revealed shared individual differences: participants with stronger learning-related increases in top-down parietal-to-occipital connectivity during TDT also showed stronger P→O modulation during motor-error feedback in the VAT. In contrast, gamma-band effects were domain-specific, engaging an occipital-centered pathway during visual learning and a parietal-centered pathway during motor learning. These results indicate that behavioral dissociation can coexist with neural convergence: Low-frequency oscillatory networks—particularly top-down alpha-band control along the P→O pathway—may constitute a domain-general mechanism for attention and error monitoring across both domains, while gamma-band activity supports domain-specific processing.

A subcortical nexus for visually guided movement

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Visually guided movement requires the transformation of a visually sensed location into an appropriately directed motor response. Models of the processes involved generally start from the assumption that the lion's share of the work is performed by cortex. Parietal and frontal lobes are seen as key to performing the necessary coordinate transforms (from eye to head to trunk), together with planning and executing the subsequent motor response; a response which incorporates the coordination of joint movements spanning multiple degrees of freedom (e.g. shoulder, elbow, wrist and hand). Despite supporting neurophysiological evidence, there is at least one reason to query this assumption: Cortex is, phylogenetically speaking, a recent innovation. Although all mammals have a cortex, many vertebrates do not, and yet many of them are still able to produce rapid, accurately targeted responses. We describe three rapid reaching studies in which direction selective muscle activation occurs 70-100ms after visual target onset. This, we argue, is consistent with the action of an express subcortical pathway, analogous to ones found in non-mammalian vertebrates. Overall, our work suggests that in addition to cortical pathways, a more ancient system is at work, at least when humans are tasked with producing very rapid responses. We go on to explain how the work helps recast cortex into the role of modifier, coordinator and supervisor of movement rather than actor per se.

Guiding features behave differently in visual and memory search

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Selective attention is typically studied in the context of external perceptual prioritization, but it can also be directed toward internal representations in working memory. Externally and internally directed attention share characteristic signatures (e.g., set-size, search asymmetries, feature similarity effects), yet differ in their temporal dynamics. In external attention, spatial attention is faster than featural, but

this reverses for internal attention. Here we investigate whether the temporal difference is due to the level of representation (i.e., spatial, featural or object-based), or whether it can be observed only the featural level. Participants performed either a standard visual search (with a pre-cued target feature) or memory search (display encoded into working memory, then probed with a post-cue). Targets were defined by two features, one processed relatively early in the visual hierarchy (e.g., colour, motion) and one relatively late (e.g., object category, relational properties). Across three experiments, early features were detected faster than late features in visual search, but this advantage was attenuated or reversed in memory search. These findings suggest that differences between externally and internally directed attention are not solely explained by representational level, but also by how early in the visual hierarchy it is processed.

Similarity judgments and visual working memory do not share the same cognitive representation

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Many cognitive models assume processes operate upon a psychological representation that is derived using multidimensional scaling (MDS) of similarity judgments. While MDS-based models have been useful in exploring cognition, the underlying representation itself should not be left unexplained. The leading models of visual working memory (VWM) have not included psychophysical scaling, but Schurgin et al. (2020) influentially argued that VWM is better modelled on the psychological similarity space. To address this debate, we took a Bayesian generative modeling approach that jointly infers the representation with the cognitive processes. We applied these cognitive models to the open data from Tomić & Bays (2024), which contained a perceptual reproduction task, a memory reproduction task, and a similarity comparison task. We show that the underlying representation for these tasks can be inferred with this approach, and find that there is non-uniformity in the representation with respect to the physical stimuli. Our critical result is that the representation is task-dependent; it differs between the similarity comparison and stimulus reproduction tasks. This suggests that the psychological representation derived from similarity tasks cannot be assumed to be the representation underlying VWM. We

conclude by arguing that mental representations should be explained by being included in cognitive process models rather than derived from independent tasks like similarity comparisons.

Attention allocation during multi-item maintenance in human working memory

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Working memory (WM) is essential for everyday life and impaired in numerous disorders. Various oscillatory correlates have been argued to support WM processes. Yet we have no clear understanding of their role, hindering their clinical use in WM dysfunction. We present findings from human non-invasive (MEG) and intracranial electrophysiology (sEEG) during a WM retro cue task combining lateralised presentation with distinct item categories of faces and gabor gratings. We utilised a novel approach by invisibly tagging visual stimuli (RFT) that can be read out using MEG. RFT results demonstrate covert attention shifts during retention as key for successful WM maintenance. In addition, MEG results identified two low frequency oscillatory correlates of WM maintenance (alpha and beta oscillations) as having distinct but complementary functions, with no interaction and different anatomical origin; as one supports spatial attention whereas the other item-specific processing. Furthermore, we identified an extensive brain network with increased HFA (high frequency activity 70-150 Hz recorded with sEEG as proxy for neuronal firing); with a complex relationship to low frequency rhythms. Our findings extend our knowledge of covert attention and maintenance processes in WM and demonstrate distinct parallel functions for lateralised attention and downstream category processing supported by alpha and beta oscillations, respectively along with HFA; leveraging the strengths of MEG and sEEG.

Tracking how task information persists in working memory

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Completing a task often requires holding task-relevant information in mind over time. Complex

tasks are made up of multiple components which may each persist in working memory using different neural formats, such as persistent neural firing, or without ongoing neural activity via synaptic changes. Here, we used neural decoding applied to MEG recordings to assess how information about different task components (visual stimuli, relevant/irrelevant visual features, selection rules, and comparison rules) persists in working memory. Participants were shown a bi-coloured stimulus, a selection rule indicating which colour to remember, and a rule for how to compare the selected colour to a probe colour presented after a 2s delay. We assessed how distinctly each component was maintained via neural activity by how accurately it was decoded across the delay. While each component could be decoded for longer in the maintenance task compared to a non-maintenance control task, classification was negligible by the delay's end. Yet, during post-delay decision-making, information about the comparison rule and relevant colour re-emerged from activity patterns, alongside selection rule information, despite it being no longer explicitly relevant. Further, neural representations of task content during the delay were generally distinct from the non-maintenance task, suggesting that maintenance uses its own coding scheme rather than reactivating perceptual representations. Funding: ARC FT230100119

Implicit auditory cueing under working memory load

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Probabilistic cues can bias visual performance, yet it remains unclear whether such cueing operates when the cue is auditory, implicit, and embedded in a working-memory (WM) demanding task. We examined this question using a countback paradigm in which participants encoded a two-digit number and repeatedly subtracted 3 across a variable number of intervals. At the onset of the final interval, a brief high- or low-frequency tone was concurrently presented. Tone frequency was probabilistically associated with whether the upcoming visual target would match the correct calculation (80% vs. 20% validity), but this relationship was not instructed. Participants judged whether the target matched their calculation, and reaction times (RT) and

accuracy were analyzed as functions of cue validity and interval length. Preliminary data (n=5) showed faster responses when the target status was predicted by the high-validity auditory cue than in the low-validity condition, suggesting sensitivity to the implicit probabilistic structure. RTs also increased with interval length, indicating that the manipulation increased computational/WM demands. Post-experiment questionnaires suggested that participants were not aware of the cue-target relationship. Ongoing data collection will test whether the implicit auditory cueing is attenuated, preserved, or enhanced under higher WM load.

Stress, cognitive load, and perceptual capacity in Augmented Reality: Implications for adaptive human–system interfaces

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Objective: To determine the psychophysical and physiological effects of acute stress and cognitive load in an augmented reality (AR) environment. Method: Participants completed a dual-task scenario in a hybrid CAVE–HoloLens environment. A head-stabilised AR Gabor orientation-averaging task (variable set-size) provided a measure of perceptual capacity. A continuous 1- vs 3-back task indexed working-memory load. Participants made orientation judgements using a first-person shooter (FPS) action. Acute stress was induced via threat-of-shock and social evaluation, with shock contingency tied to Gabor errors, n-back errors, or both. Behaviour and pupil diameter were recorded. Results: Perceptual capacity, indexed via set-size effects, was robust. Neither cognitive load nor stress altered the slope of the set-size function. Working-memory load selectively impaired n-back performance but had minimal impact on Gabor accuracy. Stress did not globally degrade performance; instead, it enhanced performance on the task predicting shock and impaired the non-threatened task, with collapse only under diffuse threat. Pupillometry yielded a strong, task-invariant signature of stress. Conclusion: Stress and cognitive load do not reduce perceptual capacity in AR. Instead, stress acts as a priority amplifier. Perceptual integration limits remain stable under high cognitive and physiological demand.

Poster Presentation Abstracts

Comparing Satisfaction-Based and Just-About-Right Scaling Methods for Sensory Attribute Diagnostics: Evidence from Coffee Consumer Research

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The Degree of Satisfaction-Difference (DOSD) method was developed as a Signal Detection Theory based alternative to hedonic scaling, using cognitive warm-up and reminder procedures to improve judgment consistency. Subsequent work combined DOSD with a multi-attribute Double-Faced Applicability test, pairing satisfaction judgments with sensory descriptor evaluation for diagnostic profiling. However, this approach has yet to be validated through direct empirical comparison with an existing attribute diagnostic measure. The present study uses the Just-About-Right (JAR) scale as a benchmark to address that gap. Participants (N = 49) evaluated seven instant coffee samples across two product sets differing in attribute range context in a within-subject counterbalanced design. For samples appearing in both product sets, neither method showed evidence that attribute-range context significantly affected consumer evaluations. JAR penalty analysis produced several reversed penalties, indicating that deviations from 'just-about-right' were not always associated with lower satisfaction. Consumer segmentation revealed a meaningful qualitative difference between methods: DOSD-based segmentation produced more differentiated taste-preference profiles, whereas JAR-based clustering appeared more strongly influenced by individual differences in scale use.

A signal detection analysis of "suicide" themed Search Engine Optimisation (SEO)

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To increase website prominence Search Engine Optimisation (SEO) techniques use high-value keywords to attract users. As the search term "suicide" is being used to attract browsers we need to

understand the potential impact of this confusing practice. Such a policy is harmful if it encourages or triggers suicide (Werther effect) or beneficial if it distracts or encourages alternatives to suicide (Papageno effect). To quantify such browser confusion, a series of online searches used Signal Detection theory and subtractive methodologies to consider the impact of search terms: "painless methods", "suicide", "alcohol" and "gambling". 800 websites provided by Google in June 2023 were categorised as Hit, Miss, False Alarm and Correct Rejection by 2 raters. The degree of overlap between "harmful" and "harmless" distributions was indicated by d' , while Google's relative willingness to report harmful results was indicated by β . The most harmful search (largest d') resulted from the search term "Painless Methods", but Google was less willing to report this content (highest β). Including the search term "Suicide" elicited more helpful sites and reduced d' . However, more harmful content was shown when the terms "Alcohol" or "Gambling" were added. Using the word "Suicide" on websites is actually beneficial, and can flag the site for health services, but deliberately using it to attract the vulnerable to harmful websites seems inappropriate.

An investigation of the robustness of depth perception by motion parallax in peripheral vision against variety stimuli

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It is said that we perceive three dimensional information of the world, including depth, by inferring from features obtained from two dimensional retinal images, called "depth cues." Motion parallax is one of the depth cues, which uses the difference of the retinal motions caused by the distance between the observer and each object with relative motions to the observer. While many studies about depth perception with motion parallax in foveal vision have been done so far, few studies have focused on perception in peripheral vision. In previous studies focusing on peripheral vision, the more eccentricity of the stimulus increased, the more the perceived depth decreased. In addition, previous studies about depth perception with

motion parallax in peripheral vision used similar stimuli, which were random dot patterns with motion simulating a smooth sine-curve-like surface. However, stimuli simulating a surface with discontinuous depth have not been used yet. For better comprehension of depth perception with motion parallax in peripheral vision, we did a psychophysical experiment about the relationship between eccentricity and the perceived depth in method of constant stimuli using random dot stimuli simulating planes with discontinuous depth. In this presentation, we will show the results of the experiment and discuss the differences from the previous studies.

Cue-Based Modulation and Transfer of Cognitive Control Across Conflict Tasks

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Learning-guided control refers to improvements in conflict adaptation that arise when individuals learn to anticipate and prepare for conflict based on contextual cues. This project investigates how probabilistic and deterministic pre-cues influence performance in conflict tasks and whether such effect transfers within and across task contexts. Using variants of the Flanker and Simon paradigms, participants encounter pre-cues that vary in their predictiveness regarding upcoming congruency. Primary measures are reaction time and accuracy, focusing on cue $\times$ congruency interactions in both trained and transfer contexts. Secondary analyses may be used to examine temporal dynamics and use model-based approaches to explore whether cue utilisation reflects changes in evidence accumulation, response thresholds, or other processing components. All data quality criteria, exclusion rules, and analysis plans are specified a priori. The project aims to clarify the extent to which cognitive control mechanisms are domain-general or task-specific and to explicitly assess the role of learning in conflict adaptation. I will present the experimental framework, methodological considerations, and the current status of the research.

Spectral Regulation of Ocular Growth and Retinal Function in the Chick Model

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Eye growth and refractive error (myopia and hyperopia) development are influenced by the spectral composition of light, yet the mechanisms underlying this effect remain unclear. We examined the effects of narrowband blue and red light on lens-induced refractive error development in chicks and determined whether these manipulations alter retinal function using global flash electroretinography (gfERG). One hundred and five chicks wore a monocular -10 D or $+10$ D lens, or no lens, and were reared under broadband white, narrowband blue, or narrowband red illumination. After 4 days, refraction and ocular biometry were assessed. A separate cohort ($n = 25$) underwent gfERG testing at baseline and after 4 days using spectrally matched red, blue, and white 1 Hz square-wave flash and 30 Hz flicker stimuli. Blue rearing induced a hyperopic shift relative to red and white light, whereas red rearing produced a greater myopic shift than white. Across conditions, white flashes elicited larger a- and d-wave amplitudes, while red flashes elicited larger b-wave amplitudes. Blue light rearing reduced the a/b-wave ratio and increased the b/d-wave ratio, indicating altered signalling balance between photoreceptors and ON and OFF bipolar pathways. These findings demonstrate that blue and red light bidirectionally alter refractive development and produce distinct retinal functional signatures, supporting a cellular basis for spectrally driven changes in eye growth.

Investigating automation-assisted unfamiliar face matching performance over time

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Identity verification often involves deciding whether two images show the same person or two different people. The average human makes errors on 10-30% of trials in laboratory tests of unfamiliar face matching ability. While face matching was once only performed by humans, Automated Facial Recognition (AFR) systems are increasingly being incorporated to assist with these tasks. Depending on the scenario, human operators may provide oversight of these systems or use them as decision making aids. But our previous research consistently shows that while humans can improve their own face matching performance when using these

systems as decision aids, the average assisted performance of the human is worse than the AFR system alone. However, these past studies do not consider whether use of the system may change over time with increasing experience. In two experiments, we asked novice participants to complete the longest automation assisted face matching tasks we are aware of: Experiment 1 ($n = 150$) had 320 trials (8 blocks of 40 trials), Experiment 2 ($n = 148$) had 220 trials (4 blocks of 55 trials). Both experiments found participants improved with assistance from the AFR system, but that the degree of improvement remained consistent across the task. There was little evidence that reliance on the AFR system changed over the course of the unfamiliar face matching tasks, suggesting that experience using AFR systems may not improve performance in the short term.

Comparing Human and AI Curiosity in 3D Object Exploration

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Humans' robust object recognition may rely on efficient, curiosity-driven exploration. In machine learning, Intrinsic Curiosity Models (ICMs) formalise this process in AI by using prediction error to guide exploration. The present study investigated whether humans and curiosity-driven AI agents exhibit comparable exploration behaviours when interacting with novel 3D objects. Human participants ($N=32$) explored objects through constrained rotational actions, followed by an old/new recognition test to assess learning. In parallel, custom-trained ICMs explored the same objects via the same visual interface, choosing "interesting" actions (those that maximised the model's own prediction error). Stimuli were 80 novel 3D rendered objects which varied systematically in shape profile (isotropic vs elongated) and surface material (matte vs glossy), with randomly placed local shape features. Behavioural data collected from both groups included frequency and duration of visited viewpoints, and exploration trajectories. Permutation analyses revealed that both human and AI exploration behaviour was highly non-random, prioritising specific actions and viewpoints. This design enables a direct comparison of human and AI exploration strategies, providing insights into whether curiosity-driven mechanisms in machine learning agents can approximate human visual learning and view preferences.

Neural Basis of Eye Movement Metrics in Natural Reading: A Fixation-Related fMRI Study

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Decades of research show that eye movement metrics in reading reflect distinct cognitive processes, with growing interest in their neural basis. Prior work has focused on associations between these metrics and brain structure, leaving neural activity during natural reading poorly understood. To address this gap, we analyzed a natural reading dataset of 27 native English speakers with simultaneous eye tracking and fMRI. Using fixation-related fMRI, we mapped fixation events to eye movement metrics and examined their neural correlates. Early-stage metrics (i.e., first fixation duration, FFD; gaze duration, GD) activated the left occipital cortex, reflecting bottom-up visual and lexical processing. Late-stage metrics (i.e., second-pass reading time, SPRT; total fixation duration, TFD) also engaged the left occipital cortex but recruited a broader network, including the right occipital cortex, supplementary motor area, and left precentral gyrus. TFD further engaged the left fusiform and middle temporal gyri, whereas SPRT recruited the left prefrontal cortex, cingulate cortex, and insula, reflecting semantic integration and top-down processes. These findings indicate that early eye movement metrics index lower-level perceptual and lexical processing, whereas late metrics index higher-level integrative processes during reading. To our knowledge, this study provides the first neural evidence for cognitive accounts of reading-related eye movement metrics.

Confidence Reflects Boundary-Weighted Evidence in Perceptual Decision-Making

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When assessing our decisions, a central question is how different sources of evidence are weighted when computing confidence. Prevailing accounts suggest that confidence is predominantly driven by decision-congruent evidence (i.e., positive evidence bias; PEB). Here, we used a colour-averaging task to examine how observers integrate decision-congruent and decision-incongruent evidence when

forming confidence judgments. Participants judged the average colour of multi-element stimuli and reported their confidence, allowing us to dissociate the contribution of distinct evidence samples. Strikingly, confidence was disproportionately influenced by evidence near the category boundary, even when this evidence conflicted with the participant's choice. This pattern is inconsistent with the PEB account and instead supports a robust averaging mechanism, whereby boundary-proximal evidence is upweighted. Consistent with recent work, these effects can be captured by an extended log-posterior-ratio framework in which heightened sensitivity to boundary-proximal evidence governs both perceptual decisions and confidence. Together, these findings suggest that confidence reflects a systematic re-weighting of evidence driven by decision-related computations rather than a simple readout of decision-congruent information.

Orientation Extrapolation in Humans and CNNs: A Fatigue-Based Account

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Visual adaptation and feature extrapolation are perceptual phenomena that demonstrate the brain's flexibility in a changing visual environment. A debate exists between two explanations: predictive coding suggests the brain predicts inputs from prior experience, whereas neuronal fatigue proposes that both phenomena arise from intrinsic suppression in feature-selective neurons. Prior studies have implemented both mechanisms in convolutional neural networks (CNNs), showing that extrapolation arises from predictive coding and adaptation from neuronal fatigue. However, it is unclear whether extrapolation can occur within a fatigue-based model. Extrapolation has been observed in motion and colour, but is less studied for orientation. Here, we measured orientation extrapolation using a flash-lag paradigm, where participants judged the orientation difference between a rotating grating and a flashed static grating. The same paradigm was simulated in a CNN incorporating intrinsic suppression; orientation was decoded from its activations. Results showed extrapolation: orientation shifted in the direction of rotation in human and model data. However, the model failed to capture differences in extrapolation magnitude across cardinal and oblique orientations in humans. These findings demonstrate an extrapolation effect in orientation and suggest intrinsic suppression can

account for it, while highlighting the limitations of CNNs in explaining differences in effect size across orientations.

Spatial Regularities Preferentially Drive Distractor Suppression

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Recent research has shown that the visual system can suppress distractors through statistical learning of regularities. However, when multiple regularities—such as feature and spatial information—are available, it remains unclear whether they are learned independently or predominantly guided by a specific regularity. To address this, we used a capture-probe paradigm in which a color singleton distractor consistently appeared at a fixed location during visual search. Attentional allocation was indexed by probe report accuracy. Critically, on some trials, the color singleton appeared at locations other than the fixed one, allowing us to assess feature-based and spatial learning independently. The results revealed robust spatial suppression at the fixed location, reflected in reduced accuracy even when a non-singleton appeared there. In contrast, suppression failed to generalize to color singletons presented at alternative locations. These findings indicate that, despite both color and spatial regularities, the visual system preferentially acquires spatial suppression. This may reflect the architecture of the attentional priority map, in which downweighting spatial coordinates is more efficient than modulating feature-level gains. Furthermore, our results suggest that suppression is not necessarily applied to all available regularities in a uniform manner, which may inform recent theoretical accounts of attentional control.

Cognitive Appraisal and Epistemic Emotions: How Manipulating Motivational Beliefs Shapes Curiosity, Confusion, and Engagement

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Grounded in situated expectancy-value theory, this study examined whether enhancing students' task-specific motivational beliefs (i.e., expectancy and

task value), and reducing perceived emotional cost would influence their epistemic emotions (curiosity and confusion) and learning engagement in a mathematics context. A 2 (Group) $\times$ 2 (Time) quasi-experimental design was conducted with seventh grade students from a Taiwanese junior high school. During a three-week instruction unit on a mathematics problem-solving task (the Four-Color Theorem), the experimental group ($n = 39$) received a series of message-based manipulations designed to enhance expectancy and task value while reducing perceived cost, whereas the control group ($n = 25$) received conventional instruction. Mixed ANOVAs results revealed significant interaction effects on confusion and learning engagement. The experimental group showed a significant decrease in confusion and reported lower levels than the control group at posttest. Regarding engagement, the experimental group demonstrated a significant increase over time, outperforming the control group in growth trajectory, although the between-group difference at posttest was not significant. No significant effects were found for curiosity. These findings support SEVT's causal claims, demonstrating that enhancing students' expectancy and task value while reducing emotional cost alleviates confusion and foster learning engagement in challenging mathematics tasks.

Examining real-life ToM in adolescence using the “Director Task”

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It is well established that theory of mind continues to develop between adolescence and adulthood. A common measure in this literature is the Director Task – a referential communication task where participants must take the perspective of the “Director” to organise objects in a set of shelves. Prior studies have shown that adolescents make more errors on this task than adults. However, these studies have relied exclusively on a computer-based format, where the Director is a human avatar. Given that adolescence is a developmental period with heightened social sensitivity, adolescents may respond differently if the Director was a real person relative to an avatar. Indeed, social facilitation theory posits that the presence of a real person can affect task performance. Therefore, we developed a version of the task with a real human Director and compared performance on this version with the

traditional computer-based version. We recruited 213 participants, including 109 adolescents (aged 13 – 20 years, $M = 16.31$; 55% female) and 104 young adults (aged 25 – 35 years, $M = 28.54$; 57% female), who were randomly assigned to complete either the computer-based or real-life Director Task. We additionally measured eye-gaze as an exploratory variable in the real-life version using wearable eye-tracking. Behavioural data comparing accuracy rates across each age group and each task version will be presented, along with preliminary eye-tracking data for the real-life version of the task.

Characterising EEG spectral activity following mild traumatic brain injury

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Limited research to date has accounted for aperiodic (1/f-like) activity when investigating electroencephalography (EEG) power spectra after mild traumatic brain injury (mTBI). To our knowledge, no studies have examined these aperiodic parameters beyond the acute stage of injury. Here, we aim to explore whether individuals with a history of mTBI show differences in aperiodic-adjusted oscillations and aperiodic parameters, and whether these relate to working memory performance. We collected EEG data in participants with a self-reported history of mTBI ($n = 20$) and control participants ($n = 38$) while they performed a whole-field change detection visual working memory task. mTBI participants had sustained their injury more than three months but less than five years prior. A battery of additional working memory tasks was also employed. Event-related potential (ERP) analyses show that electrophysiological indices of early visual processing (i.e., P1 and N1) and visual working memory capacity (i.e., negative slow wave) did not differ between the groups. However, preliminary findings from a subset of the data suggest possible group differences in aperiodic-adjusted alpha centre frequency and power, as well as the aperiodic exponent (i.e., slope) and offset. These findings suggest that mTBI history may be associated with lasting differences in brain activity underlying working memory performance.

Hormonal Influences on Insomnia Across the Female Reproductive Lifespan

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Insomnia Disorder is a sleep–wake disorder characterised by persistent difficulty initiating or maintaining sleep and associated daytime impairment. Women are disproportionately affected, with risk varying across the reproductive lifespan. Although fluctuations in ovarian hormones across the menstrual cycle, menopausal transition, and hormonal contraceptive use have been linked to sleep disturbance, their influence on insomnia severity among women with clinically diagnosed ID remains unclear. This study examined whether reproductive variables were associated with insomnia severity in women with ID. Participants were drawn from two randomised controlled trial cohorts including pre- and postmenopausal women ($N = 14$). Insomnia severity was assessed using the Insomnia Severity Index (ISI) alongside self-reported menstrual and hormonal symptoms. After controlling for age, insomnia severity did not differ by hormonal status, $F(1,11) = 0.08$, $p = .782$, menstrual cycle regularity, $F(2,10) = 0.19$, $p = .828$, or contraception type, $F(2,3) = 2.36$, $p = .242$. Menstrual symptom severity, $r(12) = .20$, $p = .495$, and hormonal symptom severity, $r(12) = .37$, $p = .199$, were not associated with ISI scores. However, the overall model examining menopausal status and age was significant, $F(2,11) = 5.27$, $p = .025$ (adjusted $R^2 = .40$). These preliminary findings suggest reproductive factors may not independently influence insomnia severity beyond age effects in women with ID.

Rotating Snakes illusion before and after cataract removal: a single case study**Hiroshi ASHIDA** (Academic)

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Perception of illusory motion in the 'Rotating Snakes' (RS) pattern (Kitaoka & Ashida, 2003) generally declines with age. Optical blurring caused by cataracts might be one of the causes, but a recent study suggested no effect of cataract removal (Fujita et al., 2026). Their use of between-participant comparisons with a binary judgment (rotated or not), however, may have undermined the detection of any effects. Here we report a case of the author, HA, before and after binocular lens implantation, with quantitative measurements of the RS illusion. The procedure of Uesaki et al. (2024) was adopted,

except that a high-speed LCD with a 120 Hz refresh rate was employed and that eye movement was not monitored. The illusion patterns were slowly rotated and the null speeds were estimated to quantify the illusion strength. Before the surgery, reliable illusion was induced by the image that comprised blue and yellow elements (interleaved with white and black ones), and weaker illusion was induced by the greyscale images, as in Uesaki et al. (2024). The illusion was very weak, however, by the images with red and green elements. After the surgery, the illusion was almost at the same level for the blue-yellow and the greyscale patterns, while the illusion slightly increased for the red-green pattern. The surgery therefore did not have significant impact on the Rotating Snakes illusion, while reduced optical diffusion may contribute to clearer retinal images of the red-green pattern.

Modelling Brightness Perception Using Symbolic Regression**Bianca-Mihaela PREDA** (Master student)

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Understanding how the human visual system integrates multisensory signals into a unified brightness percept remains a fundamental challenge. Traditional linear models often fail to capture the non-linear interactions inherent in biological sensory processing. This study explores the mathematical models of brightness perception by combining psychophysical data with Symbolic Regression (SR), which discovers functional forms. Our protocol first establishes a baseline using Linear Mixed Models (LMM), then utilizes SR to evolve equations for a "Universal Rule" of brightness. Finally, we integrate biological models, such as Weber-Fechner, to ensure biophysical validity. We apply this pipeline to psychophysical data obtained using a multi-primary illumination system with silent substitution, allowing independent control of photoreceptor stimulations. This receptor-isolating approach enables direct mapping between model components and underlying photoreceptor pathways. We aim to quantify how the brain's computational logic shifts at different background colours. Using the method of constant stimuli and the two-down, one-up staircase procedure, we determined discrimination thresholds across the different background colour conditions. The results showed that the L-M cone-opponent signals

contribute to brightness perception, which is consistent with studies in the literature.

The Effect of Psychopathic Traits on the Would/Should Gap in Probability Discounting of Rewards

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Psychopathy comprises distinct traits that may differentially influence risk-related decision-making. This study examined how individual differences in Fearless Dominance (FD) and Self-Centered Impulsivity (SCI) relate to probability discounting in decisions framed as what participants would versus should do. 181 undergraduates completed the Psychopathic Personality Inventory–Revised Short Form (PPI-R-40) and an online probability discounting task involving hypothetical financial rewards; either a certain smaller reward value, or an uncertain reward of \$200. Consistent with expectations, participants displayed steeper discounting of uncertain rewards in the should condition than the would condition, reflecting greater caution when considering normative choices. Higher FD scores were associated with shallower discounting across both conditions, indicating greater tolerance for risk, whereas SCI scores were unrelated to discounting behaviour. No interaction effects emerged between psychopathy traits and decision conditions. These findings highlight the value of distinguishing between FD and SCI in understanding psychopathy-related risk-taking and demonstrate the utility of the would–should framework for studying moral and economic decision-making.

Effects of Haptic Feedback in a VR Sliding Task

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Our sense of touch plays a crucial role in calibrating and correcting movement. While this feedback is often unnoticed in our everyday lives, in virtual reality (VR) the lack of detailed feedback and low sensory fidelity can have undesired consequences for learning and performance. One important cue that touch communicates is surface friction. Understanding how people calibrate their movements in the presence of haptic feedback

about surface properties is important for improving VR interaction design. In this study, we examine how haptic feedback influences performance, visual behaviour, and subjective experience during a VR object manipulation task. Thirty-four participants completed a within-subject experiment across four haptic conditions: congruent, incongruent, unreliable, and no haptics. Participants slid the object towards a target across surfaces (ice, wood, stone) with different friction properties. Performance varied across surfaces, indicating stone to have higher radial error compared to ice but not across haptic conditions. Performance improved significantly over the course of the experiment, indicating general learning across conditions. Overall, our inability to detect consistent effects of haptic feedback was surprising. It may suggest that the fidelity and strength of the feedback provided by common VR systems is too low to elicit measurable benefits over the visual cues alone.

Evaluating Lab-Acquired Face Familiarity using Event-Related Potentials

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Accurate recognition of familiar faces is an important ability, and recognition failure can be detrimental for effective socialisation. Previous research has found specific effects in event-related potentials from 200ms onwards following presentation of a personally familiar or celebrity face. In many laboratory settings, people can successfully learn and remember multiple faces that were previously unfamiliar. How is this “lab-acquired” familiarity similar to “real” face familiarity (of family and friends)? We aimed to investigate how faces become familiar by utilising a novel face familiarity training paradigm with 10 identities, employing varying naturalistic images and higher experimental control on familiarity. In a preliminary sample of 20 participants, we found that participants were able to recognise and recall the names of the 10 identities in a social media test (novel images in different contexts) with high accuracy. These newly learnt identities elicited neural representations of face familiarity, similar to previous findings of “real” face familiarity, which generalised to novel social-media-like test images, ruling out image-dependent recognition. These results demonstrate that a brief learning paradigm of varying naturalistic images are sufficient to establish generalisable representations

of facial identity. Our findings also provide support for the ecological validity of image-based learning paradigms for studying the acquisition of face familiarity.

Modelling perceptual colour structure for observer-specific display optimisation

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Selecting colours that are perceptually discriminable is critical for display applications ranging from medical imaging to military displays. Standard colour appearance models are routinely used to guide such selection, yet it remains unclear how well they capture the perceptual structure governing observer performance. A behavioural dataset (OpenNeuro ds005684; 35 observers, 9 suprathreshold hues) was analysed in which sequential colour similarity ratings were collected and from which a high-reliability representational dissimilarity matrix (within-subject ICC = 0.80) was derived. Despite strong agreement with HSV hue angle ($r = 0.825$), CIELAB ($r = 0.653$), and CAM16-UCS ($r = 0.761$), a combined physical model left 22% of reliable perceptual variance unexplained. This variance correlated with red-green opponent channel distances and individual differences in cool-region similarity structure independently predicted unexplained variance ($r = -0.46$, $p = 0.006$). Group-optimal colour sets failed most observers, e.g., 83% of participants had an individually-optimal colour set that differed from the group optimal colour set at $N = 4$ colours. EZ diffusion forward modeling predicted performance losses of up to 32 ms and 8.6 percentage points on the hardest colour pair in the set. These results suggest that optimising stimulus sets for individual differences in colour ability could result in meaningful gains for applications where optimal performance is required.

Attentional Suppression of Emotionally Salient Words: An Eye-Tracking Study.

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Highly salient stimuli in the environment often capture attention automatically, even when they are irrelevant to the current task. Previous studies have shown that attentional sets and search modes can support proactive attentional control before

attention is captured. However, whether emotionally salient, task-irrelevant stimuli can be suppressed during visual search remains unclear. In the present study, we examined the distractor effects of task-irrelevant emotional words using behavioral measures and eye tracking. Two-character Japanese kanji compound words were presented as distractors in a visual search display. The distractor conditions included emotional words, neutral words, and a word-absent condition. Behavioral results showed that reaction times were slower in word-present conditions than in the word-absent condition, indicating attentional capture by salient word stimuli. However, reaction times did not differ between emotional and neutral word conditions. Eye-movement data revealed that the latency of the first fixation on the target was shorter when word distractors were present than when they were absent. These findings suggest that although task-irrelevant word distractors interfered with behavioral responses, inhibitory control over such distractors may have been partially engaged during visual search.

Visual Workload Reshapes Dynamic Trust Calibration in Human–AI Collaboration

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Appropriate trust calibration is essential in human–AI collaboration because it shapes whether users rely on AI recommendations in uncertain contexts. In visually demanding settings, users must evaluate AI advice while processing competing information, yet it remains unclear how such demands affect trial-by-trial trust updating. To address this gap, we examined how visual workload influences dynamic trust calibration using a dual-task AI-assisted mineral exploration task. Guided by a dual-pathway framework, we distinguished process-based updating from AI recommendation correctness and outcome-based updating from task outcomes. The results showed that high visual workload reduced sensitivity to AI recommendation correctness while increasing the influence of task outcomes, indicating stronger outcome bias. The asymmetry of trust updating remained robust, with larger decreases after incorrect than increases after correct recommendations. High visual workload also increased subjective trust and behavioral compliance with AI. These findings suggest that visual workload shifts trust calibration from analytic to heuristic processing and highlight the need for AI

interfaces that support appropriate trust calibration in visually demanding environments.

Dorsomedial Prefrontal Cortex Pathology and Goal-Directed Behaviour

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Dorsomedial prefrontal cortex (dmPFC) damage is associated with a range of cognitive and behavioural impairments, particularly on tasks requiring sustained effort. One proposal is that this region regulates parasympathetic arousal according to the perceived difficulty and potential outcome of an action. Past neuroimaging research has found associations between dmPFC activity and effort. To narrow down the dmPFC's precise role, a lesion method is needed. Our project examines how dmPFC tumour pathology relates to impairments in goal-directed behaviour. We assess behavioural and physiological responses to manipulations of incentive and effort in a novel Go/No-Go paradigm. The primary focus is on ultra-short term heart rate variability measures (HF-Power and RMSSD). Healthy participants and dmPFC tumour patients completed: 1) a simple reaction time task, 2) a standard Go/No-Go task, and 3) an incentivised Go-No Go task. Controls showed a clear pattern of decreased HF-Power as the task became more challenging and/or rewarding, consistent with upregulation of parasympathetic activity. We hypothesise that this effect will be attenuated in the dmPFC pathology group. We will present control data and preliminary data from a few pre-operative tumour patient cases. Investigating the link between dmPFC damage, autonomic arousal, and goal-directed behaviour serves two purposes: understanding what the dmPFC is critical for and informing more sensitive clinical assessments of dmPFC damage.

Robustness of Adaptation-Like Dynamics in Recurrent Models of Visual Motion

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Visual motion perception has long served as a testing ground for theories of neural adaptation. From classic studies of the motion aftereffect (MAE)

and direction-selective neurons in area MT to normative accounts based on efficient coding, adaptation has been interpreted as evidence of a system that continuously recalibrates to its environment. Historically, this phenomenon has been attributed either to neural fatigue or to computational optimization enhancing sensitivity to change. Yet a key question remains: why does adaptation arise so robustly across levels of visual motion processing? Recent work has shown that recurrent neural networks trained on motion tasks can develop direction-selective representations and adaptation-like temporal dynamics (Rideaux & Welchman, 2020; Mohan & Rideaux, 2025). Notably, when adaptive mechanisms are incorporated into recurrent motion models, motion aftereffects (MAE) can emerge following prolonged stimulation, although such aftereffects are not explicitly specified as training targets (Mohan & Rideaux, 2025). Here, we extend previous mechanistic models of motion processing by systematically varying the structure of a recurrent network (AdaptNet; Mohan & Rideaux, 2025), asking whether adaptation-like dynamics persist under changes at the implementation level. We introduce controlled structural modifications, including changes to recurrence, normalization, and activity constraints.

Visual statistical learning and perceptual grouping: Cooperation or competition?

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Segments of continuous visual streams are learnt from its transitional regularities, which can be influenced by attention. While color similarity can orient attention to grouped stimuli, whether such grouping facilitates or competes with the learning of transitional regularities is unknown. This study examined whether color congruence in shape pairs modulates statistical learning. 27 participants viewed sequential presentations of colored shapes which were organized in triplets, each containing one color-congruent and one color-incongruent pair. A control group (N = 26) viewed the shapes in black. Then, they completed a two-alternative forced-choice task with black shapes, measuring their recognition of color-congruent or color-incongruent pairs versus random pairs, and recognition of triplets segmented by transitional probabilities or color versus random triplets. Recognition accuracy was higher for color-congruent pairs than color-incongruent pairs, and for triplets segmented by

transitional probabilities than color. The control group showed lower accuracy of pair recognition compared to the color-congruent condition, confirming the effect was attributable to color encoding during exposure. These findings suggest that color similarity supports shape sequence encoding, and that statistical learning dominated over perceptual grouping in segmenting visual streams. This study showed that perceptual grouping supports stream segmentation without compromising statistical learning.

Wavelength-Dependent Contribution of ipRGCs to the Luminance Pathway: A Psychophysical Study Using Metameric Stimulation

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This study investigated whether ipRGCs contribute to the luminance pathway in a wavelength-dependent manner. Using a custom-built spectral projector, we conducted heterochromatic flicker photometry at 30 Hz to measure perceived luminance. Metameric ipRGC-directed stimuli were designed to selectively modulate ipRGC excitation while maintaining constant cone and rod activation. Blue-rich stimuli (containing substantial short-wavelength components near the melanopsin peak at ~490 nm) and red-rich stimuli (with minimal short-wavelength energy) were compared. Peripheral ($\geq 10^\circ$ visual field) and central viewing conditions were tested. Results revealed substantial individual differences. In peripheral vision, several observers exhibited luminance increases with increasing ipRGC stimulation under blue light, whereas such effects were reduced or absent under red light, suggesting wavelength-dependent melanopsin involvement. In contrast, under central viewing conditions, more than half of observers showed a tendency toward luminance reduction with increased ipRGC stimulation, indicating a visual-field-dependent contribution. These findings suggest that ipRGCs can exert subtle yet measurable influences on the luminance pathway, with both wavelength and retinal location modulating their effects. The results highlight complex melanopsin–cone interactions in human brightness perception.

Probing Domain-Specific and Domain-General Mechanisms of Face Recognition in Complex Visual Scenes

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Accurate identification of unfamiliar individuals in real-world settings is a critical yet error-prone ability, particularly under visual variability, crowding, and degraded image quality. Although face recognition is well studied, most evidence derives from controlled laboratory paradigms using static, decontextualized stimuli, leaving unclear how identity is established in dynamic environments where facial information is often incomplete and must be integrated with other cues. This gap limits current theories on whether identification relies on domain-specific face processing or broader, domain-general mechanisms. This project introduces a controlled CCTV-style paradigm embedding identity recognition in complex scenes. In a within-subject design, participants complete video-based trials where cues are manipulated across three conditions: face-only, body-only, and whole-person. Scene complexity (low vs. high) is varied via crowd density, motion, and occlusion, while perspective, lighting, and context remain constant. Each participant completes 24 trials with balanced target-present/absent conditions, enabling analysis of accuracy and response dynamics under realistic search demands. This paradigm directly tests how identity cues and environmental demands interact in unfamiliar person identification, advancing a unified framework where domain-specific and domain-general mechanisms jointly contribute, with implications for surveillance, forensic practice, and human–AI systems.

How Social Relationships Shape Interpersonal Body Synchrony

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When we interact with others, body sway and heart rate can become spontaneously synchronized. It has been suggested that the degree of synchronization varies as a function of social relationships. In this study, we examined how body sway and heart rate synchronization change across different social relationships. We also systematically varied interpersonal distance across five conditions (20, 40, 60, 80, and 100 cm) to examine its effect on synchronization. This design enabled us to investigate the relationship between interpersonal synchrony and personal space. Pairs of romantic

partners and pairs of friends performed an interpersonal motor coordination task while maintaining a face-to-face standing posture. Center of pressure and heart rate were recorded. Analysis of these time-series data revealed no significant differences in synchrony as a function of social relationships. Interpersonal distance had no significant effect on heart rate synchrony. However, body synchrony in the anterior–posterior direction systematically varied with distance, with stronger synchrony observed at shorter distances, whereas no such effect was found in the medial–lateral direction. Our findings suggest that interpersonal body synchronization is more strongly influenced by interpersonal distance than by social relationships, particularly in the anterior–posterior direction.

Generalising Visuomotor Skill Learning in Virtual Reality

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Visuomotor skills are essential to daily life, requiring flexible motor actions in response to changing perceptual inputs. Studying their acquisition is challenging, as they are rarely learned in controlled settings. Virtual Reality (VR) offers a novel solution. We use the VR game Beat Sabre, where, in time to music, players slice colour-matched blocks with 'light sabres' in the direction of arrows. Prior research suggests that around 2/3 of skills transfer between Expert-level songs after five days of training, while evidence for cognitive improvements after Beat Sabre training is mixed. This study jointly assesses performance improvements within five days of Beat Sabre training and their relationship to cognition. Participants first complete cognitive tasks, then train on Beat Sabre for five days at the Easy or Expert level, playing their assigned song three times daily. On Day Five, all switch to a new Expert song and repeat the cognitive tasks. Data collection is ongoing, but early results replicate that around 2/3 of skills transfer between Expert-level songs. However, despite quickly achieving ceiling performance, Easy-level players performed similarly to Expert-level players on the new Expert-level test song. The relationship between cognition and Beat Sabre remains unclear; improvements appear to be a product of time, rather than training level, or an interaction between the two. We now aim to address this with an additional control and a larger sample.

Personality and Social Anxiety in Other-Race Face Recognition

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Face processing is a fundamental component of social interaction. While previous research has examined the role of personality in own-race face recognition, less is known about its influence on other-race face processing, which is typically more difficult. The present study investigated the relationship between Big Five personality traits, social anxiety, and performance on own- and other-race face recognition tasks. One hundred White participants completed the Cambridge Face Memory Test (CFMT), the CFMT-Chinese, the Cambridge Car Memory Test (CCMT), the Liebowitz Social Anxiety Scale, and the Ten Item Personality Measure. Results showed a clear other-race effect, with higher accuracy on the CFMT than the CFMT-Chinese. Multiple regression analyses indicated that openness to experience and social anxiety were significant predictors of other-race face recognition. In contrast, for own-race face recognition, only social anxiety was a significant predictor, while none of the Big Five traits were significant. No predictors were associated with CCMT performance. These findings suggest that personality and affective traits differentially relate to face recognition ability, with openness specifically linked to other-race face processing and social anxiety associated with enhanced face recognition more broadly.

Modulation of Shape Perception by Spatial Context

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Perception is often dependent on context, potentially biased by the presence of similar visual structures presented nearby in either time or space. While temporal context, or adaptation, has been extensively explored across the visual hierarchy, showing similar repulsive effects, this is mainly restricted to low-level features for spatial biases. One major visual property for which spatial context has not been investigated, despite the discovery of a temporal counterpart, is the representation of shape. This is surprising given the importance of shape in object recognition and action, as well as the

ubiquity of shapes in natural scenes. If a spatial shape context effect exists, then it is likely present throughout everyday vision. In the present study series, participants simultaneously viewed two sets of shapes, adjusting their central targets to match in the presence of differing surrounds. Across studies, we found a consistent attractive bias, shifting perceptions of shape toward that of the surround, increasing in magnitude as a function of stimulus dissimilarity. These results generalised between different stimulus types: simple shapes, their three-dimensional counterparts, and naturalistic silhouettes matching a previous shape aftereffect study. The findings align with assimilative or attractive effects recently found for other high-level features, and support a high-level, multi-dimensional representation of shape over one based on inherited low-level information.

Effects of Visual Presentation Methods on Drivers' Visual Search Behavior: Analysis of Eye–Head Coordination in Driving Simulators

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Driving simulators are widely used to investigate driver behavior and evaluate in-vehicle systems; however, differences in visual presentation may influence how drivers acquire visual information. This study examines how presentation methods affect visual search behavior, focusing on eye–head coordination rather than gaze targets. Two simulator environments were compared: a multi-display system with a wide field of view and a head-mounted display (HMD) with a restricted field of view. Participants drove in an urban scenario while eye and head movements were recorded. Behavior was quantified using metrics of eye movements, head movements, and eye–head coordination, including frequency, amplitude, duration, head contribution ratio, and coordination complexity. Subjective workload and simulator discomfort were also assessed. Results showed no clear differences in eye movement metrics alone. In contrast, head movement frequency and amplitude, coordination duration, head contribution ratio, and coordination complexity were higher in the HMD condition. Subjective ratings also indicated increased fatigue and simulator sickness in the HMD environment. These findings suggest that presentation methods influence how eye and head movements are combined to acquire visual information. The results indicate distinct tendencies: an eye-dominant

pattern with wide-field displays and a head-dominant pattern with restricted visual fields.

Transient and sustained properties of the melanopsin spike train are evident in its enhancement of cone vision

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The melanopsin excitation in ambient light can tune the contrast sensitivity of cone vision. Melanopsin retinal ganglion cells (mRGC) transiently depolarise at light onset with a high spike rate, then decay to a lower sustained signalling state. We investigated how these two signalling states affect cone vision. Five primary silent substitution controlled the melanopsin excitation. The effect of sustained mRGC signalling was quantified during aperiodic steady melanopsin stimulation (0Hz); transient mRGC signalling was quantified using a probed-sinewave temporal paradigm with periodic melanopsin stimulation (8 phases and 6 frequencies; 0.125–5.0 Hz). We find that a 40% increase in steady melanopsin excitation increases cone contrast sensitivity by $23.5 \pm 1.2\%$. During periodic stimulation, cone threshold tracked the phase of melanopsin modulation with $\sim 45^\circ$ delay, and the threshold improvement showed a non-monotonic dependence on modulation frequency, increasing from 0 Hz to a maximum at 0.166 Hz ($35.4 \pm 1.6\%$) and then progressively declined to zero enhancement at 5Hz. At 5 Hz, cone thresholds matched the steady state level, consistent with temporal averaging. We demonstrate that the transient melanopsin spiking response has a larger enhancing effect on cone vision than its sustained signalling component, and the non-monotonic relationship closely matches the time-course of the firing pattern of single-cell recordings of mRGCs.

Investigation the Magnification Illusion in VR-Part II

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This study investigates the reproduction of the magnification illusion in virtual reality (VR), focusing on the perception of optical slant (θ) and perspective (β) angles. Our previous VR implementation used a

projection-plane method in which the projection plane was fixed to the eye direction and moved together with head rotation, enabling magnification control under binocular rendering. In the present work, this limitation is addressed by decoupling the projection plane from the eye direction, allowing it to remain fixed in world space regardless of head rotation, and implementing a stereoscopic rendering pipeline that preserves binocular disparity. An experiment was conducted to evaluate spatial interpretation across ground, ceiling, and sidewall viewed through the naked eye or magnification, with results compared against real-world benchmarks. The stereoscopic implementation improved optical slant reproduction most clearly for ceiling surfaces and partially for sidewalls, while ground perception remained underestimated. Perspective angle remained relatively stable across implementations. These findings indicate that preserving binocular disparity enhances the reproduction of spatial geometry in VR, but additional depth cues may be required to achieve accurate ground-surface perception under magnified viewing.

Preparing for an Uncertain Future: A Design Thinking Intervention for Creative Thinking on Social Problems

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In a rapidly changing world, the ability to recognize social issues and generate creative solutions to real-life problems is increasingly essential for young people. Although creativity has been widely emphasized in education and global agendas such as the United Nations Sustainable Development Goals, limited research has examined how to cultivate creativity in the domain of social problems. This study investigated the effects of a 14-week design thinking intervention on adolescents' creative thinking on social problems and domain-general divergent thinking. A total of 164 eighth-grade students were assigned by class to either an experimental or a control group. The experimental group participated in a design thinking program involving the stages of empathize, define, ideate, prototype, and test, whereas the control group received regular instruction. Creativity outcomes were assessed using Huang's (2022) Social Problem Creative Thinking Test and Wu's (1998) Unusual Uses Task. The results showed that the intervention

enhanced fluency in problem definition, as well as fluency, flexibility, and originality in concept generation. It also improved fluency and flexibility in divergent thinking. These findings suggest that design thinking may serve as an effective pedagogical approach for fostering adolescents' social problem-oriented creativity.

Temporal Dynamics and Adaptive Control in a Prime-Probe Task: A Distributional Analysis of Congruency Effects

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This study investigated the cognitive mechanisms underlying congruency and sequence effects in a confound-minimized arrow prime-probe task using aimed-movement responses, which allowed separation of initiation time (IT) and movement time (MT). In addition, a neutral prime condition was incorporated to decompose the overall congruency effect into facilitation (from congruent trials) and interference (from incongruent trials). Results revealed a significant congruency effect in both IT and MT, with distinct temporal dynamics. The congruency effect in MT increased with response latency, driven primarily by rising interference from incongruent primes, while facilitation remained stable. In IT, the overall congruency effect showed no clear distributional trend, but decomposition using neutral trials revealed opposing patterns: interference increased with latency, whereas facilitation decreased. A significant congruency sequence effect (CSE) was observed in IT and total RT, characterized by reduced congruency effects following incongruent trials. This CSE was primarily attributed to diminished interference, not enhanced facilitation, and remained stable across response latencies. These findings provide detailed temporal and mechanistic insights into conflict processing in prime-probe tasks. These findings suggest that adaptive control in the prime-probe task operates during decision-making, selectively modulating conflict from incongruent stimuli.

Gamified Auditory-Cognitive Training for Mild Cognitive Impairment

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There is a growing need for non-pharmacological interventions to delay or prevent dementia. Mild cognitive impairment (MCI) offers a critical window to provide intervention. Hearing loss is the highest modifiable risk factor of dementia and is strongly linked with cognition. This study explores whether remote assessment and gamified auditory-cognitive training (GACT) can improve cognitive abilities in older adults with MCI (OA-MCI). OA-MCI aged 65 years and above will play two commercial auditory training games for 20 minutes daily at home for 2 weeks. Within-subject baseline-comparison analyses will be used to determine the training's effectiveness. Following training completion, participants and their support person will also be invited to share their feedback on the training experience in an in-person interview. The training improved temporal processing of auditory information, executive functioning, and cognitive flexibility in OA-MCI. The interviews also revealed mixed participant feedback on the training, due to the nature of the games and the technology used. GACT is a promising intervention for improving auditory processing and cognitive abilities of OA-MCI. Participant feedback provides insight into aspects of the intervention they liked or disliked. This study will inform future research aimed at co-creating a GACT with OA-MCI, support persons, and health professionals.

Eye-movement landings as an indicator for attentional bias

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The measurement of attentional bias (AB) has commonly relied on the 'dot probe' task, however it is widely acknowledged as difficult and time-consuming, as it requires many trials and participants to achieve reliable results. A further barrier to the dot-probe task relates to the incompatibility for individualised assessment. An alternative was introduced by Lazarov et al. (2015) using a 4x4 matrix of 16 images. AB is determined by the landing position of eye movements on the images. The images can range from emotional faces among neutral faces (Lazarov et al. 2015), or alcohol and non-alcohol related products (Soleymani et al. 2020). Therefore, an individual with high alcohol dependency is predicted to prioritise alcohol related images despite the presence of alternate images.

Analyses of the data set demonstrate that participants initial eye movement landing positions are equally consistent across the matrix. This finding provides evidence to support this measure of AB. However, an analysis of the individual data points reveals a drastic preference for specific locations within the matrix, irrespective of the content of the images presented. These results show that this alternate method of assessing AB presents significant confounding variables. Researchers should be aware of location bias as well as the interpretation of group data.

Are Ordinality Judgments Processed by a Common System?

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The ability to identify whether a triplet of numbers is monotonically ordered is positively associated with maths skills. Here we asked if the visual recognition of non-symbolic magnitudes is also related to maths performance, which might suggest a common system for ordinality processing. In our experiment, recognition of ordered and non-ordered triplets of identical polygons of different areas (shapes), the same circumscribed size non-identical polygons, and symbolic numbers were assessed, along with arithmetic fluency and potential covariates such as cognitive reflection, mathematical anxiety, and age. The aim was to recognise whether order judgement was correlated between different stimulus types and whether these correlations extended to arithmetic fluency after controlling for covariates. Results showed that symbolic order number judgements were correlated with arithmetic fluency consistent with prior research. Performance with non-symbolic magnitudes (polygon sides and shape-size) was correlated with symbolic magnitudes. These results suggest that ordinality judgments are processed by a common system.

Late Integration of Prior Expectations During Precision Weighted Perceptual Decisions

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Perceptual decision-making relies on the precision-weighted combination sensory evidence with prior expectations. Although Bayesian inference provides a clear normative account of how such integration should occur, the neural mechanisms by which the brain represents and combines priors and likelihoods remain poorly understood. Across two experiments, we investigated how the precision of prior expectations and sensory likelihoods influences visual motion judgements and neural activity patterns during a random dot motion estimation task. Eighty adults reported directions of visual motion stimuli with motion coherence varying randomly across trials. Priors were manipulated block-wise by varying the probabilities with which different motion directions were presented. Consistent with precision weighted inference, response accuracy improved in-step with coherence with robust biases toward the expected direction. Brain activity measured using electroencephalography revealed reliable effects of priors on the central-parietal positivity, consistent with reduced evidence accumulation under informative priors. Multivariate analysis using inverted-encoding models revealed robust effects of prior informativeness on motion specific neural representations, but only late, during response planning stages. Together, these findings show that priors are integrated at late stages of the decision process and challenge predictive processing accounts which emphasise early sensory processing.

Influence of Display Device on Model-Based Estimation of Color-Matching Functions

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Color-matching functions (CMFs) have traditionally been derived by direct comparison between a reference color and a mixture of three primaries, as in the maximum-saturation (MS) method. Model-based approaches that estimate CMFs through model fitting based on metameric matches have attracted attention. This study investigated whether the display device used to present stimuli influences CMF estimation. Color-matching experiments were conducted using cross-media matching with seven observers who had normal color vision. In the experiments, eleven color samples were used as reference stimuli, and matching was performed using organic light-emitting diode (OLED) and liquid crystal display (LCD) devices. The results showed

inter-observer differences in the estimated CMFs, particularly in the short-wavelength region. Differences were also found between CMFs estimated using OLED and LCD displays: deviations in tristimulus values and peak positions were observed in both the short- and long-wavelength regions, with larger differences for OLED displays. Furthermore, the model-based CMFs did not completely agree with those obtained using the MS method. Although their overall shapes were comparable, no consistent tendency was found as to which display-derived CMFs were closer to the MS-based CMFs. The validity of the display-derived CMFs will be further evaluated by presenting colors predicted from individual CMFs to the observers and examining whether they are perceived as intended.

Stimulus motion coherence and eye of presentation determine the strength of a repulsive history effect

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The perception of visual stimuli can be influenced by things seen in the recent past. The perception of motion direction tends to be repulsed away from previous moving stimuli. We used monocular versus binocular stimulus presentation to investigate the neural level at which this repulsive effect occurs. Participants indicated whether the direction of motion of a random dot kinematogram (RDK) presented for 500 ms was clockwise (CW) or counterclockwise (CCW) relative to a reference direction. The RDK was presented, via a haploscope, either to both eyes (at 100% or 50% coherence), to only one eye (at 100% or 50% coherence), or half the dots in one eye at 100% and half in the other at 0%. The results confirm our previous findings that (1) the more coherent the past stimulus, the stronger the repulsive effect on the current stimulus; (2) the more coherent the current stimulus, the weaker the repulsion from the past; (3) there is an interaction between previous and current conditions. In addition, the mixed stimulus (0% coherence in one eye, 100% in the other eye) repulses subsequent perception only when the subsequent RDK is a 50% coherent monocular stimulus, and not when it is a 100% monocular stimulus. Mixed stimuli are repulsed but less than a monocular RDK, revealing that each eye contributes to repulsion, and that there is a non-linear relation between RDK coherence level and subsequent repulsion.

Evaluation the relationship between motion energy and body expression recognition

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Humans can recognize body expression from the change of postures. We examined how motion energy affected the ability to recognize emotion from body expressions. Twenty-six participants identified the emotion content of the point-light displays of Japanese and Taiwanese performers showing joyful, sad, fearful and angry emotions (Cheng et al., 2025) in various intensities. Anger was easiest to recognize (100% accuracy), followed by sadness (81%), fear (52%), and joy (41%) was the most difficult. Fear was often mistaken for joy (37%), while joy was frequently confused with all other emotions (17-20%). Motion energy significantly facilitated emotion recognition across both Japanese ($r=.165$, $p<.001$) and Taiwanese ($r=-.091$, $p<.001$) stimuli. This positive correlation suggests that movement intensity is a key cue for identifying body expressions. Results varied by emotion: accuracy for anger, fear and joy increased with motion energy, particularly for joy in the Japanese stimuli ($r=.29$), whereas sadness had a significant negative correlation (JP: $r = -.19$; TW: $r = -.10$), suggesting that high-intensity movements interfere with the perception of sad emotional states. These findings suggest that the visual system is selectively tuned to motion cues: while high-arousal emotions benefit from greater signal intensity, low-arousal emotions like sadness may rely on low-energy movement templates. This highlights motion energy as a critical feature in body expression recognition.

Quality Emerges from Structural Quantity: Optimizing Developmental Trajectory by Enhancing Internal Representation Capacity through Systematic Manipulation of Learning Experiences

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While acknowledging environmental biases, traditional connectionist models often rely on linear training protocols where implicitly equating “epochs” with “age”. This approach overlooks the non-uniform but certain structural nature of real-

world experiences, failing to account for diverse individual transitions of development. This modeling study adopts McClelland's (1989) connectionist model to systematically manipulate the sequential patterns of training data, including data complexity, training order, and distributional skew, to examine the training output and internal representation patterns of the model. The results indicate that, under identical model architectures and training amounts, easy-to-hard sequences facilitate the formation of more stable and rapid internal representation than random or hard-to-easy training scenarios. Critically, strategically manipulating task difficulty and sequence leads to activate initially neglected features, enabling underperformed models to overcome learning plateaus. It is revealed that the learning protocols and occurrence timing might precede the property of experience per se. This study suggests that the learning performance based on early diverse internal states can unexceptionally be improved by specific qualitative manipulations of experience, optimizing the activation of latent capacities. Overall, this study implies that the qualitative structure of experience is as critical as the cumulative quantity of training.

More Than Emotion: N400 Evidence for the Semantic Primacy of Moral Evaluation

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Current models of affective word processing primarily emphasize the dimensions of valence and arousal. However, moral evaluation—characterized by complex concepts such as “harm” and “sanctity”—may represent a distinct cognitive operation. This study utilized ERPs to investigate whether moral lexicons possess a “semantic primacy” that extends beyond general emotional processing. Participants performed a LDT while ERPs data were recorded for moral words (varying in morality and valence), emotional words (high/low valence), and neutral controls. Behavioral results revealed that moral words elicited significantly longer reaction times and higher error rates than emotional words, suggesting that moral evaluation entails a higher cognitive load. Electrophysiologically, while both moral and emotional words evoked similar early components (EPN and P250) reflecting initial categorization, a critical divergence emerged during middle-stage

processing. Specifically, moral lexicons induced significantly larger N400 amplitudes compared to emotional words, whereas no significant differences were observed in the LPP. These findings demonstrate that while early sensory and late evaluative stages may overlap, the middle-stage N400 reflects a unique, intensive process of semantic integration and value-based judgment within personal schemas specific to morality. Our results provide neurophysiological evidence that moral semantics represent a primary and distinct category of neural processing.

Revealing Rhythms of Attentional Sampling in Behavioral Data Using a Generalized Adaptive-Trend Analysis

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Rhythmic fluctuations in behavioral performance have been proposed to reflect periodic attentional sampling, yet such rhythms are often weak, nonlinear, and embedded in slow temporal structure. We present a generalized adaptive-trend analysis (GATA) method, a data-driven framework for revealing and testing behavioral rhythms in cognitive-task data. GATA uses empirical mode decomposition to separate a behavioral series into intrinsic mode functions (IMFs) and scale-dependent residuals. Unlike conventional detrending, which typically assumes a fixed functional form or treats only the final residual as trend, GATA conceptualizes trends adaptively across multiple temporal scales. Extrema of IMFs are used as candidate change-points, and residual-level F tests and piecewise-linear tests evaluate whether the extracted trend and its change-points are statistically reliable. We demonstrate GATA using precision-error data from an adaptive orientation-discrimination task investigating attentional sampling. In this task, cue–target onset asynchrony varied from approximately 300 to 1,300 ms, and spatial prediction was manipulated by cue validity. Prior analyses showed precision fluctuations around 4 Hz under the 100% cue validity condition. Applied to these behavioral data, GATA provides an adaptive, statistically interpretable approach for visualizing and validating rhythms of attentional sampling without imposing fixed sinusoidal or detrending assumptions.

Walking reduces visual dominance in multisensory perception

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Vision often plays a dominant role in perception. This is exemplified by the Colavita effect, in which participants are more likely to respond to visual than to auditory stimuli when presented simultaneously. Locomotion is known to modulate sensory processing by enhancing visual responses while suppressing auditory representations. However, it remains unclear whether and how locomotion reshapes sensory dominance during multisensory perception. To address this question, 25 participants performed a discrimination task in which visual gratings and tones were presented with three modes (visual-only, auditory-only, and audiovisual), at two spatial locations (left vs. right), and under two behavioural states (standing vs. walking). Participants were asked to report the stimulus location via a button press. In audiovisual trials, they responded according to the modality they perceived first. The results showed that participants responded more frequently to visual than to auditory stimuli in audiovisual trials, demonstrating a clear Colavita effect. Crucially, after controlling for single modality influences using a binomial mixed-effects model, the proportion of auditory responses increased significantly during walking compared to standing, indicating a significant reduction in visual dominance during locomotion compared to standing. These findings demonstrate that visual dominance can be attenuated during locomotion in multisensory contexts.

Subvocalization and Reading-Aloud Performance: Evidence from Comprehension and Eye Movements in Junior High School Students

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Subvocalization is the silent articulation of words during reading and reflects speech-like phonological processing. Individual differences in subvocalization may influence reading strategies and eye movements, but prior studies report little difference during reading-aloud, possibly due to articulatory constraints. Two experiments were conducted with

Japanese junior high school students. In a text-reading task, 14 participants read passages (~250 characters) aloud and answered comprehension questions. In a sentence-reading task, 15 participants read single sentences (~26 characters) aloud and answered simple questions. Eye movements were recorded in both experiments, and measures included fixation count, fixation duration, saccade amplitude, and number of regressions, in addition to reading time and comprehension accuracy. The degree of subvocalization was assessed using a five-point self-report scale. No significant differences were found between high- and low-subvocalization groups in either experiment, and correlations were non-significant. In the text-reading task, comprehension showed a non-significant trend with a medium effect size. Overall, subvocalization showed no clear effect on reading-aloud performance, although a potential relationship may have been undetected due to limited statistical power. Further research with larger samples is needed.

The Involvement of Parietal Cortex in First-Person Shooter Skill Learning

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Mastering first-person shooter (FPS) games demands visuomotor integration and attentional control, yet the neural dynamics in the parietal cortex during novice learning are poorly understood. We used functional near-infrared spectroscopy (fNIRS) to monitor bilateral parietal cortex activity as novices performed 15 rounds of a one-minute FPS shooting task. Learning performance was tracked via a composite score combining reaction time and accuracy, and learning speed was quantified by the slope of individual exponential learning curves. We found that consistently across early, middle, and late training stages, better performance correlated with smaller neural changes in the parietal cortex. Furthermore, faster learners showed significantly less parietal neural changes between the early and middle stages, and between the early and late stages. These results reveal a specific role for the parietal cortex in adapting its activity during FPS skill acquisition and suggest that FPS training offers a valuable, naturalistic model for studying visuomotor learning.

The Effect of Auditory Rhythmic Patterns on Chinese Printed Word Segmentation

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Even though Chinese is written without word boundaries, skilled readers can somehow segment characters into words. The question is: How? One account is that readers use implicit prosodic patterns as a heuristic to aid segmentation. The present study tested this hypothesis by examining if distinct auditory rhythmic patterns modulate readers' segmentation of three types of four-character strings: (1) pairs of two-character words; (2) four-character words (or idioms); and (3) four-character phrases (which may or may be treated as linguistic units). The rhythms consisted of either four 'di' sounds presented at a fixed rate, or two pairs of 'di' sounds separated by brief intervals. Participants were asked to judge if each target string was a single word while EEG was recorded. Auditory rhythmic priming modulated P2 amplitudes (reflecting pattern matching) during target judgments. With a fixed rate, the four-character words elicited marginally larger P2 amplitudes than word pairs ($p = 0.06$, Cohen's $d = 0.35$) and phrases ($p = 0.06$, Cohen's $d = 0.39$), which did not differ ($p = 0.95$). But with a varied rate, word pairs elicited larger P2 amplitudes than four-character words ($p = 0.004$, Cohen's $d = 0.54$) and phrases ($p = 0.004$, Cohen's $d = 0.56$), which did not differ ($p = 0.46$). These results thus provide evidence that rhythmic patterns can modulate Chinese word segmentation, suggesting a possible role of prosody in Chinese reading.

Individual Differences in Attentional Control and Epistemic Motivations

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Measuring attentional control reliably at the individual-differences level has proven challenging, with many behavioural tasks showing low reliability (Draheim et al., 2024). In the present research, we implemented a battery of "squared" attentional control tasks (Burgoyne et al., 2023) within a large pre-registered online sample ($N = 299$). These tasks demonstrated strong reliability and converged onto a single latent attentional control factor, highlighting their promise as efficient tools for large-scale individual-differences research. We then examined how attentional control relates to epistemic

motivations. Lower attentional control was consistently associated with higher political extremism, stronger right-wing political orientation, right-wing authoritarianism, and dogmatism - patterns broadly consistent with the “rigidity of the right” hypothesis (Zmigrod, 2020). Extending this framework, we also observed that conspiracy thinking was negatively associated with attentional control, suggesting that cognitive rigidity may form part of the psychological profile of conspiracy theorists. Finally, attentional control showed negative associations with specific dimensions of trait curiosity, such as a strong drive to resolve uncertainty or seek novelty. Together, these results demonstrate the feasibility of brief, reliable attentional control measures and highlight their value for advancing research on cognitive and epistemic individual differences.

Walking speed impacts attentional performance: evidence from a Navon task in wireless-VR

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Perception research has historically relied on seated laboratory paradigms, with the intersection between perception and everyday movement largely unexplored. While recent work has shown that walking impacts visual and auditory processing, the attentional mechanisms underlying these effects remain unclear. The present study therefore examines whether hierarchical visual processing is sensitive to attentional demands induced while walking at slow and natural speeds. Participants ($n=10$, data collection ongoing) completed a 2AFC Navon task under divided attention conditions, responding to whether a target letter was present or absent at either the global or local level. Using advances in wireless virtual reality (VR), accuracy and response times were captured while walking at slow and normal speeds, hypothesising that walking speed would interact with hierarchical performance on the attentionally demanding Navon task. In support of this hypothesis, local processing accuracy was higher during slow than normal walking speed, whereas global accuracy remained stable across both speeds. These findings suggest that local and global processing differ in their susceptibility to cognitive-motor interference, with local processing benefiting from slow walking speed relative to

normal speed. To our knowledge, this is the first study to examine hierarchical visual processing during VR walking, opening new avenues for investigating embodied cognition and attentional flexibility.

Modulation of Central Brightness Perception by Peripheral Light Stimuli

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Perceived brightness is not solely determined by local luminance but is also influenced by spatial context across the visual field. In particular, the presence of peripheral light stimuli may modulate brightness perception in the central visual field; however, the underlying relationship remains insufficiently characterized. The present study investigated how the eccentricity and intensity of a peripheral point light stimulus affect perceived brightness in the central visual field. Two psychophysical experiments were conducted. First, thresholds of discomfort glare in the peripheral visual field were measured using the method of constant stimuli across eccentricities (10° , 20° , 25°) and intensity levels. Second, perceived brightness in the central visual field was evaluated using the method of paired comparison, with and without a peripheral stimulation. Results showed that the threshold of discomfort glare decreased as eccentricity decreased. More importantly, perceived brightness in the central field was reduced when a peripheral stimulus was present. A two-way repeated-measures ANOVA revealed significant main effects of eccentricity and intensity, suggesting a robust interaction between peripheral stimulation and central brightness perception. These findings highlight the influence of the entire visual field on brightness processing.

Gender Differences in Color Preference and Perceived Harmony

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We examined the gender effects on aesthetic preference and perceived harmony for color combinations. The stimuli were color patches presented on a neutral gray background, modulated

along eight color directions distributed evenly on an equilluminance plane spanned by the L-m and the S axes. There were two contrasts for each color direction, which were 3 and 6 times the individual detection thresholds, resulting in a total of 16 single colors, which were paired into 256 combinations. In each trial, participants rated their preference and perceived harmony for a color pair with a 6-point Likert scale. There were distinct gender differences in both color preference and perceived harmony. Overall, Females gave more diverse preference ratings across colors. Whereas both genders favored bluish hues, females preferred a combination of different shades of blue-green, and males preferred the blue–purple paired with pink and a stronger dislike of yellow–green pairs. Both genders preferred low-contrast combinations over high-contrast ones. In harmony judgments, females gave higher ratings for identical or similar colors, regardless of contrast differences, whereas males gave high harmonious ratings only when both hue and contrast were similar. Preference and harmony were positively correlated, with more preferred combinations being those more harmonious. The result showed both genders used different strategies to approach perceived color harmony and, in turn, color preference.

Critical Role of High Spatial Frequency in Adult Sensory Eye Dominance Plasticity.

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Purpose: This study aimed to investigate the critical spatial frequency information through which short-term monocular deprivation modulates sensory eye dominance in adult humans, by applying low-pass versus high-pass spatial information deprivation. **Methods:** Frequency-domain filtering was applied to black-and-white movie to selectively remove spatial frequency components ≤ 0.5 cycles/° (low-frequency deprivation, high pass) or > 0.5 cycles/° (high-frequency deprivation, low pass) of each movie frame. The non-dominant eye of seven normal adults underwent two separate 1-hour monocular deprivation sessions. Sensory eye dominance was assessed before and after deprivation using binocular orientation combination task at 0.5 cycles/° and 6 cycles/°. **Results:** High-frequency deprivation significantly increased the deprived eye's contribution to sensory eye dominance at both 0.5 cycles/° and 6 cycles/°, with a larger effect observed at 6 cycles/° (SF: $p = 0.019$; Time: $p < 0.001$;

Interaction: $p = 0.832$). In contrast, low-frequency deprivation decreased the deprived eye's contribution at 0.5 cycles/° and had no significant effect at 6 cycles/° (SF: $p = 0.025$; Time: $p = 0.266$; Interaction: $p = 0.009$). **Conclusions:** These findings suggest that deprivation of high spatial frequency is a critical factor in inducing adult sensory eye dominance plasticity, which may be related to modulation of the excitatory-inhibitory balance of parvocellular pathway neurons.

Integrating Objective Measures in ADHD Assessment: Online Eye-Tracking and Continuous Performance Test

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The diagnosis of Attention Deficit Hyperactivity Disorder (ADHD) in adults is complex and requires reliable multimodal assessment methods to ensure accuracy. We investigated whether integrating subjective, behavioural, and eye-tracking measures could improve diagnostic accuracy for adult ADHD using a web-based approach. A total of 119 adults completed an online sequence of tasks, including the Adult ADHD Self-Report Scale (ASRS), the Continuous Performance Test (CPT non-X task) as the behavioural measure, and webcam-based eye-tracking with RealEye software. Significant group differences were observed for ASRS total scores, CPT Non-X commission errors, and d' sensitivity, indicating greater inattention, impulsivity, and reduced signal discrimination in the ADHD group. We did not find significant differences for CPT Non-X omission errors, reaction time, or eye-tracking variables (fixation count, fixation duration, scanpath length). Logistic regression showed that CPT Non-X performance measures significantly predicted ADHD classification with high sensitivity and specificity (AUC = 0.93), while adding eye-tracking variables offered minimal improvement in model accuracy. These findings support the diagnostic value of combining subjective and behavioural measures, but webcam-based eye-tracking contributed little predictive value. Results endorse the feasibility of a remote, web-based assessment, and highlight the need for further research to refine digital assessment pathways.

The effects of music and traffic noise on the vividness and content of mental imagery

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The effect of music on the vividness and content of mental imagery (Ayyildiz et al., 2025; Herff et al., 2021) may be affected by concurrent stimuli, such as background noise, which can disrupt cognitive performance, including mental imagery (Mazard et al., 2002). Therefore, understanding the interaction between noise and music within a directed mental imagery paradigm is essential. This study investigated the additive and interactive effects of background noise and music on the vividness and content of directed mental imagery. Using a within-subjects design, participants (N = 107) experienced conditions of music, traffic noise, both music and noise, and silence (control) across eight trials of a directed mental imagery task. In each trial, they viewed a video of a figure ascending a sand dune and then imagined the continuation of the journey. After each trial, participants rated their imagery vividness and the content they imagined. Results showed that both music and noise enhanced imagery vividness compared with silence, but only music increased the positive emotional sentiment of imagined content. Overall, these findings reinforce the role of music in shaping mental imagery and provide new insights into how potentially disruptive sounds may affect imaginative processes. They suggest the potential of music to support guided imagery in applied settings, even in the presence of background noise.

Not All Failures Are Equal: How Failure Context Shapes Children's Responses to Parental Failure Mindsets

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Children can respond to failure in different ways. While existing evidence suggests that parental beliefs about failure may play a central role in shaping these responses, most research has focused on older children and single failure contexts, typically Academic. As a result, whether parental failure mindset effects generalise across different failure contexts and exist with young children remain open empirical questions. This study examined how maternal and paternal failure mindsets relate to 4–5-year-old children's emotion regulation strategies and sadness across two distinct failure contexts: an individual and a competitive failure context.

Participants were 235 children (M = 54.65 months; 52.3% girls) and their mothers and fathers. Linear mixed-effects models were estimated, with task condition as a within-subjects factor and maternal and paternal failure mindsets entered as separate predictors. Maternal failure mindset moderated goal-directed behaviour during repeated competitive failure, with more adaptive maternal beliefs buffering the decline in child persistence. The paternal failure mindset had a marginal effect on reduced cognitive reappraisal, and the maternal failure mindset had a marginal effect on avoidance under repeated competitive failure. These findings suggest that parental failure mindsets operate in context-dependent ways, with distinct maternal and paternal pathways, highlighting the importance of examining failure context in mindset research.

Understanding Perception and Anxiety

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Dysfunctional perceptual processing appears to be a key component for many mental health disorders, including anxiety. While research has begun to explore the association between anxiety and dysfunctional perception, limited research has explored how interventions for anxiety alter perceptual abilities, and whether these changes are associated with alleviated anxiety. We aimed to explore how anxiety is related to both interoceptive and exteroceptive processes, and how these are altered by commonly used interventions (SSRIs and exercise). 200 participants across four cohorts completed questionnaires to measure affect and self-reported interoceptive abilities, and two perceptual tasks to measure perceptual abilities in the interoceptive (breathing) and exteroceptive (visual) domains. Increased anxiety was associated with decreased perceptual abilities for both the interoceptive and exteroceptive processing. Following an eight-week exercise intervention, despite a decrease in the severity of depression and anxiety symptoms, there were no significant changes to perceptual abilities. In contrast, treatment with SSRIs, alongside a decrease in the severity of depression and anxiety symptoms for the treatment group, was associated with improved perceptual abilities for both treatment and control groups. Understanding how perception is influenced by the severity of anxiety and interventions for anxiety, may be the next step for developing individualised and effective treatment plans.

Meaningful stimuli support binding in visual working memory, limited to younger participants

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Previous research (e.g., Cao & Deouell, 2025) showed that visual working memory can shift between binding-dominant and feature-dominant formats depending on task demands. In the present study, we manipulated the type and relative frequency of retrieval probes across blocks in a color memory task to encourage different retrieval strategies. Participants encoded meaningful and meaningless stimuli and were tested with either feature probes or combination probes. We examined whether probe type effects differed by stimulus meaningfulness and age. The ANOVA did not show a significant Probe $\times$ Stimulus interaction. However, in an exploratory ANCOVA, age was included as a covariate, and a significant Probe $\times$ Stimulus $\times$ Age interaction was observed. Follow-up analyses showed that, probe-type differences emerged for meaningful stimuli but not for meaningless stimuli. For meaningful stimuli, combination probes showed a relative advantage over feature probes at younger ages; however, this advantage decreased with age and disappeared in older participants. These results suggest that the influence of probe type depends on both stimulus meaningfulness and age. More broadly, meaningful information may support binding-based representations in visual working memory, but this benefit becomes weaker with age.

Narrowing attentional scope enhances eye-region sensitivity and reduces interference in face perception

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Attentional scope, often conceptualized as the “zoom lens” of attention that determines whether processing is broadly distributed (global) or narrowly focused (local), is recognized to flexibly shape perceptual processing. However, its influence on facial recognition remains underexplored. The present study examined how global versus local attentional deployment influences sensitivity in a face congruency task. Attentional scope was

manipulated trial-by-trial using a hierarchical letter (Navon) task to bias processing toward global or local information. Participants then performed a face congruency task requiring judgments about specific regions (eyes vs. nose). Our behavioral results revealed an interaction between attentional scope and target face region. Local attention enhanced perceptual sensitivity for eye-region judgments relative to global attention, but not for nose judgments, suggesting selective facilitation of diagnostic facial features rather than general improvement. A congruency effect was observed, with reduced sensitivity on incongruent trials, yet this cost was attenuated under local attention due to improved performance on incongruent trials, indicating reduced interference from task-irrelevant facial information. Overall, attentional zooming modulates face processing in a feature-specific manner while reducing interference from irrelevant information. Ongoing analyses will further clarify the robustness and mechanisms underlying this effect.

Summary Statistical Perception in Daytime Traffic

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Grasping the overall traffic situation across a wide spatial range is essential for ensuring the safety of one's own vehicle, surrounding vehicles, and pedestrians. Previous studies on driving cognition have primarily used tasks measuring detection rates of specific traffic signs or fixation durations. However, safe driving requires not only rapid visual recognition of local information but also continuous and accurate extraction of summary statistical information from the traffic environment. In this study, participants viewed a 5-second forward-driving scene of a straight urban road from a driver's perspective in a virtual reality environment and judged whether the average speed of surrounding vehicles was faster or slower than their own. The participant's vehicle speed was fixed at 54 km/h, while the true mean speed of surrounding vehicles was either 51 km/h or 57 km/h. Inter-vehicle distance (50, 55, 60, and 70 m) and speed variability (SD = 0, 4, 8, and 12 km/h) were systematically manipulated. Judgment accuracy decreased monotonically as both inter-vehicle distance and speed variability increased. Notably, the presence versus absence of speed variability (i.e., 0 vs. non-zero) had a particularly critical effect. These findings suggest that, given humans' relatively low sensitivity to motion in depth, speed variability may trigger a

shift in the prioritization between global and local information processing during driving.

Line Bisection Performance Bias in Virtual Reality Space

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Line Bisection task performance generally shows a shift to the left from the center while its kinesthetic task tends to the right (e.g. Jewell & McCourt, 2000). However, previous studies with the LB task showed the bias towards the right as the viewing distance from the observer to the line stimulus increased (e.g. McCourt & Garlinghouse, 2000; Rinaldi et al, 2018). The present study examined the line bisection performance in a space of virtual reality. The depth space perception was implemented with linear perspective and texture gradients in a 3D display programmed with UNITY. Participants observed the 3D space using a Head-Mounted Display. A thick horizontal line of 24 cm or 48 cm in length was present in the center of the display, at a calculated distance of 30, 60, 90 or 120 cm away from the observer. The horizontal line was shown with a thin vertical bar, which could be moved left or right by observer's pressing keys. The observers adjusted the location of the bar subjectively to the center of the horizontal line. Twelve university students participated in the experiment. The result showed that the LB performance showed a consistent bias to the right in the distance of 60, 90 and 120 cm. However, in the condition of 30 cm distance with 48 cm line, the performance was biased to the left. The results indicate that the LB performance shows a similar trend in virtual environment as in the real space.

Spatial-scale-dependent surround modulation enhances receptive field center gain in frog retinal ganglion cells

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The visual system is thought to have evolved under selective pressure to detect events early. Expanding stimuli, such as looming objects, are key cues of approaching predators or imminent collisions. Although retinal ganglion cells (RGCs) integrate signals within and beyond the classical receptive

field (RF), how surround signals interact with RF center pathways across spatial scales remains unclear. Using multielectrode array recordings from the frog retina, we examined dimming detectors, RGCs that may contribute to escape behavior. Stimuli covering both RF center and surround enhanced firing, whereas narrow bar stimuli confined to the surround evoked little or no response. When identical center flicker stimuli were presented with or without a surround stimulus, responses were amplified. To investigate the mechanism, we modeled the RF center pathway using a linear–nonlinear (LN) framework. Spike-triggered average analysis showed that surround stimulation did not alter the RF center temporal filter, preserving its polarity and temporal structure. In contrast, the static nonlinearity became steeper, indicating selective gain enhancement of RF center signals. This effect is more consistent with presynaptic disinhibition than linear summation of center and surround inputs. These findings suggest that dimming detectors flexibly switch between local and global spatial processing depending on stimulus scale, providing a retinal mechanism for context-dependent visual sensitivity.

Surveillance induces perceptual biases towards a more threatening stimulus

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Surveillance has increased dramatically in modern society, yet research on its cognitive and perceptual consequences remains limited. Recent research suggests that CCTV surveillance alters fundamental aspects of social vision. Individuals under surveillance demonstrate enhanced face detection compared to control conditions, indicating that surveillance can influence involuntary perceptual mechanisms that operate outside of conscious awareness. The present study builds on this work by investigating whether surveillance induces perceptual biases in face perception. Using a within-subjects design, we conducted a face discrimination task under surveillance and no surveillance conditions. Stimuli consisted of morphed images of young adult faces varying in strength from male to female. Condition order was counterbalanced across participants. Results reveal the effects of surveillance on perceptual judgements (i.e., a shift in the point of subjective equality between male and female faces) was moderated by individual differences in paranoia. Higher levels of paranoia

resulted in a stronger male bias under surveillance, with participants assigning maleness to stimuli they deemed more female under no surveillance. These findings provide novel evidence that surveillance can induce involuntary perceptual biases towards more threatening interpretations of social stimuli, with effects dependent on a predisposition to paranoid ideation.

Investing the Effect of Response Options in Face Matching Tasks to Improve Human-algorithm Teaming Performance

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Face matching involves determining whether two images of faces belong to the same person and is used in identification verification. However, human face matching performance is often poor. In response to the shortcomings of human judgement, Automated Facial Recognition (AFR) systems have been introduced. Humans can either use AFR systems as a decision aid or monitor, only intervening when they believe the system made an error. This collaboration is referred to as human-algorithm teaming. Evidence shows combined team performance is lower than the AFR alone, highlighting the need to better understand how humans use AFR systems. This experiment examined the role of humans by comparing human-in-the-loop and human-on-the-loop conditions. All participants (N = 129) completed the same face matching task. Response options were manipulated to reflect different levels of human control. In the control condition, participants were assisted by an AFR system and made “same” or “different” identification decisions. In the test condition, participants provided oversight and made “accept” or “reject” responses based on the AFR system decision. Results indicated that there was no significant difference between the conditions. Both response conditions failed to reach the level of accuracy offered by the AFR system alone. Our findings suggest that manipulating response options to reflect the different levels of human involvement may not matter when trying to improve human-algorithm performance.

Linking Contrast Processing Deficits to Underlying Neural Property Changes in Amblyopia with a Biologically-Interpretable Model

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Biologically interpretable modeling enables researchers not only to use behavioral measurements to infer neural deficits, but also to predict task performance based on changes in underlying neural properties. Accordingly, in the present study, we constructed a simple yet biologically plausible model to establish a quantitative link between behavioral contrast loss and underlying neural property changes in amblyopia. A total of 11 amblyopic patients and 10 normally sighted adults were recruited. We measured the threshold-versus-contrast (TVc) functions in a contrast discrimination task at two spatial frequencies and fitted the data using the proposed model. Our results showed that the poorer performance at low spatial frequency in amblyopic participants could be quantitatively accounted for by alterations in neuronal population distribution, whereas the deficit at higher spatial frequency could be explained by changes in the shapes of contrast response functions and neuronal response amplitudes. These findings suggest that contrast loss at different spatial frequencies in amblyopia may arise from distinct neural mechanisms, which can be dissociated using biologically interpretable modeling approaches. Overall, this study demonstrates the potential of biologically interpretable models to quantitatively bridge the gap between behavioral deficits and underlying neural alterations, providing a promising framework for investigating both normal and abnormal visual systems.

A Spectral Transmittance-Based Simulation of Color Trajectories: Implications for the Abney Effect and Unique hue

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While natural objects often appear uniform in color, they exhibit inherent gradations caused by physical factors like pigment density, light propagation distance, and inter-reflection. To investigate these mechanisms without resource-intensive measurements, this study utilizes a computational simulation of 120,000 randomly generated spectral transmittances. Pigment density variations were

modeled by raising these transmittances to the n -th power. Analyzing the resulting trajectories on the CIE xy chromaticity diagram revealed that color changes for all hues consistently form curved lines, diverging toward red, blue, or green terminals based on their initial spectral peaks. Crucially, these simulated curves align with constant-hue loci from psychophysical experiments, successfully reproducing the Abney effect. This implies the Abney effect originates from the physical spectral properties of objects rather than purely nonlinear neural color coding. We propose that universal human color categorization is fundamentally calibrated by these pigment-driven physical phenomena. Specifically, bifurcation points where trajectories diverge, such as boundaries separating reddish and greenish hues, serve as environmental signals defining "unique hues". This suggests consistent color interpretation among humans evolved as an adaptation to stable physical properties of the environment, anchoring color category boundaries in the objective behavior of light and matter.

Caught by the Body: How Body Image Distortion Shapes Attention to Self- and Ideal-Referenced Body Cues

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This study examined how body image distortion influences attentional processing of body-shape cues and whether reference frames modulate attentional orienting. Body size distortion was assessed using the Image Marking Procedure (IMP), and participants were classified into high-distortion (HD) and low-distortion (LD) groups. In a Posner spatial cueing task, nine BMI-varying body figures served as peripheral cues with a 400-ms SOA. After the task, participants selected their perceived-self (PS) and ideal-self (IS) figures from the same set. For analysis, cues were recoded separately within the PS and IS frames as smaller, baseline, or larger relative to each selected reference figure; responses to figures outside this ± 2 -BMI-level range were excluded. Compared with the LD group, the HD group responded faster to smaller cues in the PS frame and to larger cues in the IS frame. Facilitation analyses showed that smaller cues produced stronger facilitation than larger cues. The HD group showed greater facilitation for smaller than larger

cues across both reference frames, whereas the LD group showed the strongest facilitation for baseline cues in the PS frame. For disengagement, the HD group showed greater overall disengagement costs than the LD group, particularly for larger cues in the IS frame. These findings suggest that body image distortion shapes attentional orienting and disengagement through self- and ideal-referenced body representations.

A Open Source Time Course Synchronize Tool for Visual Psychophysics Experiments

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Many visual psychophysics experiments need to synchronize the time course of visual stimuli with other data collected in the experiments, like EEG, MRI, etc. A software trigger under a non-realtime operation system, e.g. Linux or Windows, faced unexpected delay in order of magnitude from 10 to 100ms. A hardware trigger was needed for a realtime synchronization which was normally provided by well designed visual stimuli presentation systems. Here I provide an open source tool, VisSync (<https://github.com/VisionShilin/VisSync>), to resolve this problem without the need for a pre-designed hardware interface and the hardware cost of the tool was less than 20 dollars. A photosensitive diode and an Arduino board are all we need. The photosensitive diode is placed on the corner of the display, which is stimulated by a high intensity flash included in the visual stimuli. The program running on the Arduino board reads pin-input from the photosensitive diode in realtime and triggers a physical synchronize signal to the output pin according to a pre-setting threshold value. The precision of the synchronization is in order of magnitude $1\mu s$ using an Arduino board with 16MHz CPU frequency.

Measuring suppression-related attenuation of stimulus information in binocular rivalry

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Binocular rivalry (BR) is a perceptual phenomenon in which conflicting images presented to each eye cannot be fused into a stable percept, and perception spontaneously oscillates between the two images. While BR has been studied extensively,

the role of attention in the neural dynamics of BR remains unclear. We used magnetoencephalography (MEG) to compare the neural information about a dominant BR percept and the associated suppressed stimulus, and how attention modulates this relationship. Participants (N = 16) viewed a stimulus with a rivalrous and non-rivalrous component, alternating whether their attention was directed to the rivalrous or non-rivalrous component. We used classification analyses to quantify the amount of information about each stimulus component contained in the MEG signal over time. As expected, classifier accuracy is greater for the attended than the unattended non-rivalrous stimulus, from ~200ms post stimulus presentation. For the BR stimulus, we decoded the image content of both dominant and suppressed stimuli, finding that information about the suppressed stimulus was surprisingly robust. Information about the suppressed stimulus was lower than the dominant stimulus, but was less attenuated than the unattended non-rivalrous stimulus. Overall, the decoding dynamics are consistent with the onset of BR involving similar processes to engaging covert spatial attention.

The effects of contextual constraint, character-position frequency, and individual differences on Chinese word segmentation

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It remains unclear how Chinese readers can accurately segment three-character overlapping ambiguous strings (OASs) when the middle character (C2) can form a word with either the left (C1) or right (C3) character. To address this question, we conducted two experiments to examine how contextual constraint and the positional frequency of characters jointly affect the segmentation of character sequences in which, within-sentence context, the OASs are correctly segmented into C1 and C2C3. Experiment 1 showed that off-line segmentation was faster and more accurate when prior context was less constraining towards a C1C2 segmentation, or when C3 was high frequency. Experiment 2 then used eye tracking to examine how OASs are segmented during natural sentence reading, again manipulating contextual constraint and character-position frequency. Although faster readers showed no differences across conditions, slower readers made shorter fixations on OASs when the OASs were less constraining towards a C1C2

segmentation or contained a high-frequency C3. These findings collectively indicate that both contextual constraint and character-position frequency affect word segmentation during Chinese reading, but that these effects are more pronounced with slower readers.

Beyond Vision: Shared and Modality-Specific Mechanisms in Visual and Haptic Sound–Shape Correspondences

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Sound–shape correspondences (SSCs) refer to systematic associations between speech sounds and visual shapes (e.g., /kiki/ with angular shapes). Since shapes are perceivable via vision and touch, SSCs provide a useful framework for examining whether crossmodal matching relies on shared perceptual dimensions or modality-specific processes. In this study, participants matched rounded (/ambula/, /honulo/) and angular (/knitsky/, /fixtant/) pseudowords with rounded/angular 2-D objects in a visual or haptic 2AFC task. Participants then rated the pseudowords and shapes on multiple attributes, including semantic differential scales, preference, and object associations. Results showed reliable congruent sound–shape matching in both modalities. MDS revealed highly similar psychological representations of shapes across vision and touch, suggesting a shared perceptual structure. GLMM showed that rounded–angular attribute similarity was the primary predictor of matching choices in both modalities. In an extension using symmetric/asymmetric objects, visual matching remained reliable SSC, while haptic matching did not differ from chance; however, GLMM indicated that potency and object-related preference similarity predicted symmetry-based choices, particularly in the haptic condition. These findings suggest that angularity-based SSCs rely on shared perceptual dimensions across vision and touch, whereas symmetry-based matching depends more on modality-specific, associative processes.

Attractive aftereffect in mean orientation perception induced by motion trajectory adaptation

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Although preceding orientation information is known to affect subsequent orientation perception, it remains unclear whether different sources of orientation-related information, such as motion trajectories, have similar effects particularly under uncertain conditions. In the present study, we investigated how adaptation to motion trajectories affects subsequent perception of the mean orientation of static stimuli. After participants adapted to noise patches moving back and forth along oblique trajectories with a common tilt, we measured the tilt at which the mean orientation of multiple static grating patches was perceived as vertical using the method of constant stimuli. The orientation of each grating patch was pseudo-randomly sampled from a uniform distribution spanning $\pm 20^\circ$ around the mean orientation. The results revealed an attractive aftereffect: the perceived mean orientation was biased toward the tilt of the adapting trajectories ($n = 9$). Furthermore, using the double-drift illusion to dissociate physical and perceived trajectories, we found that this attractive aftereffect was absent following adaptation to trajectories that were perceptually tilted but physically vertical ($n = 12$). These findings are difficult to explain in terms of a simple response bias and suggest that relatively low-level motion signals may contribute to stabilizing estimates of orientation summary statistics.

Cross-domain aversion to breaking a sweat: Evidence that people who avoid cognitive effort exercise less

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If common high-school tropes are to be believed, then people can be sorted into those who enjoy cognitive effort and those who enjoy physical effort. In this study, we instead report evidence that effort aversion may be a fundamental individual difference that generalises across domains. As part of a hands-on research experience for high school students at UNSW, 248 adult American students were recruited through Prolific to engage in an “effort discounting” task. On each trial, they reported whether they would prefer to engage in a tedious cognitive-effort task (typing a large number of words backwards) for \$20 or to receive a lesser amount for no effort. They

also reported how much physical activity they had engaged in over the previous week. Results showed that people who were willing to sacrifice more money to avoid the tedious cognitive task also reported lower physical activity. Strikingly, this pattern was strong among female participants but absent in male participants, who reported a high level of physical activity across the board. These findings suggest that (a) effort avoidance in one domain predicts real-world avoidance of effort in other domains, and (b) the relationship between cognitive effort aversion and real-world physical activity is not consistent across genders. Future research should investigate biopsychosocial mechanisms that drive these gender differences, such as identity- or socially-derived expectations.

Melanopsin increases spatiotemporal contrast sensitivity by reducing retinal noise and improving calculation efficiency

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Visual sensitivity is limited by noise in neural transduction and the efficiency in sampling of visual information. To understand the mechanism through which melanopsin can enhance cone vision, we decomposed this effect into the equivalent internal noise and calculation efficiency. Photoreceptor silent substitution was used to create stimuli which were the additive superposition of three photoreceptor-controlled components: (1) A melanopsin-high (i-high) or melanopsin-low (i-low) background which was a cone metamer to an equal-energy white (20% melanopsin Weber contrast), (2) LMS-cone-isolated sinusoidal test gratings (0.25 – 2 cpd & 0.25 – 5 Hz), and (3) LMS-cone-isolated, spatiotemporal external noise (0.2 – 17.8% Michelson contrast). We find that melanopsin enhances cone vision at low spatiotemporal frequencies (0.25 – 0.50 cpd & 0.25 – 1 Hz). This enhancement is a function of both a reduction in the internal noise power (σ^2) by 44% [from σ^2 (i-low) = 0.00128 to σ^2 (i-high) = 0.000714] and an improvement of the calculation efficiency (η) by 1.45 fold [from η (i-low) = 1.07 to η (i-high) = 1.56]. Electrophysiological evidence suggests that melanopsin augments cone vision at two sites, one in the retina and another in the cortex (Adhikari et al 2024 Proc R Soc B). Our findings provide evidence that in the retina, melanopsin signalling reduces the neural noise and that downstream cortical melanopsin signals increase the calculation efficiency of human cone vision.

Beliefs and Behavioural Intentions in Response to Health Misinformation

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Health misinformation is widespread online and can influence important decisions, yet little is known about how people evaluate health claims or how these beliefs shape intentions. Past research suggests susceptibility to health misinformation is topic-independent, but this has been tested on a limited range of topics. In this pilot study, participants (N=293) rated their belief in accurate and inaccurate health claims across seven topics, including sexual and reproductive health, nutrition, and vaccines, and indicated their intention to act accordingly. Participants distinguished between accurate and inaccurate claims, but this ability varied by topic, with the greatest discrimination for vaccines and contraception, and the least for nutrition. Belief ratings predicted intentions, though this link was influenced by whether claims were accurate. Lower health literacy was associated with greater acceptance of misinformation. These findings suggest sensitivity to misinformation may depend more on topic than previously assumed, with belief and intention not always aligned. Implications for health communication will be discussed.

Time out of Mind: The role of modality, absence and change on the perception and metacognition of time

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Time is unique as a fundamental perceptual experience in that it can be derived from any sensory modality. Furthermore, the awareness of time passed, the metacognition of time, is critical for the maintenance of an ongoing awareness of the external world and the segmentation of events. Building on previous work, our modified temporal bisection paradigm was used to examine the perception and metacognition of short (1500ms and 3000ms) temporal intervals demarcated by auditory, visual and audiovisual stimuli. The intervals were either full (the coding stimulus endured for the

duration) or empty (interval signalled by a 10ms pulse at beginning and end). Visual stimuli (a 1cpd luminance grating) were either drifting at 4hz or static. 8 subjects completed 250 trials in each of the 6 control conditions and then 4 each in the test conditions. Trial-by-trial bisection and metacognitive data were analysed using a hierarchical Bayesian measurement model. Both the empty and drifting intervals were bisected earlier than controls with reduced confidence, indicating a dilation of perceived duration; an effect amplified in the sub-second condition. Audiovisual intervals reduced, but did not remove, the dilation in both drifting and empty intervals. The results further support the utility of the novel paradigm and Bayesian analysis and are consistent with increased cognitive load dilating perceived time and reducing confidence in the judgement, particularly at sub-second intervals.

Phase-Dependent Melanopsin Responses in the Human Pupillary Light Reflex Vary with Temporal Frequency

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Light influences non-image-forming functions, including the pupillary light reflex and circadian rhythms. Melanopsin-containing retinal ganglion cells contribute to these functions; however, they also receive inputs from rods and cones, making it difficult to isolate their specific roles. Although melanopsin responses are known to be slower than cone-mediated responses, the temporal integration of signals from multiple photoreceptors remains unclear. The present study examined whether temporal differences between melanopsin and cone pathways can be revealed by manipulating their phase relationship across temporal frequencies. Test stimuli were used to independently modulate cone and melanopsin stimulation. Two stimulus conditions were compared: an in-phase modulation (Cone+Mel) and an opposite-phase modulation (Cone-Mel). This manipulation allowed the phase of melanopsin stimulation to be varied while keeping cone input constant. Pupillary responses were recorded at temporal modulation frequencies between 0.5 Hz and 8 Hz. The root mean square (RMS) difference showed a decreasing trend with increasing temporal frequency (0.5-8 Hz), whereas the 0-lag correlation coefficient showed an increasing trend across the same range of frequency. These findings indicate that phase-dependent effects of melanopsin stimulation are more evident

at low temporal frequencies. This provides a basis for functionally distinguishing melanopsin and cone inputs in the human pupillary reflex.

Understanding the neurophysiological basis of mind wandering under different task demands: A drug and brain stimulation study

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Mind wandering is a common feature of everyday cognition, with implications for productivity, and well-being. Evidence suggests that mind wandering may be modulated by transcranial direct current stimulation (tDCS), although the findings are currently mixed. Dopamine levels are also a promising moderating factor, with evidence showing that increased dopamine availability reduces spontaneous mind wandering, consistent with its established role in executive control processes. Additionally, task demands have been shown to affect the nature and frequency of mind wandering processes, likely due to fluctuations in the availability of executive resources. Despite these findings, the optimal brain stimulation parameters for influencing mind wandering and the underlying neurochemical mechanisms remain poorly understood. We examined the independent and interactive effects of task difficulty, dopamine availability (levodopa vs placebo), and tDCS intensity (1mA, 2mA, 4mA, or sham) on mind wandering using a n-back task (2-back and 3-back). We observed an interaction between stimulation intensity, dopamine availability, and task load. Specifically, dopamine availability impacted the increase in unintentional mind wandering typically seen with increased task difficulty. In addition, this effect varied as a function of stimulation intensity. Collectively, these findings demonstrate how dopaminergic and stimulation-based mechanisms jointly shape mind wandering under varying cognitive demands.

Fixation behavior during AI interface interaction predicts user satisfaction: evidence from a humanities knowledge discovery system

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Gaze behavior offers a behavioral complement to self-report user experience, yet its predictive value in AI interface contexts remains underexplored. We recorded eye movements in 38 participants using a locally developed AI Knowledge Discovery System and examined whether fixation characteristics predict user satisfaction. The results showed that longer mean fixation durations (reflecting sustained processing) were associated with higher ratings, whereas elevated fixation rates (reflecting rapid, shallow gaze) predicted lower ratings. Clustering participants by their visit of the system and fixation characteristics revealed two distinct processing modes. Deep Readers showed long mean fixation durations and low fixation rates, consistent with the focal processing and sustained semantic-level engagement with interface. Rapid Scanners showed short mean fixation durations and high fixation rates, consistent with the ambient processing and visual search. Deep Readers reported higher likelihood of recommending the system to others than Rapid Scanners. Among Rapid Scanners, greater total fixation duration did not translate into higher satisfaction, indicating that how one engages with an interface matters more than how long. These findings extend the ambient-focal processing framework from scene perception to human-AI interface interaction, and establish mean fixation duration and fixation rate as behavioral predictors of AI system satisfaction.

The Geometry of Material Representation Across Vision, Language, and Action Models

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Material appearance is multidimensional, defined by colour, glossiness, translucency, metallicity, and subsurface scattering. Humans intuitively cluster this complex space into meaningful categories using multimodal knowledge like visual features, semantics, and affordances. How these factors shape the representation of human material perception remains poorly understood. Artificial neural networks (ANNs) make this tractable, as their representations are shaped by controllable objectives and visual diets. We used Physics-Based Rendering (PBR) to sample photorealistic material images with ground-truth control over properties, isolated from confounds like object identity. We compare material representations across three ANN families: vision-only, vision-language (VLMs), and

vision-language-action models (VLAs)—frontier models trained to perceive and reason about the physical world. We observed distinct representational geometries across training objectives and input modalities. Intriguingly, in VLMs, text prompting steers representations of the image toward task-relevant axes. VLMs and VLAs thus enable the investigation of inference-time dynamics driven by multimodal interactions that are absent in unimodal models but present in the human brain. Together, our findings characterise material representation across the ANN landscape, including for the first time in VLAs, and open a new avenue for understanding how multimodality shapes visual representations.

Sound as a Tool for Focus: Why There Is No One-Size-Fits-All Soundtrack for Productivity

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Can "focus music" actually improve how we work? This study investigated whether specific auditory environments, Classical Music, commercial Work Flow Music, Office Noise, and Silence, reliably enhance sustained attention during a Sustained Attention to Response Task. Our results challenge the idea of a universal "focus" effect, revealing that different sounds affect distinct components of attention. Mixed-effects models and Bayesian analyses showed that both Classical Music and Work Flow Music reduced commission errors compared to silence, suggesting they help improve inhibitory control. Interestingly, while Office Noise reduced omission errors and helped maintain alertness over time, it did not provide the same "stability" as music. Across all sound conditions, participants reacted more slowly than in silence but showed reduced response variability, indicating more consistent performance. Thought-probe data revealed that while mind-wandering increased over time, regardless of the environment, classical music specifically helped reduce "mind blanking" in the early stages of task. Notably, these changes occurred without significant shifts in physiological arousal (heart rate or skin conductance), suggesting that, in the present task context, attentional modulation was not significantly associated with tonic autonomic activation. Ultimately, auditory effects on attention are component-specific and dynamic, and not fully explained by arousal-based mechanisms.

Overestimation of Upper-Body Size Following Media Exposure Is Associated with Psychological Well-being in Men

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Body image disturbance in men has gained attention; however, the perceptual mechanisms through which visual media influence body size estimation remain unclear. This study examined the effects of idealized male physiques on men's implicit body perception and psychological well-being. Sixteen healthy male participants completed the Image Marking Procedure (IMP), from which the Body Perception Index (BPI) was derived for the shoulders, waist, and hips. Standardized measures, including the Body Shape Questionnaire (BSQ) and Adult Mental Health Scale (AMHS), were also administered. Using a pretest–posttest design, participants viewed idealized male physiques and self-photographs while eye-tracking recorded gaze patterns toward body features. Results showed a significant increase in shoulder size distortion after media exposure. Notably, greater overestimation of upper-body size was positively associated with psychological well-being and lower body dissatisfaction. Eye-tracking results showed a similar pattern, with attention to upper-body features paralleling the perceptual findings. These findings suggest that exposure to idealized media does not necessarily exacerbate body dissatisfaction. Overestimation of shoulder size may reflect a self-enhancing cognitive–perceptual tendency associated with psychological well-being. This study highlights the importance of gender-specific patterns of perceptual distortion in understanding the psychological effects of visual media.

The Role of Linguistic and Visual Word-Segmentation Cues in Chinese Reading

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In Chinese, word boundaries are not explicitly marked, raising the question: How do readers segment continuous strings of characters into words? One possible answer is that skilled readers exploit statistical and/or visual cues to identify word

boundaries. To test this possibility, we conducted two eye-tracking experiments in which we manipulated word type (monomorphemic vs. compound) and visual segmentation cues (Experiment 1: colour alternation, Experiment 2: spacing). We hypothesised that visual cues may disrupt the holistic processing of monomorphemic words but have no effect on compound words due to such cues being redundant to the segmentation process. We found that monomorphemic words were in fact processed faster than compound words, and that colour alternation disrupted monomorphemic but not compound word processing, supporting our hypothesis. However, there was no interaction between word type and spacing, indicating a more nuanced role for morphological and visual cues in Chinese reading. Building on this, we propose that morphological information functions as a key segmentation cue in Chinese, with morphologically simple words being processed holistically and compound words being decomposed into constituents, with both routes operating in parallel.

A Portable Single-Camera Method to Quantify Lens-Zone Use in Myopia-Control Spectacles

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Contemporary myopia-control spectacle lenses, such as highly aspherical lenslet (HAL), combine a central clear zone with peripheral treatment regions. The clear zone provides foveal refractive correction and helps maintain visual function, while treatment regions delivers myopia-control signals. However, real-world use of these zones in naturalistic tasks remains poorly quantified. We developed a single-camera method to estimate lens-zone use from consumer-grade video. The algorithm reconstructs a subject-specific 3D face-eye-lens model from facial landmarks, pupil/iris geometry, head pose, interpupillary distance, and spectacle parameters. Clear-zone position is inferred from head motion and lens geometry; gaze position additionally uses pupil/iris landmarks and a visual-axis model. A motion-gated 3D correction module, trained with weakly supervised AprilTag labels, further reduced localization error while preserving geometric constraints. Validation used lens-mounted AprilTags as lens-plane references in static chin-rest and dynamic head-motion videos (spanning -15° to $+19^\circ$ pitch, -15° to $+31^\circ$ yaw, and

-17° to $+4^\circ$ roll). Mean $\pm$ SD localization errors for clear-zone, gaze, and combined estimates were 1.18 ± 0.43 , 1.16 ± 0.65 , and 1.66 ± 0.72 mm in static condition, and 1.34 ± 0.67 , 2.15 ± 1.16 , and 2.24 ± 1.19 mm in dynamic condition. Our approach enables scalable quantification of lens-zone exposure and is being applied to characterize near-work behaviour in myopic children

Integration of visual attributes in spatial segmentation based on temporal asynchrony revealed by a noise masking paradigm

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The visual system relies on multiple features to segment space into meaningful regions. While these features are well studied in static contexts, their temporal covariation, namely temporal correlation, plays a critical role in temporal segmentation. However, how different visual attributes interact in this process remains unclear. To address this issue, we introduced a noise masking paradigm to dissociate interactions among luminance, color, and spatial phase. Participants viewed an 8 by 16 dynamic lattice composed of Gaussian blobs or Gabor patches. The lattice could be segmented into left and right regions when elements within each region shared temporal correlation, while regions were uncorrelated across the boundary. Each stimulus was defined by one or two attributes, and performance was measured while half of the elements were replaced with temporally uncorrelated noise from either the same or a different attribute. Results ($n = 5$) showed that cross attribute noise impaired segmentation to a degree comparable to within attribute noise when signal strength was matched. This suggests that signals from different attributes are not processed independently, but instead interact and jointly contribute to temporal correlation computation. A computational model assuming integration into an amodal representation before correlation computation accounted for the data ($R^2 \approx 0.9$), supporting an integrated processing stage in temporal segmentation.

Investigating Memory Without Awareness: Neural Evidence for Unconscious Processing of Memory Retrieval

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The present study examined whether memory traces can be detected under unconscious viewing conditions. Participants completed a pre-post fMRI paradigm combined with discontinuous flash suppression (dCFS). In session 1, novel faces were suppressed using dCFS. This was followed by an explicit learning phase in which a subset of faces was encoded as to-be-memorized (TM), while remaining faces served as non-memorized (NM). In session 2, identical stimuli were again presented under dCFS, followed by a recognition task requiring “old” (TM) or “new” (NM) responses. Analyses were divided into stimulus-driven and behavior-driven approaches. Stimulus-driven decoding compared TM vs. NM across sessions. Behavior-driven analyses reclassified trials based on recognition performance into OO, ON, NO, and NN categories, enabling decoding comparisons across behavioral outcomes. Whole-brain searchlight decoding using a linear SVM and ROI analyses focused on bilateral fusiform face area (FFA) and parahippocampal gyrus (PHG). Stimulus-driven analyses revealed no significant effects. In contrast, behavior-driven analyses showed increased decodability in session 2 relative to session 1 for OO vs. NN in the right FFA and for OO vs. ON in the right TPJ/AG. ROI analyses demonstrated session-dependent increases for OO vs. NN in the left FFA and left PHG. These findings suggest that memory traces emerge under unconscious perception when behavioral performance are considered.

Subjective ratings of inter-talker similarity predict word reading ability in young adults

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Reversing sentences can make them completely unintelligible but have most sound structures preserved. Fleming et al. (2014) suggested familiarity with the phonology of a language reflected by the perceived similarity of pairs of reversed sentences plays an important role in identifying talkers speaking that language. Here we examined whether the perceived similarity of pairs of reversed sentences can predict word reading ability in which phonological ability is widely

considered crucial. We predicted lower perceived similarity of reversed sentence pairs would be associated with higher word reading ability. In this study, sentences recorded from adult talkers who didn't exhibit unique acoustic features were reversed in time so that these sentences were completely unintelligible, but had most phonetic information retained. A group of young adults was administered an inter-talker similarity rating task in which they rated the degree of the similarity of a pair of reversed sentences by using a visual analog scale (0-10 with 0 denoting “totally different” and 10 “totally same”). Word reading ability was also evaluated. Results showed the perceived inter-talker similarity based on reversed sentences was negatively correlated with word reading ability, suggesting that lower perceived similarity (higher sensitivity to phonetic information) was associated with higher word reading ability. These findings have clinical implications for early identification of children with dyslexia.

Selective Encoding of Human Faces in Peripheral Vision

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Humans show an advantage for detecting faces in peripheral vision, yet it remains unclear whether this advantage is tightly tuned to human facial structure or broadly tuned to face-like patterns. We examined whether illusory face distractors interfered with the detection of human face targets in the visual periphery. First, we tracked eye movements during a fast saccadic choice task with stimuli presented 12 DVA to the left and right of fixation. Participants (N = 20) looked as quickly as possible toward human face or food targets, with the other category acting as a distractor. Half of food stimuli contained illusory faces. Stimuli were removed once fixation was broken to ensure strictly peripheral viewing throughout. As expected, participants responded faster to human face targets than food targets, but responses were less accurate and slower when human face targets were paired with illusory face distractors compared to non-face food distractors. This indicates that illusory faces interfered with detection of human faces. Then, in an EEG study using the same stimuli and task design (N=30), time-resolved decoding revealed that only the location of human face targets, but not food targets, could be reliably decoded. However, face

targets' location decoding performance did not differ between illusory face and non-face distractor conditions. Together, these findings show that illusory faces interfere with the decisional stages of human face detection but not with early perceptual processing.

Testing the Richness of Visual Experience at Small Set Sizes

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A central question in visual cognition is whether conscious experience is richly detailed or limited to a small number of objects. At very small set sizes it is often assumed that all items are consciously accessible, so any performance limits should reflect constraints on how visual information is used rather than failures of awareness. We tested this using a repetition detection task with arrays of two or three items drawn from color, orientation, and shape. In Experiment 1 participants judged whether any item repeated. In Experiment 2 the same task was used and participants also rated subjective visibility. Performance varied strongly by feature type, with color easiest and orientation most difficult. However these differences were not mirrored in visibility, which remained relatively stable even as accuracy declined with increasing set size or feature difficulty. Critically visibility and performance dissociated and sometimes diverged in opposite directions. At larger set sizes orientation produced the lowest accuracy but higher visibility than shape. This reversal shows that what is seen most clearly is not necessarily what can be used most effectively. These results indicate that subjective visibility and behavioral performance are not interchangeable and support the view that visual experience remains relatively rich despite limits on functional access.

Context Matters: The Influence of Background Hue on Color Preference

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This study investigated adolescent color preferences using a novel psychophysical methodology designed to normalize for individual variations in visual sensitivity. Visual stimuli were 2°x2° color patches (target) displayed on a 20°x20° background. The

target colors were specified on the equiluminance plane on the MB-DKL color space. We first used a temporal 2AFC to measure participants' visual detection thresholds of each color patch on a neutral gray background to establish an equal-sensitivity curve. The target colors for the subsequent preference test had a contrast ten times of the detection threshold to ensure stimuli equal salience. Subsequently, 32 high school students rated the targets under 7 backgrounds with different hues and luminance. The color preferences were significantly influenced by the background hue, inconsistent with the Ecological Valence Theory, which suggested that color preference is due to its association with objects and thus should not be affected by background colors. Yellowish and greenish colors exhibited the greatest susceptibility to changes in background, with green and blue backgrounds significantly increasing preference, and a reddish background decreasing preference. Conversely, background luminance did not alter color preference, inconsistent with the contrast theory, which suggests color preference can be explained by the cone contrasts of the colors. A predictive model for color preference was developed, achieving an R^2 value of 0.78.

Effect of emotional arousal on visual search varies with set size

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High emotional arousal would narrow the functional visual field (FVF) within which one can attentively select and identify objects with a single fixation (e.g., Nobata et al., 2010). However, emotional arousal would increase amount of attentional resources allocated to attended stimuli (e.g., Mather et al., 2016). We examined how emotional arousal affect the performance in a conjunction search task. To minimize the attentional resources allocated to the search task, we shortened the presentation duration of the search stimuli. To vary the spatial distribution and depth of attention required, we manipulate the set size across multiple levels (4, 8, 16, 24, and 32). In each trial, emotion-inducing images of different arousal levels were presented, followed by conjunction search stimuli for 500 ms. If the emotional arousal narrows the FVF, search performance under the high arousal conditions should decline as the set size increases. However, if it enhances attentional resource for the visual search, performance under the high arousal

conditions should be improved. We found that, under the high-arousal conditions, accuracy in target detection increased at small set sizes but decreased at large set sizes. These results suggest that emotional arousal narrows the FVF at large set sizes by diffusing and shallowing attention toward the stimuli, whereas it facilitates visual search at small set sizes by focusing and deepening attention toward the stimuli.

Development of looming-based depth judgment and its relation to ball-catching performance in children

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Perception of motion in depth is thought to emerge within the initial months of life, but its development beyond infancy and its relation to dynamic motor skills, which are thought to require depth perception, remain unclear. The present study examined performance on a looming-based depth judgement task in 25 preschoolers (4-6 years), 17 elementary schoolers (6-12 years), and 21 middle schoolers (12-14 years). A subset of 17 preschoolers and 11 elementary schoolers also completed a ball-catching task. In the visual task, participants pressed a button when a target circle gradually expanding from the center of the screen at 25 mm/s appeared to coincide with a reference circle. In the catching task, they attempted to catch a ball launched from a tossing machine 2-3 m in front of them. Each participant completed 10 trials per task. Mean absolute error in the visual task decreased with age ($r = -.54$, $p < .01$). In a small subset of 7 middle schoolers one year later, performance changed little, suggesting that this ability is largely stabilized by early adolescence. Catching success also increased with age ($r = .77$, $p < .01$). Notably, while low perceptual errors did not guarantee high catching success, no participants with high perceptual errors achieved it. These findings indicate that sensitivity to looming information may be a necessary but not sufficient factor for successful interception of approaching objects, whereas catching skill may also depend on additional factors.

Spatial Summation of Ensemble Perception

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When viewing a complex scene, the human visual system uses ensemble perception to extract the gist of an image. While perceptual averaging is well documented, it remains unclear whether perceiving the "sum" of a set reflects direct sensory integration or post-hoc inference. We defined the "sum" as the linear sum of Gabor arcs on an imagery circle of 3° visual angle radius. The cumulative length of the arcs was 25° , 36° , 50° , 71° , and 101° . Experiment 1 used a matching task in which the observer compared the combined length of four arcs with the length of a test arc to estimate perceived subjective equality (PSE). Experiment 2 used a 2AFC paradigm to measure the contrast thresholds for Gabor arcs of various lengths at 75% accuracy level. The PSE was about half the sum of all arcs across all conditions, suggesting an integration efficiency of 50%. The threshold decreases with combined length with a slope -1 for smaller stimuli and -1/2 for larger ones, consistent with linear and probabilistic summation, respectively, and thus suggesting an early visual integration. The 50% integration efficiency was thus stable across beyond single receptive fields. These findings suggests that perceived totals may arise from early sensory integration rather than solely from higher-level inference alone, offering a framework for dissociating early integration from later decoding processes in ensemble perception.

Contextual salience modulates, but does not eliminate, the Other-Race Effect

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The other-race effect (ORE), often attributed to greater exposure to own-race faces, reflects better recognition of those than other-race faces. How experience would improve memory for new individuals remains unclear. We tested a cost-efficient encoding hypothesis positing that when a salient feature such as skin colour makes a face distinctive, that feature receives disproportionate weighting during learning, reducing encoding of finer details. Manipulating distinctiveness based on ethnicity could thus potentially reverse the ORE. Using FaceGen, we created Caucasian and non-Caucasian versions of 8 identities (4 targets, 4 foils) differing only in pigmentation. Caucasian participants ($N = 96$)

learned four faces, one made distinctive by its skin colour (same-race for half—SRD group; other-race for the other half—ORD group). Pigmentation and distinctiveness status were counterbalanced. We tested recognition with skin colour removed to assess how much information beyond pigmentation was encoded and predicted reduced recognition for distinctive faces. Instead, same-race distinctive faces were recognised better than the three other-race faces in the SRD group, whereas no difference appeared in the ORD group. With skin colour restored, a distinctiveness advantage emerged in both groups. Therefore, while contextual saliency can modulate the ORE in a superficial way, representations for distinctive same-race faces seem more robust, consistent with long-term experience-based tuning.

Effects of Depth Cues on the Perception of Second-Order Symmetry

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It is reported that an observer can detect symmetry without correspondence between image elements across the symmetry axis, but rather through changes in image statistics across space (Chen & Tyler, 2023). This kind of symmetry perception has been termed second-order symmetry, and its underlying mechanism remains unknown. Since dot density does not affect the first-order symmetry detection but the second-order symmetry (Chen & Tyler, 2023), suggesting that second-order symmetry perception is associated with surface completion. We investigated how depth modulation affects the perception of second-order symmetry. The stimuli consisted of grayscale scrambled pattern multiplied by an envelope that modulated luminance contrast. 6 kinds of binocular disparity depth cues were used to present the stimulus. We used a PSI staircase method to measure the modulation depth threshold at 75% accuracy for symmetry discrimination. Unlike in the first-order symmetry patterns, where symmetry perception diminishes when the inflection of the surface is not consistent with the symmetry axis (Chen & Sio, 2015), it was easier for observers to detect symmetry when the two sides of the symmetry axis were on different surfaces. The vertical hinge improved the sensitivity by 30% to the first order symmetry but only 11% to the second order symmetry. These results suggest that second-order symmetry perception appears to involve a

different surface completion mechanism from that of first-order symmetry.

Human Navigation in Virtual Spaces: Comparing: Euclidean and Non-Euclidean Geometries

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The goal of the present study was to test whether humans can learn to navigate in the curved spaces defined by non-Euclidean geometry. Three groups of participants completed triangle completion task tasks in Euclidean (N=10), spherical(N=9), and hyperbolic(N=9) virtual environments using a controller. In each trial, participants navigated along two legs of a triangle and were asked to point the direction of original point they started. Feedback for the correct location was presented after each response. We manipulated two within-subject factors: path ratio and rotation angle. The distance ratio was either 1:2 or 2:1 and the rotation angle at the second turn varied from -150° to +150° in 30° increments. Each of the 20 unique triangles was tested three times (in random order) for a total of 60 trials. Results showed that participants were able to learn to navigate in non-Euclidean geometries. Performance measured as the absolute deviation of angular responses from correct values significantly improved over blocks in all geometries, and was most accurate in Euclidean geometry (although not significantly so). Regression to the mean effects in angular estimation were obtained in all geometries, consistent with previous studies. This research suggests that humans are not 'hardwired' for navigation in Euclidean geometry and can adapt to novel spaces when feedback is provided.

Tracking Perceived Motion Paths in Apparent Motion Using SSVEP and Neural Decoding

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Apparent motion can give rise to the vivid perception of a moving object despite the absence of continuous physical motion. Psychophysical studies have shown that target identification is impaired when a stimulus appears along the perceived path of apparent motion, a phenomenon known as motion masking (Yantis et al., 1998).

However, the neural mechanisms underlying this effect remain unclear. In the present study, we investigated the neural correlates of motion masking using a frequency-tagged steady-state visual evoked potential (SSVEP) paradigm. A bistable apparent-motion quartet was used, in which observers perceived either vertical or horizontal motion. Distinct flicker frequencies were assigned to the two possible motion paths, allowing us to track path-specific neural responses. Results from pilot recordings show that coherence between EEG and tagging signals at the frequency associated with a given motion path was modulated by perceptual reports. Specifically, neural responses corresponding to the perceived motion path exhibited systematic changes compared to the non-perceived path. In addition, a task-related component analysis (TRCA) based decoding approach achieved classification accuracy of 60–70% in distinguishing perceptual states. These findings provide preliminary neural evidence consistent with motion masking and suggest that the visual system may dynamically represent motion paths even in the absence of physical stimuli.

Investigating the breakdown of two-frame motion and disparity defined form as a function of horizontal and vertical displacements in random dot patterns

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Sequential presentation of random dot patterns with a displaced uniform region between the two images, reveals a shape generated by apparent motion in the shifted dots. The same form can also be seen via disparity contrast by stereoscopically viewing the two images. The purpose of this study is to test the breakdown of form perception as a function of displacement for two-frame motion and disparity contrast. We utilised random dot stereograms and two-frame motion stimuli, matched for spatial sampling and duration, to compare performance between the contrasts. We measured aspect ratio discrimination thresholds for a range of horizontal and vertical disparities/displacements (~12 – 60 arc min). If two-frame motion and disparity defined form result from similar processes, aspect ratio JNDs should be impacted by increasing vertical and horizontal displacements in a similar way. Alternatively, aspect ratio JNDs should increase for smaller vertical than for horizontal displacements in the stereoscopic condition since binocular fusion

thresholds are smaller for vertical disparities than for horizontal disparities. This asymmetry is not expected for two-frame motion. We found a slight asymmetry between stereoscopic and two-frame motion displays, with JNDs rising for smaller vertical displacements for stereoscopic stimuli than the two-frame motion stimuli. These results contribute to testing for the existence of a binocular mechanism in motion perception.

How can rods see in daylight?

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The textbook description of rod saturation in daylight is based on classic chromatic adaptation experiments. Here, we test whether uncontrolled S-cone and melanopsin signals in the classic experiment can elevate detection thresholds and be misinterpreted as rod saturation. Using five-photoreceptor silent substitution, rod detection thresholds (10°, 200ms; 10° temporal retina) were measured in 4 experimental conditions across a 5-log unit illumination range, including bright photopic levels (2793 cdm-2): the classic condition with contaminant S-cone and melanopsin signals, rod-directed stimuli with selective S-cone or melanopsin excitation, and rod-isolated. We find the expected saturation-like increase in threshold only in the classical condition. There was no saturation when S-cones or melanopsin were selectively activated with rods; rod-directed thresholds with S-cones were lower and shallower (14.9% Weber contrast; 0.91 slope) than with melanopsin (18.6% contrast; 0.96 slope), indicating rod vision is better at lower melanopsin excitations. In the rod-isolated condition, thresholds did not saturate (13.81% contrast). We conclude that chromatic adaptation creates unnaturally high LMS-cone and melanopsin signals, which prevent rod-cone coupling. Rods saturate in the classic experiment, but not in natural daylight with its markedly lower LM-cone than S- and melanopsin excitations, thereby supporting daylight rod vision through abundant gap junctions to LM-cones.

Effects of Temporal Luminance Modulation on Depth Perception of Small-Field Light Sources

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This study investigates how temporal variations in luminance influence depth perception of small-field light sources under dark viewing conditions. We conducted psychophysical experiments using a 2AFC task in which observers judged which of two small light stimuli appeared nearer. In the first experiment, stimuli shared identical temporal frequency spectra (3 Hz sinusoidal modulation), and only modulation amplitude varied across six luminance ratios (0–2.0 relative to a baseline of 140). Results showed that, regardless of flicker presence, stimuli with higher mean luminance were more likely to be perceived as closer. In the second experiment, modulation amplitude was fixed (140–35), and temporal waveform varied across ten conditions: steady (0 Hz), sinusoidal modulations at 1–8 Hz, white noise, and pink noise. Hierarchical cluster analysis (Ward's method) classified responses into two groups: Cluster 1, in which steady and aperiodic stimuli were more frequently perceived as nearer, and Cluster 2, in which relatively high-frequency sinusoidal stimuli were more often perceived as nearer. Additional judgments of brightness and size revealed a stronger correlation between perceived brightness enhancement and depth perception in Cluster 2. These findings suggest that when mean luminance is equal, flicker-induced brightness enhancement (Brücke–Bartley effect) can modulate perceived depth of small-field light sources, with substantial interobserver variability.

Foveal Load and Environmental Complexity Affect Peripheral Perception: Eye Movement Evidence for Tunnel Vision in Driving

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Previous studies have shown the tunnel vision effect in driving, demonstrating a narrowed attention span to enhance foveal processing capacity. The present study aimed to investigate the roles of foveal load and environmental complexity on tunnel vision with eye movement recording in driving scenarios. Participants were asked to attend to the central signs shown in driving-perspective road videos and to detect squares shown at different eccentric distances simultaneously. Foveal load was manipulated by different tasks of simple detection or choice reaction to the central sign, while

environmental complexity consisted of roads with intersections versus those without. The tunnel vision effect was evident in eye movement measures: high foveal load led to shorter saccade lengths, and reduced eccentricity and spatial dispersion of fixations, narrowing the attentional span during road environment scanning. The accuracy of peripheral detection showed a significant interaction between foveal load and signal eccentricity under low complexity. Specifically, detection accuracy declined with eccentricity, and high foveal load exhibited a more pronounced reduction than low foveal load at the far periphery. However, no such reduction caused by foveal load was found in the high complexity environment. The findings suggest that foveal load can induce tunnel vision and environmental complexity modulates foveal load to affect the tunnel vision effect.

Visual Cortical Modulation Underlies Eye Movement Reduction of Trauma-Related Intrusive Memories

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Eye movement desensitization and reprocessing (EMDR) can reduce trauma-related intrusive memories, but the neural mechanisms of eye movement (EM) remain unclear. We combined fMRI and sEEG with a trauma-film paradigm to test whether EM attenuates intrusions by modulating affective-memory networks through the visual system. In Experiment 1, participants viewed traumatic films and later underwent image-cued reactivation during fMRI, followed by horizontal EM or fixation. EM reduced the frequency of intrusions recorded in a 7-day diary. During intervention, EM enhanced visual cortical activity and attenuated activity in the amygdala and hippocampus. gPPI and DCM showed stronger coupling between the hippocampus–amygdala complex and visual cortex, with a negative influence from LOC to amygdala. In Experiment 2, isolated EM was compared with a 1-back working-memory (WM) task. Although both tasks induced PCC-centered DMN deactivation, EM preferentially recruited visual regions and PCC–LOC coupling, indicating that EM effects cannot be reduced to generic WM load. In Experiment 3, sEEG showed that WM was characterized by vmPFC-to-amygdala information flow, whereas EM showed LOC-to-amygdala information flow. Together, these

findings suggest that EM reduces intrusive memories by engaging visual sensory modulation of the amygdala–hippocampal affective-memory system through a mechanism distinct from WM.

How Does Social Interaction Shape Peer Cooperation During Early Childhood?

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While much is known about the developmental trajectory of cooperation, little is known about how different interactive contexts influence children's cooperative abilities. A recent study demonstrated that 2-year-olds' cooperation with an unfamiliar peer was impacted by their initial interactions (Breeland et al., 2022). Whether this extends to older children remains an open question. Given that children gain experience with a range of interactive partners with age, older children may be less prone to spillover. It is also possible that older children care more about forming social relationships thereby more prone to spill-over. To examine these possibilities, we explored spillover effects in same-sex dyads at age 3 ($N = 117$). Of interest was whether children's affiliation, antagonism, and joint coordinated engagement during a warm-up phase predicted later behaviour on a cooperation task with the same peer. At age 3, cooperative ability was not predicted by initial interactions, but by children's interaction quality during the task itself. These findings suggest that by age 3, cooperation may rely less on initial impressions and more on children's abilities to interpret and respond to a social partner within the task itself. This is consistent with evidence that by age 3, children gradually improve their ability to coordinate their own behaviour with a partner's actions and infer others' wants, needs, and goals rather than relying on social and emotional cues.

Hierarchical response profiles to optic flow patterns and speeds along the human dorsal visual stream: an fMRI study

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Natural locomotion produces optic flow patterns of opposite directions (expansion and contraction) with varying speeds. While human cortical areas

selective for optic flow supporting self-motion perception have been identified (Cardin & Smith, 2011), how pattern and speed selectivity are organized across the dorsal visual hierarchy remains unclear. We conducted a block-design fMRI experiment on human participants ($N = 19$) to measure responses to expanding and contracting optic flows at five speeds (1 to 128 °/s). Regions of interest were defined using the Benson atlas (Benson et al., 2014) and functional localizers (Wall & Smith, 2008). To minimize adaptation, stimuli alternated between radial and rotational motion while maintaining constant speed along the moving trajectories. We found that early visual areas showed comparable responses to expansion and contraction, whereas higher-order areas exhibited consistently stronger responses to expansion. This asymmetry increased progressively from V1–V3 to hMT+, V6, and further to PcM and CSv. The magnitude of the expansion–contraction difference increased with stimulus speed. Peak response speeds for each pattern also diverged progressively along the hierarchy. Because expansion corresponds to forward locomotion and is more common in natural experience, these results suggest that cortical processing becomes increasingly specialized for ecologically relevant self-motion signals along the dorsal visual hierarchy.

Obstacle-based physical plausibility modulates body ownership for an impossibly deformed arm in virtual reality

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Body ownership is usually weakened when a visually presented body violates anatomical constraints. However, body perception may also depend on whether a deformation is understood as a rational adaptation to the surrounding environment (Gergely et al., 1995). We tested whether obstacle-based physical plausibility modulates body ownership for an impossibly deformed virtual arm. Thirty male participants performed a reaching task in immersive virtual reality while observing their virtual body in a mirror. In a 2x2 within-participant design, we manipulated arm deformation (deformed vs. rigid) and obstacle context (present vs. absent). In the deformation condition, the virtual arm bent along a curved path; with an obstacle present, this could be interpreted as avoiding the object. After each 5-min block, participants rated body ownership, agency, and perceived bodily change, and skin conductance

responses to a threat stimulus were recorded. Body ownership decreased with arm deformation, but this reduction was attenuated when an obstacle provided a physically plausible context. By contrast, agency was reduced by deformation regardless of obstacle context. Perceived bodily change was also reduced in the obstacle-present deformation condition, whereas skin conductance responses showed no reliable effects. These findings suggest that body ownership is shaped not only by anatomical consistency of body form, but also by perceived physical consistency between the body and the environment.

Temporal Dynamics in Perceptual Decision-Making

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Humans can make appropriate decisions for perceptual objects under complex circumstances. Many previous studies have investigated observers' abilities to distinguish objects in stable and static contexts. However, circumstances in the natural world are sometimes dynamic, and objects are often partially hidden and unfold gradually. In this study, we created a face/house discrimination task to simulate such situations with a stimulus that was displayed segment-by segment in the trial, and participants were asked to continually report over time what the stimulus was and their confidence with the decision. In the meantime, we used electroencephalogram (EEG) to record participants' scalp electrical activity. In this approach, we were able to obtain multiple middle states during the development of perceptual decision-making and related neural signals, such as when the decisions changed or were unchanged, and when the confidence levels changed or remained unchanged. The Multivariate pattern analysis (MVPA) applied to whole-brain EEG oscillations revealed that the alpha power (8-12 Hz) could significantly decode when the confidence level changes vs was unchanged (accuracy = 69%, $p < .05$), whereas the beta power (13-30hz) could decode change vs no change for both confidence (accuracy = 65%, $p < .05$) and category (accuracy = 68%, $p < .05$). These results demonstrate the involvement of alpha and beta oscillations for signalling different stages of perceptual decision-making.

Implicit Associations Between Color Categories and Basic Tastes: An IAT Study

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Taste expectations are shaped by other sensory information available prior to ingestion and this expectation influences the actual perceptual experience. Among visual information, color is considered a major factor influencing taste perception. While associations between specific colors and basic tastes have been widely reported, most previous studies rely on subjective rating tasks, which may be confounded by individual differences in evaluation and contextual factors. The present study investigated the implicit association between two basic tastes (sweetness vs. saltiness) and two color categories (warm vs. cool colors) using the Implicit Association Test (IAT), with reaction time as an objective measure. Two versions of the IAT were conducted: a word-based task using food names and an image-based task using food images. Participants classified stimuli under compatible (sweetness–warm colors / saltiness–cool colors) and incompatible conditions (saltiness–warm colors / sweetness–cool colors). In both IATs, analysis of reaction time showed a significant difference between the two conditions, indicating stronger associations between sweetness and warm colors and between saltiness and cool colors, corresponding to the compatible condition. Furthermore, no reliable differences were observed between the word and image formats. These findings suggest that color–taste correspondences operate at an unconscious level and remain consistent across stimulus formats.

Using gaze measures to differentiate surgeons' looking behaviors in laparoscopic cholecystectomy

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Surgical robot is trendy but for it to work intelligently, it is necessary to study how surgeons look when operating. We surveyed literatures in the past 20 years and selected 33 gaze measures related to surgical manipulation. We recorded 7 surgeons' gaze in 28 laparoscopic cholecystectomy and investigated how their gaze differed. Each gaze recording was divided into 5 phases based on

surgical tools used; each phase was divided into segments when there were changes in action sites or in laparoscope's FOV. Phases with >100 datapoints were hook, forceps and clip. In these phases, dynamic AOIs around tools and around operation targets were drawn. We excluded gaze measures strongly correlated with action duration; for interrelated gaze measures, one was selected. To the remaining 24 measures, we ran cluster analysis (k means) on gaze data in all segments, forming 2 clusters in hook, 3 in forceps and 3 in clip. The different clusters represented different looking patterns when surgeons controlled various tools. We ran random forest models on the 24 gaze measures to determine which ones predicted the clustering. Judging by the mean decrease Gini and mean decrease accuracy, gaze velocity, pupil dilation time, and fixation distance, saccade length, and saccade rate in target AOIs were predictive of gaze clustering. They were able to differentiate surgeons' looking behaviors. Surgical robots should learn to detect them to better cooperate with a particular surgeon.

Neural Correlates of Modality Compatibility in Crossmodal Task Switching Across Age

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Previous behavioral work has shown that modality-incompatible stimulus-response mappings increase mixing and switch costs in crossmodal task switching, particularly in older adults. Building on this evidence, the present fMRI study examined whether modality compatibility is associated with differential neural recruitment in younger and older adults. Preliminary analyses were based on 36 younger and 23 older adults. Participants performed a cued auditory-visual task under modality-compatible and modality-incompatible mappings across single-task, repetition, and switch conditions. Behavioral analyses revealed reliable modality compatibility effects in accuracy and response time. Further analyses indicated that age-related modulation of modality compatibility was most evident for local switch cost, whereas the corresponding pattern was less clear for mixing cost. Whole-brain fMRI analyses revealed robust activation associated with both mixing and switch demands in overlapping frontoparietal control regions, with switch-related recruitment being more extensive. Compatibility-related neural effects were weaker at the corrected whole-brain level, although

follow-up contrasts suggested more extensive local switch-cost-related activation under modality-incompatible than modality-compatible mappings. These findings suggest that modality compatibility reliably shapes behavior, whereas neural effects are dominated by mixing and switch demands.

Slope of Lea symbols visual acuity psychometric functions in preschool children

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Purpose To compare the slope of the Lea symbols visual acuity (VA) psychometric function between preschool children and adults. **Methods** This cross-sectional comparative study included 20 preschool children aged 3–5 years (4.05 ± 0.76 years) and 20 adults aged 18–40 years (27.75 ± 4.35 years), all with no significant refractive error, normal birth history and ocular health. Right eye VA was measured at 3m using single crowded Lea symbols run via modified QUEST (32 trials). The first six trials presented stimuli at estimate of threshold, and the remaining trials presented optotype sizes scattered by 0.10 logMAR above and below the threshold estimate. Frequency-of-seeing data were analysed using maximum-likelihood probit analysis to estimate probit size. A smaller probit size indicates a steeper function. **Results** One child was excluded as an extreme outlier due to highly variable responses, which resulted in QUEST failing to converge on a threshold estimate. After exclusion, mean probit sizes were 0.085 ± 0.054 logMAR in children and 0.096 ± 0.078 logMAR in adults, with no significant difference between groups ($p=0.617$). Based on Monte Carlo simulations, the unbiased estimate of probit size was 0.090 logMAR for children and 0.101 logMAR for adults. **Conclusion** Psychometric slope for VA measured with single crowded Lea symbols in preschool children is similar to that in adults. Slope findings in children can be used to model different rules for VA measurement in young children.

Modeling Visual Deficits in Amblyopia via Artificial Neural Network with Spike-Timing-Dependent Plasticity

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Amblyopia is a neurodevelopmental disorder characterized by reduced visual acuity and impaired binocular function, arising from abnormal visual experience during early critical periods. Many studies have investigated the deficits in amblyopic at behavioral and neuronal levels, however the link between behavioral performance and neural mechanisms is not clearly defined. While artificial neural networks have shown broad utility, most lack biological plausibility in architecture and learning mechanisms. In this study, we implement a bio-plausible neural network model of early visual processing based on spike-timing-dependent plasticity (STDP) that reflects developmental cortical plasticity. The model simulates amblyopia by introducing optical defocus to mimic degraded input from the amblyopic eye, and traces its impact on signal integration from retinal input through LGN to V1. We demonstrate that the STDP-based model reproduces key neural deficits observed in amblyopia, including altered spatial frequency and orientation tuning, elevated contrast thresholds, shifted ocular dominance, and degraded population encoding. Furthermore, the model exhibits amblyopia-like perceptual deficits in contrast sensitivity, binocular phase combination, and stereoacuity at behavioral level. These results highlight the role of experience-dependent plasticity in amblyopia and establish a unified framework linking STDP-driven synaptic adaptation to system-level visual dysfunction.

Visual and haptic cues in goal-directed reaching across virtual and physical environments

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Goal-directed reaching relies on the integration of multiple sensory cues, including visual and haptic information. These cues guide all phases of the movement, including planning, initiation and late-stage control, and provide the error-based feedback required for learning, yet how these multisensory signals are integrated during reaches is not fully understood. Immersive environments such as virtual reality (VR) are emerging as a valuable tool for exploring these underlying processes, as they allow an experimenter to systematically vary the availability and reliability of sensory information. This study investigated the use of visual and haptic

information when performing a rapid reach to one of six target locations identified by a centrally presented cue. Participants completed VR and real-world (physically matched) versions of the task to assess the impact of visual and haptic cues on task performance and learning. Our results reveal that different phases of a reaching response – as measured via performance and kinematic measures – are differentially sensitive to alterations in visuo-haptic information and can generalise to real-world performance at significantly different rates depending on prior exposure. The findings also underscore the importance of rich, high-fidelity haptic feedback across all phases of the movement, particularly when visual cues are conflicting or unreliable, as is common in modern head-mounted VR systems.

Body Size Discrepancy and BMI in Attentional Orienting and Disengagement to Body Shape Cues

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This study examined how subjective body size perception and objectively measured body mass index (BMI) jointly influence attentional processing of body-shape cues. We investigated whether the body size discrepancy index (BSDI) interacts with BMI to modulate attentional processing. 41 participants were assigned to a 3 (BSDI: high, medium, low) × 2 (BMI: low vs. high/medium) between-subjects design. A Posner cueing task was employed using five body-shape stimuli (apple, pear, inverted triangle, hourglass, and rectangle) as peripheral cues. Results revealed a significant main effect of BMI on attentional orienting: the low BMI group showed greater cueing benefits, particularly for pear-shaped stimuli, indicating enhanced attentional orienting. Discrepancy also modulated orienting under rectangle and inverted triangle conditions, suggesting that larger discrepancies amplify cue-driven attentional capture. For attentional disengagement, the low BMI group demonstrated higher inhibition scores under rectangle and inverted triangle cues. Low BMI individuals and low discrepancy exhibited the greatest disengagement cost for inverted triangle cues, indicating increased difficulty disengaging attention once captured. These findings supports the view that body image disturbance involves a biased integration of perceptual and physical

information, characterized by both hyper-vigilance (facilitation) and attentional sticking (disengagement cost) toward body-related stimuli.

PI-26: A proposal for the 26 Items of Prosopagnosia Index for detecting developmental prosopagnosia in children

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Developmental prosopagnosia (DP) is a neurodevelopmental disorder characterized by lifelong difficulties in recognizing faces, despite having normal vision and intelligence. In childhood, DP often goes unnoticed, even though it can lead to significant social and Academic problems. While research on adult DP has rapidly expanded over the past decade, studies on childhood DP remain limited, and few standardized tools are available for early detection. To address this gap, we introduce the PI-26, a child-specific Prosopagnosia Index designed to identify potential developmental prosopagnosia in children. The PI-26 builds on the original adult version, the PI-20 (Shah et al., 2015), a widely used self-report assessment for adults, as well as its Traditional Chinese version, the PI-20 TW (Wang et al., 2025). The PI-26 features two main modifications: it rewrites questions to reflect situations typical in children's daily lives, such as at school and with peers, and adds six new items targeting challenges especially relevant to childhood DP, including social participation, safety concerns, and identity issues. Despite growing awareness of the developmental and psychosocial challenges associated with childhood DP, age-appropriate screening tools remain scarce. By expanding item coverage and including child-specific contexts, the PI-26 aims to facilitate future validation and promote earlier detection of developmental prosopagnosia in children.

The Impact of H.A.L.T. MAX Lens Technology and Spatial Frequency on Face Identification Contrast Thresholds

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Face identification depends on information across spatial-frequency (SF) bands, which may be differentially affected by optical lens designs used for myopia control. We quantified contrast thresholds for face identification with single-vision lenses and through the treatment zone of a myopia-control lens incorporating H.A.L.T. MAX technology. Observers performed a 4-alternative forced-choice task using faces filtered into three SF bands: broadband, 5–15 cycles per face width (cpf), and 27–45 cpf. Weber contrast within the visible face region was controlled adaptively with QUEST to estimate the threshold for 75% correct performance. Log10-transformed thresholds were analysed using a linear mixed-effects model with participant as a random intercept. Preliminary data ($N = 5$) showed a significant Lens $\times$ SF interaction, $F(2,24) = 4.58$, $p = 0.021$. Thresholds were elevated selectively for lenses with H.A.L.T. MAX technology in the 27–45 cpf condition, with a mean difference of 0.181 log10 units ($p = 0.008$), corresponding to a 52% increase in contrast threshold relative to single-vision lenses. There was no overall main effect of lens ($p = 0.982$), and the main effect of SF was marginal ($p = 0.066$). These preliminary results suggest that lens-induced optical changes affect face identification in an SF-dependent manner, with selective impairment when performance relies on high-frequency facial information.

Effects of Reference-White Chromaticity on Color-Matching Functions in the Maxwell Method

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Many studies report discrepancies between color-matching functions (CMFs) derived using the Maxwell and maximum-saturation methods. One possible reason is the difference in chromatic adaptation to the reference stimulus: the Maxwell method uses an identical white reference, whereas the maximum-saturation method uses different chromaticities. This study investigated how variations in the reference's chromaticity affect the derived CMFs in the Maxwell method. CMFs obtained using a standard white reference were compared with those from bluish-white and reddish-white references. The color difference, ΔE , between each colored reference and the standard was set to 20. Eleven observers in their twenties participated,

completing five sessions per condition. Eighteen and seventeen test stimuli were used for the bluish-white and reddish-white conditions, respectively. Preliminary results from three observers showed CMFs changed mainly in the short-wavelength region under the bluish-white condition, and in the long-wavelength region under the reddish-white condition. This suggests chromatic adaptation to the reference influenced the results. Tristimulus value B increased under the bluish-white condition, whereas R did not clearly increase under the reddish-white condition. Although further data are required, these findings indicate CMFs may be affected by the reference's chromaticity.

Attention-mediated Binocular Integration: Restoring Stereopsis in Stereo-deficient Adults via Dichoptic Visual Search Training

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Standard clinical paradigms offer limited therapy for adults with stereoscopic deficits and often viewing sensory suppression alleviation as a prerequisite for stereoscopic recovery. This study utilised a novel dichoptic visual search paradigm with a high attentional load to promote active, top-down binocular integration. Ten stereo-deficient adults were recruited for this pilot study aimed at improving stereovision. Interocular contrast balancing was individualised for each participant, and the paradigm involved embedding local disparity cues within a visual search task, necessitating the active allocation of selective attention to binocular signals for the task to be completed. Results revealed rapid and significant improvements in local stereopsis after five training sessions. Stereoacuity gains preceded significant reductions in suppression and persisted at a 20-week follow-up, even as suppression returned to baseline. However, recovery did not translate significantly to global stereopsis. Furthermore, local stereopsis recovery was achieved independently of changes in visual acuity, fixation stability, or microsaccades. These findings suggest that intensive attentional training may promote top-down cortical plasticity, enabling binocular integration despite persistent low-level suppression. It is possible that stereoscopic recovery is not strictly dependent on eliminating suppression, highlighting the value of

attention-based paradigms in adult binocular rehabilitation.

A Recurrent Neural Network Modeling Account to Children's Cognitive Development: The Role of Working Memory Constraints

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Although previous connectionist modeling work by McClelland (1991) demonstrated the outcome of simulating Siegler's balance scale task, it is evident that real children's trial-by-trial learning fashion indeed leads the failure of modeling for showing expected stage-like development. This disadvantage of modeling performance indicates a significant deficiency of the model structure. In this study, a WM module is proposed in attempting to explain why a child with limited early mental processing ability can proficiently encode continuing experience but gradually develop an advanced cognitive system during time course. We used a Simple Recurrent Network (SRN) to simulate the performance based on the integration of weight and distance information in the balance scale task to deploy WM constraints. The results indicate that the present SRN modeling captures the trial-by-trial mode of learning processes, reflecting realistic learning dynamics. Secondly, it is revealed that the arranged manipulation of hidden units and recurrent connections of the model result in disparate modeling outcome. That is, higher WM capacity allows facilitating earlier occurrence of advanced outcome than lower WM capacity. Additionally, limited WM may prevent children from processing distance information, causing them to rely more heavily on weight when making decisions. These findings provide a more realistic account with a temporal processing module, worthwhile further theoretically reconsidered.

Neural representations underlying memory-based hand pre-shaping during virtual object interaction

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Hand pre-shaping plays a pivotal role in hand actions by enabling the motor system to anticipate and

optimize interactions with objects. It is expected that accumulated visual and perceptual experience during reach-to-grasp actions shapes the underlying neural representations. To investigate this, we developed a system that precisely synchronizes EEG recordings with a virtual reality environment. Using this setup, we explored memory-based hand pre-shaping in humans and examined how motor memory engrams related to hand pre-shaping modulate neural activity by comparing responses to familiar (e.g., apple, computer mouse, pencil, etc.) and unfamiliar objects, leveraging everyday tool-use experience. Eleven young adults were instructed to perform a virtual grasping task using their dominant hand, involving both familiar and unfamiliar objects presented via a head-mounted display. Scalp EEG signals were continuously recorded from 63 channels throughout the data collection period. Our findings distinguish the neural representations underlying hand pre-shaping between familiar and unfamiliar object conditions. In the familiar condition, frontal theta activity became increasingly prominent as participants approached the grasp. In contrast, the unfamiliar condition was characterized by elevated neural activity in both occipital and frontal regions. These results demonstrate how long-term tool-use experience reorganizes specific cortical dynamics to facilitate memory-based pre-shaping.

Impact of Refractive Surgery on Interocular Correlation

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Background: This study aims to evaluate the impact of refractive surgery on interocular correlation in myopic patients. **Methods:** Interocular correlation sensitivity was measured in 50 visually normal adults and 43 myopic patients who had undergone bilateral corneal refractive surgery (KLEx, FS-LASIK, Trans-PRK). Cross-sectional measurements were obtained at the most recent postoperative visit. In addition, 10 patients were prospectively followed before surgery and at 1 day, 1 week, and 1 month postoperatively to examine short-term changes. **Results:** Normal subjects showed stable interocular correlation sensitivity across spatial frequencies (mean AULCSF = 0.17, 95% CI 0.16–0.19). Compared with normal controls, postoperative patients demonstrated

significantly reduced sensitivity at spatial frequencies of 1.31, 1.83, and 2.54 c/d (all $P < 0.001$). In the KLEx subgroup, interocular correlation sensitivity showed partial recovery over time, whereas no clear temporal trend was observed in the FS-LASIK or Trans-PRK groups. **Conclusions:** Refractive surgery may reduce interocular correlation, indicating potential changes in binocular visual perception.

Establishment of an Asthenopia Assessment System Integrating Multi-Dimensional Visual Function Indicators

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Purpose: To establish a standardized assessment system for visual display terminal-induced asthenopia, based on three core indicators specified in the Chinese national standard (GB/T 40230-2021): contrast sensitivity (CS), critical flicker fusion frequency (CFF), and blink frequency (BF). **Methods:** A 120-min iPad task was used to investigate differences in asthenopia under two environmental conditions: 40% relative humidity (RH) with gentle breeze and 60% RH without air flow. Forty normal adults completed the task under both conditions, with CS, CFF, and BF measured at baseline and every 30 min. Thirty asthenopia patients with Liver-Kidney Deficiency syndrome (Traditional Chinese Medicine, TCM) underwent the same measurements under the more asthenopia-inducing condition. **Results:** The area under the log contrast sensitivity function (AULCSF) at 60 min was significantly lower under 40% RH with gentle breeze than under 60% RH without air flow ($P = 0.024$). CFF at 90 min was significantly higher under 40% RH with gentle breeze ($P = 0.028$). Under the 40% RH with gentle breeze condition, baseline AULCSF, CFF, and BF were all significantly lower in patients than in normal adults (all $P < 0.05$). **Conclusion:** The 40% RH with gentle breeze is more likely to induce asthenopia than the 60% RH without air flow condition. Patients with asthenopia associated with Liver-Kidney Deficiency syndrome (TCM) exhibit abnormal visual function indicators compared with healthy individuals.

Closing Karakia

Karakia are traditional Māori prayers and affirmations, used to invoke guidance and protection at the opening and closing of events, or to bless kai (food) or taonga (treasures).

Unuhia, unuhia!

Unuhia ki te uru tapu nui!

Kia wātea, kia māmā, te ngākau, te tinana,
te wairua i te ara takatū.

Koia rā e Rongo, whakairia ake ki runga.

Kia tina! TINA! Hui e! TĀIKI E!

English translation

Draw on, draw on!

Draw on the supreme sacredness!

To clear, to free the heart,
the body and the spirit of mankind.

Rongo, suspended high above us.

Draw together! Affirm!





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