UCL Neuroscience Domain

UCL Neuroscience Symposium 2024

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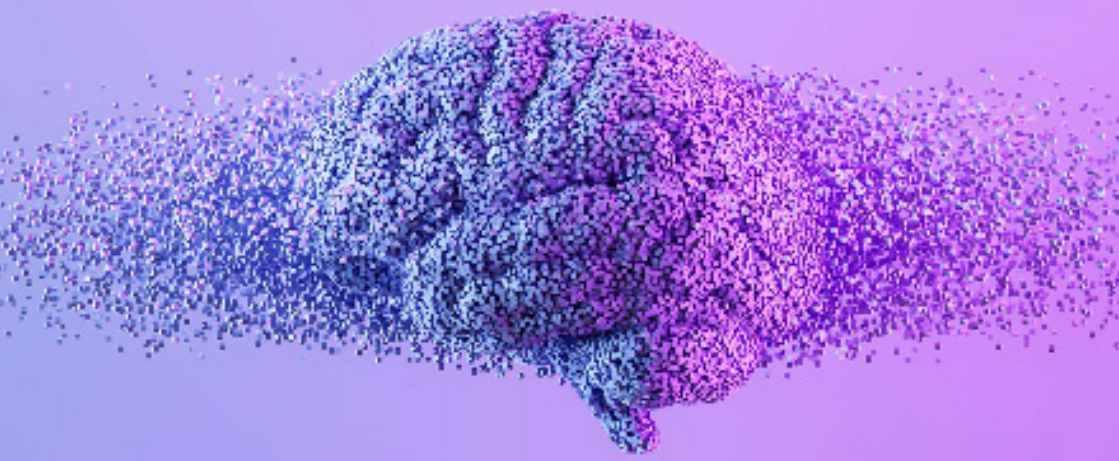
Abstract booklet



From Molecules to Mind

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The 10 posters shortlisted for the 2024 Research Poster Prize are highlighted in green and will be displayed in the Jeffery Hall Foyer.

Cognition and Behaviour | Elvin Hall

1. Yaniv Abir - Max Planck UCL Centre for Computational Psychiatry and Ageing Research

POSTER TITLE
Reinforcement learning mechanisms of antidepressant treatments (RELMED)

AUTHORS
Abir Y, Qiu Z, Dercon Q, Mkrtchian A, Dolan R, Kessler D, Leurent B, Morriss R, Nazareth I, Nixon N, Watson S, Wiles N, Peddada A, Browning M, Huys Q

ABSTRACT
Two extensive literatures concern the neuromodulators serotonin, dopamine, and noradrenaline. First, numerous double-blind, randomized clinical trials confirm the efficacy of medications targeting these neuromodulators in depression treatment. Second, a similarly large and convincing body of work has established causal roles for these neuromodulators in reinforcement learning (RL). The interdisciplinary field of computational psychiatry seeks to bridge these two areas. Nevertheless, the degree to which RL mechanisms are involved in depression treatment remains uncertain.
We introduce RELMED, a project aimed at establishing whether antidepressants targeting various neuromodulators engage distinct components of RL. RELMED comprises two consecutive double-blind randomized clinical trials conducted in UK primary care. Each trial involves 516 depressed patients randomized to receive bupropion, escitalopram, or a placebo. The initial trial will explore broad RL domains, with the subsequent trial examining specific RL mechanisms.
During the first trial, participants will engage in a series of online behavioral RL tasks. Unlike standard approaches, RELMED measures multiple RL mechanisms within a single coherent task framework, including appetitive and aversive instrumental learning, Pavlovian-Instrumental transfer, controllability, working memory, and average reward effects. We outline the task sequence, test-retest reliability, and results of acceptability and user testing.

2. Benjy Barnett - Wellcome Centre for Human Neuroimaging

POSTER TITLE
Creating something out of nothing: Symbolic and non-symbolic representations of numerical zero in the human brain

AUTHORS
Barnett B, Fleming S

ABSTRACT
Representing the quantity zero is considered a unique achievement of abstract human thought. Despite considerable progress in understanding the neural code supporting natural numbers, how numerical zero is encoded in the human brain remains unknown. We find that

both non-symbolic empty sets (the absence of dots on a screen) and symbolic zero (“0”) occupy ordinal positions along graded neural number lines within posterior association cortex. Neural representations of zero are partly independent of numerical format, exhibiting distance effects with countable numerosities in the opposing (symbolic or non-symbolic) notation. Our results show that format-invariant neural magnitude codes extend to judgements of numerical zero, and offer support to theoretical accounts in which representations of symbolic zero are grounded in more basic representations of sensory absences.

3. Lioba Berndt - Applied Computational Psychiatry Lab

POSTER TITLE
The effects of a mindfulness-based decentering intervention on momentary changes in self-esteem after social feedback

AUTHORS
Berndt LCS, Tymchyk R, Norbury A, Huys QJM

ABSTRACT
Background: With the increasing prevalence of mental health issues, mindfulness-based interventions, such as decentering, have been explored for their potential to mitigate symptoms of depression. Decentering focuses on reducing the automatic identification with thoughts and feelings, which is particularly relevant for addressing the impacts of negative feedback on self-esteem—an important aspect in depression.

Aim: This study aimed to investigate the effect of a decentering intervention on self-esteem levels in response to negative social feedback and to determine if it could reduce the variability of self-esteem responses across trials.

Methods: An online social evaluation task was employed, where participants predicted and received feedback on their profiles. Self-esteem was measured after feedback to assess fluctuations. Cognitive-computational models were used to analyse the data.

Results: Decentering did not significantly increase overall self-esteem or reduce its variability across trials. However, it effectively moderated the weights of negative feedback on self-esteem in the intervention group.

Discussion: The findings suggest that decentering may not directly enhance self-esteem or reduce its variability, but it contributes to a more stable self-esteem response to negative social feedback. Further research is needed to explore these processes in depth and to confirm these preliminary findings.

4. Elin Bonyadi - Department of Speech, Hearing and Phonetic Sciences

POSTER TITLE
How does hearing loss affect cognitive influences on speech-in-noise perception?

AUTHORS
Bonyadi E, Smith HJ, Holmes E

ABSTRACT
Understanding speech amongst noise is particularly difficult for people with peripheral hearing loss. In normal-hearing people, speech intelligibility is improved using cognitive factors like knowledge of semantic context (“what”), the talker’s identity (“who”), and spatial information (“where”). However, we do not fully understand how hearing loss affects use of these factors for speech-in-noise perception. This study will test differences between hearing-impaired and normal-hearing young adults in use of these factors. 24 participants from each group will hear two concurrent sentences, one target and one masker, and try to repeat the target sentence. The two speech streams have different topics and different talkers, and will be spatially separated. Participants will be visually cued to the topic, talker identity (after voice familiarisation training), or spatial location of the upcoming target stream, or will see an uninformative cue. The study is ongoing, but we expect that, compared to normal-hearing participants, hearing-impaired participants will derive a greater benefit to intelligibility from semantic and talker identity cues, but a smaller benefit from spatial cues. These findings would suggest that while some auditory cognitive processes are impaired in hearing loss, others can help to compensate for hearing loss, potentially indicating these processes use different neural pathways.

5. George Booth - Cortexlab, UCL Institute of Ophthalmology

POSTER TITLE
Dynamic and additive audiovisual integration in mice

AUTHORS
Booth GM, Sit TPH, Bimbard C, Takács F, Coen P, Harris KD, Carandini M

ABSTRACT
When auditory and visual cues each indicate the position of a stimulus, mice integrate these cues linearly (Coen et al., 2023). This strategy is optimal if the cues are independent and informative. What happens if the reward structure is changed to make this strategy suboptimal?

Mice were trained to indicate the left-or-right position of audiovisual cues by turning a wheel. Cues were presented alone (unisensory trials), simultaneously in the same location (coherent trials) or simultaneously in opposite locations (conflict trials). Training alternated between auditory-dominant and visual-dominant blocks, in which, on conflict trials, mice were rewarded for responding to the auditory or visual cue. Unisensory trials remained rewarded as in the original task. We modelled behaviour using a dynamic Bernoulli generalized linear model (Roy et al., 2021).

Mice adjusted their strategy to respond to a single sensory modality in conflict trials. They continued to act linearly, progressively increasing the weight given to one sensory modality while decreasing the other, despite this strategy reducing performance in unisensory trials.

These results suggest that linear combination is the fundamental operation with which the mouse brain integrates spatial multisensory cues. Mice learn by adapting the weights dynamically but do not deviate from this linear combination.

6. Sarah Bühler - UCL Institute of Cognitive Neuroscience

POSTER TITLE
Neurocognitive mechanisms of threat-of-shock induced impairments in encoding emotional faces in anxiety patients

AUTHORS
Buehler S, Lowther M, Lukow P, Kirk P, Pike AC, Yamamori Y, Gormley S, Aylward J, McCloud T, Rodriguez-Sanchez J, Robinson O

ABSTRACT
Both pathological and induced anxiety have been associated with alterations in emotional face processing. In this randomised controlled trial, we investigated the behavioural and neural effects of a 2–3-week intervention using the SSRI Escitalopram compared to placebo on the retrieval of faces encoded under a threat-of-shock state anxiety induction, in a control (n=93) and anxiety patient group (n=42). The retrieval of faces encoded under threat-of-shock anxiety was impaired in both the control group ($F=4.246$, $p=0.042$, $\eta p2=0.044$) and patient group ($F=6.906$, $df=41$, $p=0.012$*, $\eta p2=0.144$). While the effect size was larger in the patient group at baseline, the impairment did not significantly differ between groups ($F=1.162$, $df=132$, $p=0.283$, $\eta p2=0.009$), neither did it change following Escitalopram treatment. At the neural level, there was a significant increase in activation in a posterior cingulate cortex cluster in both the control and patient group, but this was not significantly different between groups or following the Escitalopram intervention. Threat-of-shock induced anxiety during the encoding stage appears to robustly impair subsequent face recognition in both healthy controls and anxiety patients. The underlying neural activation we observed in the posterior cingulate region might signal the tuning of selective attention to internal, self-relevant cues and increase with arousal state.

7. Susana Colinas Fischer - Cell and Developmental Biology

POSTER TITLE
Interactions between punishment and reward in a circuit for associative learning in C. elegans

AUTHORS
Molina-García L, Colinas-Fischer S, Benavides-Laconcha S, Lin L, Clark E, Treloar NJ, García-Minaur-Ortíz B, Butts M, Barnes CP, Barrios A

ABSTRACT
All animals need to update their preferences according to previous experience to adapt to an ever-changing environment. Here we examine how rewarding and punishing experiences modulate C. elegans innate odour preferences to understand how conflicting cues are integrated during learning. C. elegans learn to avoid innately attractive odours when these are paired with starvation. In males, such aversive learning can be overridden by sexual conditioning: if a rewarding experience (mates) is presented alongside the odour and starvation, the resulting response to the odour is attraction. We show that the neuropeptide PDF mediates both appetitive and aversive olfactory learning in C. elegans via different source and target cells.

We used calcium imaging to record the odour-evoked responses of implicated neurons after conditioning, and were able to detect traces of the rewarding and punishing memory. Furthermore, we used video tracking to analyse the locomotor state of worms during and after conditioning, which allowed us to investigate potential differences in the navigational strategies between conditions. These results show how neuropeptide signalling mediates the switch of innate odour preferences in C. elegans, and that, in the case of conflict learning, the rewarding and punishing memory are both formed and compete for behavioural expression.

8. Nadine Dijkstra - Department of Imaging Neuroscience

POSTER TITLE
Perceptual reality monitoring as metacognitive inference on sensory precision

AUTHORS
Dijkstra N, Fleming SM

ABSTRACT
The overlap between internally and externally triggered sensory signals requires a way to keep track of which signals reflect imagination and which reflect reality. One clear difference in phenomenology is that the experience of imagery is less clear and precise than that of perception. This difference in precision might be a direct consequence of running the perceptual system backwards during imagination. Here, we propose that perceptual reality monitoring might therefore be achieved by an implicit metacognitive evaluation of the precision of sensory signals. We formalize perceptual reality judgements as a higher-order inference within a generative model of perceptual content - an extended version of the higher-order state space (HOSS) model. Specifically, we propose that deciding whether a sensory signal reflects reality can be modeled as inferring that it has high sensory precision. We discuss how this simple assumption can explain a variety of neural and behavioral observations. Finally, we outline several empirical predictions that arise from the model and suggest how they can be tested in future research.

9. Daniel Dobolyi - Wolfson Institute for Biomedical Research

POSTER TITLE
Neural computations underlying the generalization of information for adaptive behaviour

AUTHORS
Dobolyi D, Buchholz MO, Bäumler E, Robinson NTM, Nițu D, Masood A, Sizov K, Roth A, MacAskill AF, Clark BA, Häusser M

ABSTRACT
Learning a set of structured relationships and extrapolating this knowledge to inform decisions when encountering new situations is fundamental for survival. Here, we investigate the neural correlates of this flexible computation in the hippocampal CA1 network. Mice were trained to perform an olfactory delayed paired association task. We show that mice successfully infer the reward contingency of new combinations of stimuli on the fly. We used two-photon calcium imaging to identify context-selective subpopulations of CA1 pyramidal

neurons. This suggests that CA1 neurons integrate information about both stimuli to inform the animal's behavioural choices and enable successful task performance. We show that CA1 pyramidal cell stimulus responses become increasingly context-dependent as mice learn the task. Context-selective neurons also discriminated between the two novel contexts that emerged in inference trials, and the extent of this generalized activity correlated with inference performance. We are currently using an all-optical approach to selectively photostimulate clusters of context-selective CA1 neurons to establish a causal relationship between the generalization of context-selective activity and successful inference. In summary, we have shown that head-fixed mice learn a novel odor-dependent inference task and are using advanced circuit interrogation techniques to provide mechanistic insight into how instantaneous inferential judgements are made.

10. Dorottya Hetenyi - UCL Queen Square Institute of Neurology

POSTER TITLE
Pre-stimulus alpha oscillations encode stimulus-specific visual predictions

AUTHORS
Hetenyi D, Haarsma J, Kok P

ABSTRACT
Predictions of future events have a major impact on how we process sensory signals. However, it remains unclear how the brain keeps predictions online in anticipation of future inputs. Here, we combined magnetoencephalography (MEG) and multivariate decoding techniques to investigate the content of perceptual predictions and their frequency characteristics. Participants were engaged in a shape discrimination task, while auditory cues predicted which specific shape would likely appear. Frequency analysis revealed significant oscillatory fluctuations of predicted shape representations in the pre-stimulus window in the alpha band (10 – 11Hz). Furthermore, we found that this stimulus specific alpha power was linked to expectation effects on shape discrimination. Our findings demonstrate that sensory predictions are embedded in pre-stimulus alpha oscillations and modulate subsequent perceptual performance, providing a neural mechanism through which the brain deploys perceptual predictions.

11. Nadia Hosseinizaveh - Cognitive Studies Department

POSTER TITLE
Investigating the mechanisms of global confidence

AUTHORS
Hosseinizaveh N, Fleming SM, Mamassian P

ABSTRACT
Confidence plays a crucial role in decision-making by enabling individuals to assess their overall task performance. Miscalibrated confidence can skew skill evaluation and impact larger-scale decisions. This study sought to understand the formation of "global" confidence over longer timescales from finer-level local confidence. In Experiment 1, participants rated their confidence of being correct after making numerosity comparisons (local confidence), and then assessed their overall performance (global confidence) after each short block.

Memorability of trials was manipulated by presenting memorable or forgettable images before the perceptual stimulus. No significant difference was found in how local confidence contributed to global confidence between the two conditions. In Experiment 2 we directly manipulated the local confidence phase. Participants were informed that certain trials carried the potential for a bonus based on their performance, with this information revealed only after reporting local confidence. Meta-metacognitive sensitivity, the ability to link global confidence to local confidence, was more disrupted in blocks with special trials, suggesting increased noise in global confidence formation. Both experiments revealed a recency effect in global confidence formation from local confidence judgments. These findings illuminate how global metacognition relies on local confidence and underscore the need for further exploration of metacognitive judgment calibration.

12. Zimo Huang - UCL Research Department of Neuroscience, Physiology and Pharmacology

POSTER TITLE
Human hippocampal theta oscillations code distance to a goal during spatial planning

AUTHORS
Huang Z, Bisby JA, Burgess N, Bush D

ABSTRACT
The rodent hippocampal local field potential is dominated by 6-12 Hz theta band oscillations during active exploration, and the theta rhythm has been strongly implicated in spatial coding and memory function across species. Invasive electrophysiology studies in both rodents and humans have shown increases in hippocampal theta power immediately before the onset of translational movement that persists throughout subsequent motion. Intriguingly, it has also been demonstrated that the magnitude of theta power increases before movement onset correlates with the distance that is subsequently travelled. Using non-invasive magnetoencephalography (MEG) and an abstract navigation task, we sought to further characterize the neural correlates of spatial planning and the oscillatory signatures of translational movement in healthy participants. In line with previous rodent and human electrophysiology studies, we observed an increase in theta band power during both planning and translational movement. Importantly, the magnitude of this theta power increase covaried with subsequent path distance during both periods, only when participants were aware of the distance to their goal. Finally, source reconstruction suggested that these changes in theta power originated from the hippocampus. This is consistent with the proposed role of hippocampal theta-band activity in supporting spatial navigation across mammalian species.

13. Luna Teresa Huestegge - UCL Institute of Cognitive Neuroscience

POSTER TITLE
The causal role of sensory strength in dissociating imagination from reality

AUTHORS
Huestegge LT, Uribe C, Fleming S, Kok P, Bestmann S, Dijkstra N

ABSTRACT
Visual imagery and veridical perception share neural mechanisms in the visual cortex, posing the question of how we distinguish imagination from reality. Because neural firing strength in the visual cortex is lower during imagery compared to perception, this signal strength difference may help in dissociating (“hazy”) imagination from (“clear”) reality, with imagery typically failing to meet a "reality threshold" for perception.
This study investigates the causal role of signal strength in dissociating imagination from reality using non-invasive brain stimulation. Subthreshold Transcranial Magnetic Stimulation (TMS) has been found to increase signal detection sensitivity and will be applied to amplify signals in the early visual cortex, while participants (n = 50) detect tilted Gabor gratings embedded in noise (present in 50% of trials). In half of the trials, participants will additionally be asked to imagine the to-be-detected grating.
We predict increased false alarms in the imagery (vs. no imagery) condition with subthreshold (vs. control) TMS. This would suggest that indeed signal strength plays a causal role in helping distinguish imagination and reality. Visual hallucinations might then arise due to strong internal signals “accidentally” crossing a reality threshold. Data collection is ongoing and preliminary findings will be presented at the symposium.

14. Krisztina Jedlovszky - Division of Biosciences

POSTER TITLE
Expected volatility and belief updating in paranoia – a reinforcement learning approach

AUTHORS
Jedlovszky K, Yon D

ABSTRACT
Belief formation and belief updating are greatly affected by how uncertain we perceive our environment to be. Problems with estimating this volatility seems to be a key driver of aberrant belief updating in numerous psychiatric conditions. For instance, individuals with high levels of paranoia behave as though the world is a volatile and unstable place.

Our study took a computational psychiatry approach and assessed how experienced and expected volatility affected learning and decision-making in individuals with high and low levels of paranoia. Participants completed a two-armed bandit task in different volatility blocks (true stable, true volatile, believe stable, believe volatile). In our critical ‘believe’ conditions, learners were exposed to environments with identical objective volatility, but different prior expectations about environmental uncertainty. This allowed us to isolate the effects of ‘volatility priors’ on learning and choice. We assessed task performance and switching rates and modelled the learning process with two reinforcement learning models. We found that prior beliefs about volatility and paranoia influenced switching rates. These effects correlated directly with the softmax beta parameters of the reinforcement learning models. Our results suggest that paranoid individuals tend to perceive the environment as more volatile, and that similar patterns of behaviour can be engendered in non-paranoid people through explicit communication about uncertainty in the world around us.

15. Alizee Kastler - Cell and Developmental Biology

POSTER TITLE
Social interaction increases tolerance to noxious stimuli in zebrafish

AUTHORS
Kastler A, Dreosti E

ABSTRACT
Supportive social environments are known to have an analgesic effect, significantly reducing the perception of pain. While this effect is recognised, its neurobiological basis and molecular mechanisms remain poorly understood.
To address this, we combined behavioural assays with light-sheet microscopy to generate 3D-maps of whole-brain c-fos activity, identifying brain regions activated during nociception and social interaction in juvenile zebrafish. Using In-Situ-hybridisation we further characterised these areas through the labelling of cell-types. Our findings show that nociceptive and social circuits share overlapping areas of activity in the brain, highlighting anatomical and molecular markers of the social modulation of pain.
Moreover, exposing juvenile zebrafish to both social and noxious heat stimuli revealed that the mere sight of other conspecific zebrafish leads to increased thermal noxious tolerance. This data suggests that social context can modulate pain tolerance in zebrafish through a descending pain modulatory pathway, similar to humans.
Overall, this work provides valuable insights into the mechanisms of pain modulation and highlights the importance of the social environment in pain management.

16. Rudy Kirchner - Faculty of Brain Sciences

POSTER TITLE
Emotions Speak Louder, Then Words: Naturalistic fMRI Study of Non-Verbal Emotional Cues in Forthcoming Word Prediction

AUTHORS
Kirchner R, Davis C, Zhang L, Yeh W, Skipper J

ABSTRACT
In face-to-face communication, listeners are tasked with processing a rapid influx of verbal and non-verbal information to interpret the intended meanings. Emerging evidence shows that non-verbal cues can provide useful context about forthcoming verbal information, simplifying the interpretation task. Here, we recruited thirty participants from University College London (UCL) community to watch 125 naturalistic videos depicting a conversation of two actresses, whilst in a functional magnetic resonance imaging scan. Non-verbal emotional cues (e.g. smiles, frowns) were presented at the video onset, followed by a coherent or conflicting emotionally valanced verbal information. Conditions where the initial emotional cue conflicted with the emotion of the subsequent verbal response elicited significantly higher levels of activity in the frontal, temporal, and parietal regions, especially in the right prefrontal cortex (PFC), fusiform face area (FFA), and premotor cortex (PMC), compared to when the emotional content was coherent. Notably, even between coherent conditions, more predictable scenarios resulted in further activity reductions. These findings support the role of non-verbal cues in forecasting auditory input, likely by saving neuronal

resources. Moreover, they lend further credence to the emerging evidence that language is processed by, more or less, the whole brain.

17. Agnès Landemard - UCL Institute of Ophthalmology

POSTER TITLE
Modulation of brainwide activity by arousal

AUTHORS
Landemard A, Krumin M, Reddy CB, Harris KD, Carandini M

ABSTRACT
Mice spontaneously go through episodes of high arousal revealed by locomotion, pupil dilation, and whisking, associated with activation of neuromodulatory systems. These episodes dramatically affect cortical activity, but it is not clear how they affect the rest of the brain, and whether they are associated with specific brainwide patterns of activity. To address this issue, we imaged activity in multiple brain regions with functional Ultrasound imaging while head-fixed mice were free to run on a wheel. Locomotion onset was associated with a stereotyped brainwide sequence of activation over the course of seconds, from ventral regions such as midbrain and hypothalamus up to the cerebral cortex and hippocampus. On the other hand, whisking in the absence of locomotion induced a widespread activation followed by a suppression, each with different amplitude across brain regions. We then used optogenetic stimulation of cholinergic neurons in the basal forebrain to causally manipulate the arousal system. Doing so, we could replicate some aspects of whisking-related changes in activity, even when controlling for stimulation-evoked whisking. Using this approach, we disentangle the contributions of different arousal-related parameters: locomotion, whisking and cholinergic release and show how they each contribute to brainwide patterns of activity.

18. Beth Longley - UCL Institute of Cognitive Neuroscience

POSTER TITLE
The relationship between interoception, olfaction, emotion, and dissociation

AUTHORS
Longley B, Hsiao S, Smith BC, Garfinkel SN

ABSTRACT
Sensory processing enables us to integrate information from our surroundings and ourselves to navigate the world, connect to our body, and experience emotions. Alexithymia (difficulty identifying feelings) and dissociation (detachment from self/world) are common transdiagnostic mental health symptoms. Investigating how our senses influence such symptoms may provide insight into mental health conditions. The ability to detect our heartbeat (cardiac interoception) relates to emotional experience, and poor olfaction is associated with mental health conditions (e.g. depression). However, this association remains unclear, as self-reported beliefs about senses do not necessarily align with true task performance. We investigated how interoception and olfaction relate to alexithymia and dissociation across behavioural measures (accuracy), self-reported subjective measures (confidence, belief), and metacognitive awareness (insight). Participants (N=154) completed Heartbeat Discrimination Task, Sniffin' Sticks Test, Toronto Alexithymia Scale, Cambridge Depersonalisation Scale. Interoception was not related to alexithymia or dissociation. Self-reported beliefs about olfaction negatively predicted alexithymia and dissociation, indicating

that individuals who believe their sense of smell is poor have difficulty identifying feelings, connecting to their body, and recalling memories. Results highlight the importance of subjective experience of senses in mental health. Future research may explore these senses in clinical populations, and investigate the possibility of targeting sensory modalities.

19. Karyna Mishchanchuk - Sainsbury Wellcome Centre

POSTER TITLE
Abstract contextual representations in ventral hippocampus support hidden state inference

AUTHORS
Mishchanchuk K, Gregoriou G, Kastler A, MacAskill AF

ABSTRACT
The ability to use the context we are in to shape our moment-to-moment decisions is a crucial determinant of our everyday lives. Although in experimental settings context is typically exemplified as a particular location in space, the context of many real life decision making problems is often not dependent on any directly observable properties of the environment. More often it is an abstract combination of experiences that together inform our subjective understanding of the world around us. The hippocampus is known to bind together combinations of sensory stimuli in order to represent the spatial context of our current and past experience, but if and how the hippocampus represents subjective, non-spatial contexts, and how such representations may influence behaviour remains elusive.

Here we show that the activity of neurons in the CA1 area of the ventral hippocampus robustly differentiates abstract contexts formed only from past probabilistic outcomes, and that removal of this hippocampal representation impairs the ability to use such abstract contexts to guide behaviour. These results highlight the role of the hippocampus in more general abstract, non-spatial representations, and provide a link between circuit investigation in rodents to changes in subjective behaviours associated with hippocampal dysfunction in mental illness.

20. Perside Ngani - Institute of Intelligent Systems and Robotics

POSTER TITLE
The link between cognitive, affective, and spatial perspective taking in patients with spatial impairments

AUTHORS
Ngani P, Auvray M, Chokron S

ABSTRACT
Adopting someone else's perspective is a crucial social skill, involving understanding spatial, cognitive, and affective perspectives, but the link between these abilities remains unclear. Research has explored whether individuals with cognitive and affective deficits also experience spatial perspective-taking difficulties. However, do individuals with spatial impairments also experience cognitive and affective perspective-taking difficulties? Brain-imaging data reveals that temporal and parietal cortices are crucial in spatial cognition, theory of mind and empathy. Research indicates that individuals with cerebral visual and spatial impairments may struggle with joint attention and early interactions. Therefore, this project seeks to reveal any co-occurrences between the perspective-taking abilities in

individuals with spatial deficits. We will investigate the correlations in performance in cognitive, affective, and spatial perspective taking tasks, including false belief tasks, emotional egocentricity bias and the graphesthesia task developed in our laboratory. Individuals with spatial disorders (i.e., unilateral spatial neglect; cerebral visual impairments) will be recruited at Hôpital Fondation Rothschild, and we expect patients to display specific patterns of cognitive and affective perspective-taking difficulties, as a function of their spatial impairments. This research will help pave the way for future research aiming to improve social information processing by increasing flexibility in spatial perspective-taking.

21. Jakub Onysk - Applied Computational Psychiatry Lab

POSTER TITLE
Large language model response consistency and contextual sensitivity across self-report psychiatric questionnaires - a building block of a framework to understand thought dynamics

AUTHORS
Onysk J, Huys QJM

ABSTRACT
Emotional states influence human behaviour and cognition, sometimes leading to rumination or suicidal ideation. Conversely, Large Language Models (LLMs) exhibit analogous behaviour, demonstrating varied responses to different prompts while maintaining human-level consistency. Such similarity has recently positioned LLMs as viable models of neural processes during language generation and internal speech. This study endeavours to establish a foundational framework for understanding thought dynamics by first examining the consistency and contextual sensitivity of LLM responses compared to human participants' responses to self-report psychiatric questionnaires.

Utilising datasets including the Self-rating Depression Scale (SDS), Patient Health Questionnaire (PHQ-9), Apathy-Motivation Index (AMI), and Generalised Anxiety Disorder scale (GAD-7), various LLMs answered said questionnaires under different sampling parameters and prompting styles. The Mistral-7B-OpenOrca-GPTQ model emerged as optimal, exhibiting human-level reliability and consistency (Cronbach Alpha ranging: [0.78; 1]). Contextual manipulation experiments revealed sensitivity in LLM responses, with depressed contexts eliciting higher depression and apathy scores, (t-values ranging [−87.59; −23.62], p-values <0.001), while positive contexts yielded improved scores.

This investigation underscores the potential of LLMs in modelling responses to psychiatric questionnaires. Future endeavours will aim to extract latent structures from LLMs to investigate what underlies such similarities and contextual sensitivity, both on a behavioural and neural level.

22. David Orme - UCL Research Department of Neuroscience, Physiology and Pharmacology

POSTER TITLE
Hippocampal role in updating and use of value and structure in an odour sequence task

AUTHORS
Orme D, Nierwetberg S, MacAskiil A

ABSTRACT
To behave optimally, animals build models of the world based on structural regularities to allow prediction of the value of actions. The computational expense of updating these models limits their usefulness in ever-changing environments with theoretical models suggesting that a way around this is to separate the representation of structure from the associated value allowing values to be rapidly updated when necessary. However, it is still unclear how this is implemented in the brain.

We developed an odour-based task that requires mice to learn about the temporal relationship between sequentially presented odour cues, that allows independent manipulation of both the relational structure and the associated value. We have shown that Mice can rapidly learn this task and that nucleus accumbens dopamine reflects a value signal consistent with the use of the temporal task structure.

We altered the value associated with individual odour sequences and found that mice rapidly adapt their anticipatory behaviour to reflect this change. Additionally, we found that the transition statistics between odours can be manipulated with little change to performance.

Our ongoing work is using this task with in vivo calcium imaging and optogenetic manipulations to delineate how structure and value is represented in the hippocampus.

23. Arjun Ramaswamy - Department of Imaging Neuroscience

POSTER TITLE
Electrophysiological Correlates of Reinforcement Learning in the Human Ventral Tegmental Area

AUTHORS
Ramaswamy A, Steele D, Akram H, Lagrata S, Simmonds L, Matharu M, Zrinzo L, Litvak V

ABSTRACT
Chronic Cluster Headaches (CCH), among the most excruciating pain syndromes, impact approximately 1 in 1000 individuals, with a notable comorbidity of depression. Deep Brain Stimulation (DBS) of the Ventral Tegmental Area (VTA), a midbrain region rich in dopaminergic neurons, presents an effective treatment. Our pioneering study utilised local field potential (LFP) recordings coupled with magnetoencephalography (MEG) in 14 volunteers receiving VTA-targeted DBS, marking the first report of electrophysiological correlates of reinforcement learning signals in the human VTA. In every trial, the subjects were asked to choose one of two fractal shapes and learn from feedback which shapes were more likely to result in reward and which in loss. Despite varied behavioural strategies among patients, a general trend emerged in distinguishing between more and less rewarded options, with a less pronounced avoidance of loss, aligning with prior research. In line with these behavioural findings, we found a significant effect of reward in the evoked VTA response to the trial outcome presentation between 280 and 530 milliseconds ($p<0.01$). While the small sample size limits clinical correlations, our findings aid in estimating effect sizes for future studies. Integration of MEG data promises to further explore the interactions between VTA and the cortex.

24. Kirsten Rittershofer - School of Psychological Sciences

POSTER TITLE
Time-resolved EEG decoding of perceptual surprise

AUTHORS
Rittershofer K, Kok P, Press C

ABSTRACT
From noisy input, our brains must construct perceptual experiences that accurately reflect the state of the world and tell us what we did not already know. It is widely thought that prior expectations play an important role in achieving these goals. However, it is currently unclear how both veridicality and informativeness can be achieved as they require enhancement of opposite (expected vs. unexpected) inputs. The opposing process theory offers a potential solution, proposing that perceptual processing is initially biased towards what we expect with subsequent reactive enhancement only of particularly surprising events. Here, we tested this account using time-resolved decoding of electroencephalography (EEG) data. Participants learned relationships between actions and visual shapes, which were degraded in an EEG session the following day such that the shapes varied in their level of expectedness (72%-4% range). Behaviourally, accuracy decreases and reaction times increase in response to the shapes as they become more unexpected. The EEG decoding profiles peak around 150 ms post-stimulus regardless of expectedness level, but for the most surprising condition this peak is sustained for longer. We discuss how neural surprise enhancements, interestingly, in the absence of perceptual change, may inform model-updating and render our perception both veridical and informative.

25. Nick Simpson - UCL Division of Psychology and Language Sciences

POSTER TITLE
Similar perceptual repulsion effects for lifelong and recently learned expectations

AUTHORS
Simpson N, Mazor M, Rittershofer K, Ward E, Press C

ABSTRACT
Perception is typically biased towards what we expect, consistent with Bayesian accounts of veridical perception in a noisy sensory world. However, opposite, repulsive effects of expectation on perception have also been reported. For example, Phan, Harris and Kim (2022) found that perception of vertically accelerating objects is negatively biased by gravitational expectations, whereby objects are perceived as less accelerating when moving downward, compared to upward. Here we asked whether this repulsive perceptual effect was due to gravitational priors being acquired early in life and remaining relatively fixed, unlike arbitrary learned expectations in typical studies of perceptual expectation effects, which more commonly give rise to attraction effects. In a pre-registered design (N=100), we replicated the vertical gravitational repulsion effect observed by Phan et al. Critically, we additionally found a repulsive bias in the gravitationally neutral horizontal plane by inducing expectations to see objects accelerating more often in one direction and decelerating more often in the other. This bias was driven by expectations learned in a 20-minute online study, rather than by lifelong expectations of gravitational forces. We conclude that both recently learnt and

stable, lifelong expectations can generate perceptual repulsion effects, and discuss potential accounts of attraction and repulsion expectation biases.

26. Ella Svahn - UCL Research Department of Neuroscience, Physiology and Pharmacology

POSTER TITLE
Ventral hippocampal acetylcholine integrates past outcomes to guide flexible decision making

AUTHORS
Svahn E, Akrami A, MacAskill A

ABSTRACT
Making optimal decisions in a noisy and ever-changing world is difficult. To do this, we must continuously track the uncertain outcomes of our actions across various timescales. This allows identification of the world's underlying regularities, guiding behavior. But how neural circuits support the integration of experience is poorly understood. Neuromodulators are ideal candidates for such integration as they signal over multiple timescales: milliseconds to seconds. Specifically, acetylcholine is suggested to be involved in both working & episodic memory and uncertainty tracking, but its mechanism of action is unknown.

To test this, we trained mice in a probabilistic reversal learning task where mice had to integrate past outcomes over tens of seconds across different experimentally controlled uncertainties. We found that performance in this task was dramatically impaired by pharmacological inhibition of cholinergic signaling; specifically reducing switching probability post omissions. When recording acetylcholine release into ventral hippocampus - a key area for flexible learning - acetylcholine levels were scaled by negative outcome history (10+ s back). It also correlated with the animal's confidence in the current best choice, indicating a potential role in state encoding. Together, this suggests a key role for hippocampal acetylcholine in shaping flexible behaviour over long timescales.

27. Oliver Vikbladh - UCL Institute of Cognitive Neuroscience

POSTER TITLE
Consolidation of Sequential Planning

AUTHORS
Vikbladh O, Russek E, Burgess N

ABSTRACT
It is commonly held that model-based planning is achieved by rollouts through a transition model, implemented through sequential dynamics in the hippocampus. Little direct evidence supports this notion, in part due to the lack of highly powered behavioural paradigms that can measure model-based planning, independently from other flexible strategies for action evaluation like the successor representation. Furthermore, while model-based planning needs the hippocampus, rodent work shows that the critical role of the hippocampus may be transient, and that transition-models may be consolidated to the neocortex over time, consistent with systems consolidation theory. Here, we used MEG to measure sequential representational dynamics while people performed a task capable of accurately measuring

model-based planning using rollouts, both immediately after learning, and one week later. People that made use of model-based rollouts showed MEG signatures of sequential dynamics through the transition model, focused in the hippocampus. Consistent with systems consolidation theory also we show that on day 7, following consolidation, the sequential dynamics are increasingly found in the prefrontal cortex.

28. Emma Ward - Experimental Psychology

POSTER TITLE
Surprise impairs perception of surprising and incidental events

AUTHORS
Ward EK, Press C

ABSTRACT
When environmental regularities change, new observations should be weighted more highly than old observations, to allow model updating in a changing world. Changes in environmental regularities influence learning rates, but it is unclear how these changes influence perception of the stimuli themselves. A recent theory suggests that surprising observations trigger a reactive noradrenaline release, increasing sensory gain. This would mean that environmental changes elicit a perceptual boost, facilitating updating. To test this account, we asked whether detection of surprising events themselves, and other events, improves after a surprising observation. Participants in four online experiments (N=1172) saw stimuli presented peripherally and at fixation and were tasked with detecting features of those events. Peripheral stimulus location was drawn from a truncated normal distribution, the mean of which changed once without warning during the task. We modelled surprise to ask whether the surprising distribution shift led to higher hitrates. The modelling showed instead consistently lower hitrates on trials with higher modelled surprise. This was observed for the peripheral stimuli, which were themselves surprising, and for other stimuli in the environment. This finding suggests that surprising observations do not automatically increase sensory gain, and suggests instead that attentional resources are allocated to previously-informative features.

Developmental Neuroscience | Elvin Hall

29. Arta Aghaeipour - Department of Neurodegenerative Diseases

POSTER TITLE
Localization of Dystrophin isoforms in the mouse brain: insights into neuropsychiatric comorbidities in Duchenne muscular dystrophy

AUTHORS
Aghaeipour A, Tetorou K, Gileadi TE, Morgan JE, Montanaro F, Muntoni F

ABSTRACT
Duchenne muscular dystrophy (DMD) is characterised by mutations in the DMD gene encoding for dystrophin protein. This disorder displays muscle degeneration, respiratory/cardiac issues, and a higher prevalence of intellectual disabilities, ADHD, anxiety, and autism compared to the general population. DMD's diverse manifestations are influenced by seven alternative promoters, two polyA addition sites and multiple alternative splicing which results in several dystrophin isoforms with different expression patterns and putative roles. Mutations affecting full-length isoforms (Dp427) correlate with emotional and behavioural complications, while those affecting shorter isoforms also associate with intellectual disabilities. DMD Mouse models like mdx5cv and mdx52 mirror heightened fear response and anxiety behaviours. We propose that understanding the expression patterns of dystrophin isoforms is crucial for elucidating the neurological manifestations of DMD and drug discovery. Investigating dystrophin isoform localisation in mouse brains via capillary western blot, qPCR, and BaseScope techniques, we found Dp427c prevalent in the cortex, while Dp427p1 and Dp427p2 dominate the cerebellum. Mdx52 and mdx5cv mice exhibit reduced Dp427 levels and lack Dp427 protein. Moreover, Dp71 emerges as the predominant brain isoform. These findings uncover molecular insights into DMD's neuropsychiatric aspects, guiding potential therapeutic targets.

30. Jonathan Ashmore - UCL Research Department of Neuroscience, Physiology and Pharmacology

POSTER TITLE
How to hear at high frequencies: what’s the tectorial membrane got to do with it?

AUTHORS
Ashmore JF

ABSTRACT
Cochlear mechanics has long been concerned with the question of how outer hair cells (OHCs) contribute to hearing sensitivity. One problem is that voltage dependent OHC “electromotility” seems to be limited to work only below about 10 kHz, irrespective of any membrane potential filtering. This concern has been re-emphasised by both in vitro and in vivo reports. Further, many theoretical discussions are complicated by non-linearities of the cochlear components at sound levels accessed experimentally, and by the interactions with the fluid mechanics of the cochlear duct.
I have been using a simple model with two features of cochlear structure that often are ignored in the literature. First, that the OHC length, over a wide variety of species, varies linearly only with tonotopic position along the cochlea (specifically with log10(CF)). Second, the overlying tectorial membrane is angled more steeply onto the reticular lamina at the higher frequencies. This implies that the TM should be considered as exerting axial forces on the OHC population. This generates currents even at high acoustic frequencies.

An outcome of such a treatment is that experimentally determined OHC parameters appear in aggregated groups and include the contribution of short OHCs at the cochlear base.

31. Juliette Champaud - UCL Research Department of Neuroscience, Physiology and Pharmacology

POSTER TITLE
The relationship between GABA concentration and spectral oscillatory dynamics in the neonatal brain

AUTHORS
Champaud J, Thomson A, Willers Moore J, Tomazinho I, Bonse B, Colford K, Adibpour P, Fabrizi L, Puts N, Arichi T

ABSTRACT
In adults, inhibitory GABAergic neurotransmission modulates neuronal oscillatory activity. Specifically, GABA levels positively correlate with the power of beta and gamma cortical oscillations. In neonates, GABA is not necessarily inhibitory due to a potential switch in GABA function from depolarising to hyperpolarising. Therefore, it is unclear whether the neonatal GABAergic system exerts the same regulation on neuronal oscillations. We aimed to explore the relationship between resting-state MRS-measured occipital GABA levels and EEG spectral power in ten healthy term-born neonates (37.28 - 43.29 weeks postmenstrual age). GABA concentrations positively correlated with both beta and low gamma power (rho = 0.90, $p < 0.05$), indicating a potential regulatory role of GABA in neonatal brain oscillations similar to the adult brain. However, given the immature state of the neonatal GABAergic system, the underlying mechanisms of this association may diverge and warrant further investigation.

32. Javier de Andrés - UCL Ear Institute

POSTER TITLE
The role of Tcf/Lef transcription factors in the formation of inner ear sensory organs

AUTHORS
de Andres J, Terry S, Gale J, Daudet N, Zak M

ABSTRACT
The inner ear is composed of several sensory organs responsible for the detection of sound, head position and acceleration. During embryonic development, these organs originate from neurosensory-competent domains within the otocyst, but the molecular signals controlling their formation remain unclear. The transcription factor Sox2 is required for neurosensory specification, since its absence abolishes the differentiation of sensory organs and their associated neurons. Sox2 is initially present throughout the otocyst, then it becomes restricted to its ventro-medial aspect. Our recent work suggests that this restriction is regulated by a dorso-ventral gradient of (high to low) canonical Wnt activity. To find out which effectors of the Wnt signalling pathway are implicated in this process, we analysed the expression and function of the four members of the Tcf/Lef family of transcription factors in the chicken otocyst. By performing a quantitative RNA-scope study, we found that Lef1, Tcf7, Tcf7l1 and Tcf7l2 exhibit distinct expression patterns in the embryonic chicken inner ear, suggesting that they participate in different elements of Wnt signalling during otic development. Using gene overexpression and Crispr/Cas9 mediated knock-down, we are

now assessing the role of each Tcf/Lef transcription factor in early otocyst morphogenesis and neurosensory specification.

33. Xhuljana Durmishi - UCL Institute of Ophthalmology

POSTER TITLE
HepaCAM regulates Müller Glia morphological complexity in the developing zebrafish retina.

AUTHORS
Durmishi X, MacDonald R

ABSTRACT
The correct positioning of glial cells and their contacts with neuronal synapses are crucial for retinal functioning during development.
Müller Glial (MG) cells are responsible for supporting all retinal neurons thanks to their elaborate morphology, but the mechanisms regulating their morphogenesis and interactions with neurons are not completely understood.
In this study, we assessed whether the hepatic and glial cell adhesion molecule (HepaCAM), known to regulate astrocyte morphological complexity in the brain, plays a role in the retina. Our experiments showed that HepaCAM is expressed in MG cells during retinal development, but its expression is lost when MG cells are removed via pharmacological treatment. Mutant zebrafish for the two hepaCAM paralogues, generated via CRISPR-Cas9, show a simpler MG morphology in the synapse-dense region called the inner plexiform layer (IPL), along with a reduction in the number of synaptic puncta contacted by MG; however, mutants' neuronal and synapse numbers are unaffected, suggesting a glial-specific defect. Conversely, overexpression of Hepacam in MG cells disrupted glial patterning. Our research has shown that HepaCAM is necessary for establishing proper MG cell tiling and IPL domain complexity. Future experiments will address whether loss of HepaCAM affects neuronal maintenance and function in the mature zebrafish retina.

34. Deborah Hofmeyr - Faculty of Education and Society

POSTER TITLE
Using fNIRS to understand the interplay between SES, language and executive function: a toddler intervention study

AUTHORS
Hofmeyr D

ABSTRACT
Variations in socioeconomic status (SES) associate with differences in educational achievement, with children from low SES families often faring worse in school than their better-off peers. SES also varies with language and executive function (EF) abilities. These associations have been observed behaviourally and neuro-cognitively, with some studies showing that differences in language and EF have mediated the relationship between SES and school achievement.
Developmentally, language undergoes a sensitive period between 0-3 years, after which any new skills will be dependent on the foundation that was laid during that time. Importantly, there is evidence that SES may impact language abilities during this sensitive period. EFs also undergo swift development during this time frame with continued maturation through adolescence. Recent research suggests language skills established before age 3 may provide support for later developing EF skills.

Given the above, this research focuses on the following hypothesis: an intervention that targets the language skills of toddlers below the age of 3 from lower SES households may improve their language and EF skills, and thus school readiness. It will use a combination of fNIRS data, behavioural findings and parent reports to ascertain developmental insights at three time points between the ages of 12-30 months.

35. Jiabo Lan - School of Pharmacy

POSTER TITLE
Promoting peripheral nerve regeneration by inhibiting Phosphodiesterase (PDE) 4.

AUTHORS
Lan J, Rayner MLD

ABSTRACT
Phosphodiesterase 4 (PDE4) inhibitors, recognized for their potent anti-inflammatory and neuroregenerative properties, play a pivotal role in modulating cyclic adenosine monophosphate (cAMP) levels, thereby influencing inflammatory pathways and neuronal functions. Despite the therapeutic potential of non-selective PDE4 inhibitors in enhancing neuroplasticity and promoting myelin regeneration within the central nervous system, their clinical utility has been constrained by the emergence of emetic side effects, such as nausea and vomiting. This challenge has led to the exploration of selective PDE4 isoform inhibitors, which aim to mitigate these adverse effects while retaining the therapeutic benefits. Our study extends the investigation of PDE4 inhibitors to the peripheral nervous system, specifically examining their impact on peripheral nerve regeneration and promoting neural cells towards a pro-regenerative phenotype in vitro. Employing a panel of PDE4 inhibitors, both selective and non-selective, and screening these within monolayer and 3D engineered neural tissues designed to mimic key features of the peripheral nerve environment post-injury, we demonstrate that these inhibitors upregulate cAMP levels, promote neurite regeneration, and influence Schwann cell phenotype. Collectively, these results contribute to the development of PDE4 inhibition-based therapies for regenerative medicine, offering promising avenues for the treatment of peripheral nerve injuries and neurodegenerative diseases.

36. Konstantina Tetorou - UCL Great Ormond Street Institute of Child Health

POSTER TITLE
Interactome analysis of dystrophin isoforms in the mouse brain

AUTHORS
Tetorou K, Aghaeipour A, Gileadi TE, Perdomo Quinteiro P, Zhang L, Spitali P, Morgan JE, Montanaro F, Muntoni F

ABSTRACT
Duchenne muscular dystrophy (DMD) results from mutations in the DMD gene, disrupting dystrophin protein production and leading to muscle weakness, respiratory, and cardiac issues. Dystrophin is also present in the brain and DMD patients often experience intellectual disability and neurobehavioral complications like autism spectrum disorder (ASD), ADHD, and anxiety. Different dystrophin isoforms are produced due to alternative promoters and splicing, impacting brain comorbidities based on mutation location. DMD mouse models lacking specific dystrophin isoforms exhibit altered behaviour, suggesting a link between dystrophin and brain function. This study aims to identify dystrophin protein interactors in the

mouse brain to understand DMD-related brain comorbidities. In this study, mdx5cv mice lacking Dp427, mdx52 mice lacking both Dp427 and Dp140 and DMD-null mice lacking Dp427, Dp140 and Dp71 were used. Different brain regions were used for immunoprecipitation followed by mass spectrometry analysis to identify dystrophin's protein interactors in the brain. The proteins were further validated with immunohistochemistry and western blot.
Various proteins involved in ion channels, synaptic transmission, neurodegeneration were found to interact differently with dystrophin isoforms across brain regions. This study provides insights into dystrophin's role in the molecular networks underlying emotional and cognitive comorbidities in DMD, offering potential targets for therapeutic intervention.

37. Konstantina Tetorou - UCL Great Ormond Street Institute of Child Health

POSTER TITLE
Brain involvement in Duchenne muscular dystrophy

AUTHORS
Tetorou K, Aghaeipour A, Gileadi TE, Perdomo Quinteiro P, Saoudi A, Ceschi L, Zarrouki F, Mitsogiannis M, Zhang L, Spitali P, Aoki Y, Morgan JE, Montanaro F, Vaillend C, Goyenvalle A, Muntoni F

ABSTRACT
Duchenne muscular dystrophy (DMD) is a severe X-linked, neuromuscular disorder, characterised by nonfunctional dystrophin protein. DMD patients exhibit progressive muscle weakness and over half of DMD patients experience intellectual disability and/or neurobehavioural complications, as autism spectrum disorder, attention deficit hyperactivity disorder, and anxiety, altogether linked to deficiency of different isoforms in the brain. DMD mouse models that carry a mutation affecting Dp427 dystrophin isoforms, display an enhanced fear response, increased anxiety- and depressive-like behaviours. As part of BIND consortium, we aimed to elucidate:i) the localisation of dystrophin in the mouse and human brain and its protein interactors, ii) effects of dystrophin's deficiency on behaviour of DMD mouse models and iii) the impact that postnatal restoration of dystrophin expression has on behavioural features in different DMD mouse models using exon skipping technologies.
Our results revealed that different dystrophin's protein interactors are related to brain comorbidities and mdx52 mice lacking Dp427, Dp140 dystrophin isoforms display enhanced anxiety and a severe impairment in learning, features present in DMD patients. Simultaneously, exon skipping strategies ameliorated the behavioural comorbidities while restoring partially dystrophin. This is the first study depicting different aspects of brain involvement on DMD, revealing molecular networks, behavioural outcomes and potential therapeutic approaches.

Disorders of the Nervous System | Elvin Hall

38. Alaa Alhamdi - Department of Pharmacology

POSTER TITLE
Targeting peroxisome proliferator-activated receptor gamma receptor (PPAR-γ) as a therapeutic target to enhance neurite outgrowth in a 3D Co-Culture Model

AUTHORS
Alhamdi A, Phillips J, Rayner M

ABSTRACT
Clinical outcomes after peripheral nerve injuries (PNI) are often far from satisfactory despite the potential regeneration capacity of the peripheral nervous system and the utilization of gold-standard surgical treatment methods. Currently, no pharmacological therapy is given in the clinic to promote nerve regeneration following PNI. Thus, a robust drug treatment has the potential to accelerate nerve regeneration. Research using in vitro and in vivo models suggests that peroxisome proliferator-activated receptor gamma (PPAR-γ) could be a therapeutic target for PNI. Non-steroidal anti-inflammatory drugs (NSAIDs), a drug class with anti-inflammatory and analgesic properties, including ibuprofen, sulindac sulfide, and diclofenac, have been found to activate PPAR-γ. The effect of the PPAR-γ agonists on neurite outgrowth was analysed using 3D co-culture model consisting of SH-SY5Y human neuroblastoma cells seeded on top of a collagen gel embedded with SCL 4.1/F7 Schwann cells. Among the tested PPAR-γ agonists, ibuprofen showed the greatest effect on neurite outgrowth. However, this effect was diminished when GW9662, an irreversible PPAR-γ antagonist, was combined with an optimal dose of ibuprofen and sulindac sulfide. In summary, these findings suggest that targeting PPAR-γ significantly increases neurite outgrowth in SH-SY5Y cells, suggesting that it could serve as a therapeutic target for improving nerve regeneration.

39. Reem Alkharji - UCL Developmental Biology and Cancer

POSTER TITLE
Dystrophin mutations affect human neuron and astrocyte behaviour

AUTHORS
Reem A, Jenny L, Francesco M, Patrizia F

ABSTRACT
Duchenne Muscular dystrophy (DMD), a severe neuromuscular disease resulting in irreversible muscle degeneration, is caused by mutations in the dystrophin gene (DMD), which has 79 exons and multiple promoters regulating the expression of different isoforms. Over one-third of DMD patients exhibit cognitive and behavioural impairment. However, why mutations in the DMD gene cause these deficits are not yet well understood. Here, we tested the hypothesis that normal neural development is affected in the absence of functional DMD, and specifically assessed neuronal differentiation and glial function in neural cells derived from DMD patients' induced pluripotent stem cells (IPSCs) and healthy controls. No dystrophin isoform is detected in DMD68 cells, whereas DMD52 cells maintain expression of the shorter isoforms, Dp71 and Dp40. First, we assessed dystrophin isoform expression upon IPSC differentiation to neurones and glia, focusing on astrocytes by RT-qPCR and

immunostaining. This indicated the regulation of dystrophin isoforms with the progression of differentiation along different cell types. Importantly, we observed reduced neuronal differentiation in both DMD lines compared to healthy ones, as indicated by reduced expressions of neuronal markers such as β-3 Tubulin, neurofilaments and synaptophysin. In addition, DMD astrocytes showed abnormal activated phenotype. RNA-seq revealed significant differences in gene expression between DMD and healthy astrocytes, as validated by RT-qPCR, western blotting and immunostaining. Differentially regulated genes/proteins included EAAT1, glutamine synthetase, S100B, and NF-KappaB. Dysregulation of metabolic pathways in DMD astrocytes was consistent with abnormalities in their response to noxious stimuli. Finally, both transcriptomic data and Ca++ imaging analysis upon KCl stimulation demonstrated dysregulation of Ca++ signalling pathways in both DMD52 and DMD68 astrocytes, suggesting that regulation of this pathway requires expression of DMD long isoforms. Together, this study indicates that dystrophin isoform expression is regulated with differentiation and suggests a role for dystrophin in neuronal differentiation and astrocyte function.

40. Ellen Appleby - Department of Pharmacology

POSTER TITLE
The effect of calcium channel antagonism in SSRI discontinuation: an immunohistochemical investigation in mice.

AUTHORS
Appleby E, Collins H, Gullino L, Sharp T

ABSTRACT
Cessation of selective serotonin reuptake inhibitor (SSRI) treatment often precipitates a disabling discontinuation syndrome which is not well understood. A recent study showed that the L-type voltage gated calcium channel (VGCC) antagonist nimodipine attenuates the anxiogenic effect of SSRI discontinuation in mice. We investigated whether nimodipine also reduced the discontinuation-evoked increase in the activity-dependent marker c-Fos in anxiety-related brain regions. A secondary aim was to validate an automated cell counting technique for immunohistochemical image analysis.

Experiments were based on a four-arm design comprising saline, continuous SSRI, discontinued SSRI and discontinued SSRI with nimodipine treatment. Drug-naïve mice were used to investigate the effect of nimodipine alone on c-Fos.

In drug-naïve mice, nimodipine had no effect on ventral hippocampus nor dorsal raphe nucleus (DRN) c-Fos expression. In SSRI-discontinued mice, nimodipine reduced ventral hippocampus c-Fos but had no effect on DRN c-Fos nor DRN c-Fos expressing serotonergic neurons. Manual and automated cell counting techniques yielded concordant results.

The data suggests that L-type VGCC antagonism can reduce ventral hippocampus c-Fos expression in a mouse model of SSRI discontinuation and advocates further investigation of L-type VGCC antagonists in discontinuation management. The data also validates automated cell counting as a time-efficient method for immunohistochemical image analysis.

41. Emily Atkinson - Department of Pharmacology

POSTER TITLE
An immunomodulatory encapsulation system for the delivery of human iPSC-derived dopaminergic neuron progenitors in Parkinson's disease

AUTHORS
Atkinson EA, Evans RE, Carter L, Gregory HN, Roberton VH, Dickman R, Phillips JB

ABSTRACT
Parkinson's Disease is a neurodegenerative disorder with an irreversible loss of dopaminergic neurons in the brain. Cell therapy is a promising treatment whereby healthy dopamine-producing cells are transplanted into patient's brains to replace degenerated ones. We have robust protocols to differentiate stem cells into dopaminergic neurons, however, many cells die post-transplantation, partly due to the immune response. Previously, we developed an alginate-based immunomodulatory therapeutic cell encapsulation system containing poly(ε-caprolactone)-tacrolimus particles to deliver local immunosuppression. Using SH-SY5Y cells, we demonstrated the viability of this technology and here, we demonstrate its potential with clinically relevant cells.

Human induced pluripotent stem cells were differentiated into dopaminergic neuron progenitors over 16 days. Cells were characterised using phase contrast microscopy and immunostained for pluripotency and neuronal markers. Cells were then encapsulated in the alginate immunomodulatory system and co-cultured with T cells for 5 days in vitro. The encapsulation system modulated the T cell response with a 69% reduction in the number of T cells/well compared to an unencapsulated cell control. There was also a 62% increase in dopaminergic neuron progenitor survival in the encapsulated condition, compared to the control. In conclusion, we successfully modulated the immune response and increased therapeutic cell survival with our technology.

42. Melanie Bonyadi - UCL Institute of Healthy Ageing

POSTER TITLE
Investigating the effects of lipid manipulations in a Gba1b knockout Drosophila model

AUTHORS
Bonyadi M, Hull A, Kinghorn K

ABSTRACT
The GBA1 gene encodes the lysosomal enzyme glucocerebrosidase, which is required for the hydrolysis of glucosylceramide to ceramide and glucose. Bi-allelic GBA1 mutations cause the lysosomal storage disorder Gaucher disease (GD), while heterozygous mutations are associated with an increased risk in developing Parkinson's disease. Here, we investigate how manipulating the lipid and sphingolipid synthesis pathways affects the health of a GBA1 knockout Drosophila model (Gba1b-/-), including on lipid storage, lifespan and locomotor ability. We demonstrate that overexpression of fatty acid synthesis and transport genes, Fasn1 and Fatp1, in the fat body of Gba1b-/- flies decreases stored triacylglycerol levels. Fasn1 overexpression in brain glia of Gba1b-/- flies results in decreased overall activity and increased sleep, with no significant effect on lifespan. Fatp1 overexpression in brain glia results in increased activity and sleep and shows a decrease in lifespan compared to other

Gba1b-/- mutant lines. Furthermore, knockdown of the ceramide synthesis genes, Schlank and GlcT, in the fat body has no significant effect on lipid storage in Gba1b-/- flies. Overall, our data demonstrate that increasing the amount of available lipids does not increase lipid storage in GD flies, suggesting a possible shift towards glucosylceramide production, which is detrimental in GBA1 deficiency.

43. Audrey Crystalia - Division of Biosciences

POSTER TITLE
Uncovering Wnt antagonist Dkk3 role in synaptic loss in Alzheimer's Disease

AUTHORS
Martin-Flores N, Podpolny M, Crystalia AA, McLeod F, Escott-Price V, Salinas PC

ABSTRACT
Alzheimer's Disease (AD) is characterised by cognitive decline which is associated with the loss of synapses. Recent studies have suggested that disruption of Wnt signalling contributes to this phenomenon. Dkk3, an endogenous antagonist of Wnts, is elevated in the brain of AD patients. However, little is known about the impact of Dkk3 on synapses loss in AD. In this study, we investigated the effect of Dkk3 on synapse loss in AD.

Our results showed that Dkk3 levels are increased in the hippocampus of AD patients as well as in the J20 and NLGF AD mouse models. Exposure of acute brain slices to Dkk3 decreases excitatory but increases inhibitory synapses in the hippocampus. To demonstrate the contribution of Dkk3 to synaptic changes, we performed in vivo loss-of-function experiments. KD of Dkk3 in the brain of an AD mouse model (J20) reverses the synaptic changes and restores memory. However, the mechanisms that contribute to Dkk3-mediated synapse changes are poorly understood.

As astrocyte and microglia are highly involved in synapse modulation in AD, we are investigating the effect of Dkk3 on these cell types in the context of synapses integrity. This study will uncover novel pathways that could be target for AD therapy.

44. Ahmad Danial - UCL Department of Medicine

POSTER TITLE
The 100 Most Influential Papers on Lewy Body Dementias: A Bibliometric Analysis

AUTHORS
Danial A, Nadeem ZA, Imran Z, Nusrat B, Jawed S, Siddiqui A, Shaikh UH, Rao R, Jamil A

ABSTRACT
Introduction
Lewy body dementias pose a challenge in the realm of neurodegenerative diseases. We aim to uncover the most cited articles and authors in the field, and to analyze the citations for disparities.

Methods
Two authors extracted the relevant articles from Scopus and ranked them according to the number of citations. Separate lists were prepared for the top 100 original articles and the top 15 review articles.

Results
The 100 original studies were published from 1980 to 2019, with the greatest number published in the year 2000. The total citations ranged from 350 to 2640, with a median of 494.5. These articles originated from 17 countries, with major contributions from the USA (n = 31) and the UK (n = 14). While most of the first authors were men (n = 67), the citations per year were higher where the first authors were women. The greatest number of articles were published in Neurology (n = 12) and Brain (n = 11).

Conclusion
Our results provide insights into the research trends and provide a list of the most influential papers on lewy body dementias. Resolving the observed disparities and promoting contribution from people all over the world is necessary to accelerate advancement in the field.

45. Perlina Desai - UK Dementia Research Institute at UCL

POSTER TITLE
Using proximity labelling to investigate astrocytic protein profile changes in response to amyloid pathology in a mammalian model of Alzheimer's disease

AUTHORS
Desai P, Arancibia L, de Strooper B

ABSTRACT
Astrocytes are a numerous and diverse glial subtype specialised to carry out distinct roles involving maintaining homeostasis and effective nervous system functioning. To do so, they respond to and secrete various proteins. Astrocytes have been linked to Alzheimer’s disease (AD), where they seem to become reactive and contribute to neuroinflammation, for example, through secreting inflammatory mediators. Currently, there remains a limited understanding of global astrocytic membrane and extracellular protein profiles and potential AD-associated changes. Here, we aimed to address this using a proximity labelling-based approach, specifically using an ER-retained TurboID viral construct under a GFAP promoter in order to study astrocyte-specific proteins trafficked through the classical secretory pathway in an AD mouse model. We have characterised the construct and are investigating protein changes between AD and controls over time in response to amyloid pathology. Such protein changes are being validated using mammalian biofluids such as CSF and plasma. This work enables a better understanding of astrocyte-specific protein changes with disease progression in a mammalian AD model. An enhanced understanding of this will not only provide insight into astrocyte biology more generally, but may ultimately be vital for identification of novel biomarkers and therapeutic targets for detecting and treating AD.

46. Karl Frontzek - UCL Queen Square Institute of Neurology

POSTER TITLE
Splicing Dysregulation In Parkinson's Disease Pathogenesis

AUTHORS
Kunasingam K, Frontzek K

ABSTRACT
Genetic sequencing efforts of humans and animal models of Parkinson’s disease (PD) have provided biological context for understanding molecular pathways that are disrupted in pathophysiology. Across multiple levels of transcriptomic organisation, local splicing regulation plays an important role in a variety of neurodegenerative diseases, however, no comprehensive profiling in PD exists. We provide a complementation to large-scale transcriptome analyses by reporting local splicing events across neural and extra-neural tissues as well as humans and mice affected by idiopathic or genetic PD. Our efforts reveal disease-specific markers and shared co-expression modules across disease subtypes. Finally, our resource informs molecular pathways involved in PD and will serve as a blueprint for mechanistic understanding of candidate risk genes.

47. Amruth Gadey - UCL Queen Square Institute of Neurology

POSTER TITLE
Resting state gamma-band power in schizophrenia

AUTHORS
Gadey AS

ABSTRACT
Introduction:
Excitatory and inhibitory balance is crucial for efficient information transfer. A shift towards increased excitation could underlie the pathophysiology of schizophrenia.

Hypothesis:
Uhlhaas et.al (https://doi.org/10.7554/eLife.37799) demonstrated that as schizophrenia advances through different stages of illness, there may be alterations in the E/I balance, which can be observed by variations in the resting gamma-band oscillations. We hypothesize that Dynamic Causal Modelling on this data will provide insights into neural dynamics underlying those results.

Methods:
They compared resting-state MEG data collected from a clinical high-risk group, first-episode psychosis patients, and chronic schizophrenia patients with two control groups.
Our objective is to reproduce their results and subsequently assess their validity using DCM.

Results:
The CHR group saw a rise in high gamma-band power (64-90 Hz). The FEP group has a decrease in both High and Low Gamma-band power (30-46 Hz) in the prefrontal region, while an increase in the occipital region. The ScZ group has a widespread decrease in both

high and low gamma-band power. Currently, we are conducting DCM to comprehend these alterations.

Conclusion:
Initial upregulation of Gamma-Band oscillations may result from circuit dysfunction; subsequent downregulation may be attributed to factors such as accelerated ageing.

48. Amy Geard - Department of Pharmacology

POSTER TITLE
AAV9-Mediated Gene Therapy In A Knock-In Mouse Model Of Infantile Neuroaxonal Dystrophy

AUTHORS
Geard AF, Whaler S, Liu W, Massaro G, Hughes MP, Nelvagal H, Poupon-Bejuit L, Albutt J, Lalji K, Waddington SN, Kurian MA, Rahim AA

ABSTRACT
Introduction: Infantile neuroaxonal dystrophy (INAD) is a rare and lethal paediatric neurodegenerative disease. It is caused by biallelic mutations in the PLA2G6 gene, which codes for the enzyme calcium-independent phospholipase A2. Patients present with progressive neurological symptoms with mortality typically occurring by 10 years old. No disease modifying treatments are available.

Methods: We investigated the therapeutic potential of an AAV9.hPLA2G6 vector administered intracerebroventricularly to neonatal and juvenile pla2g6-inad mice. We investigated survival, behavioural parameters, and histological analysis to assess therapeutic efficacy.

Results: The average lifespan of the model is reduced to approximately 14 weeks, with weight loss and behavioural decline from 9 weeks old. A long term-study over 30 weeks demonstrated that neonatally administered AAV9.hPLA2G6 gene therapy resulted in a significant improvement in all parameters measured including survival, weight and locomotor function, and neuronal counts in both the brain and spinal cord. Adult administrations to symptomatic mice have thus far shown increased survival of 21 weeks on average and improved behavioural function.

Conclusion: This study provides novel insights into INAD disease pathology and suggests an AAV9-based therapy has potential to enable effective treatment of INAD. Further clinical translation studies are being undertaken with our industrial partner, Bloomsbury Genetic Therapies Ltd.

49. Hanna Hakansson - UCL Research Department of Neuroscience, Physiology and Pharmacology

POSTER TITLE
Investigating the link between mitochondrial dysfunction and the integrated stress response in Parkinson’s disease pathology

AUTHORS
Hakansson H, Kittler JT

ABSTRACT
Mitochondrial dysfunction is strongly implicated in the pathology of neurodegenerative diseases, including Parkinson's disease (PD). While genetic and post-mortem brain studies highlight several compromised mitochondrial pathways in PD, the precise mechanisms linking mitochondrial damage to neurodegeneration remain unclear. Recent investigations suggest the integrated stress response (ISR) as a key player in this process. The ISR, which can be activated by mitochondrial stress, triggers a cascade of cellular events to promote cell recovery and survival. However, chronic or acute stress can lead to hyperactivation of the ISR, culminating in cell death and potentially contributing to neurodegeneration. Given the convergence of impaired mitochondrial function and ISR hyperactivation in PD brains, it is essential to understand the crosstalk between these two pathways. We examined the effect of PD-related mitochondrial dysfunction on ISR activation using the PINK1 knock-out (KO) mice, as mutations affecting PINK1 are linked to familial PD and its essential role in mitochondrial quality control. Our findings reveal no ISR in the brains of PINK1 KO mice; however, primary neuronal cultures of these mice show increased susceptibility to ISR induction in response to additional mitochondrial stress. These results provide new insights into the link between mitochondrial dysfunction and ISR activation in PD.

50. Meriç Başak Lenk - The UCL Division of Psychiatry

POSTER TITLE
Disentangling delirium: a genome-wide association study and meta-analysis on delirium tremens

AUTHORS
Lenk MB, Fuchs S, Bass N, McQuillin A

ABSTRACT
Delirium, a severe neuropsychiatric syndrome marked by disorientation, memory deficits and perceptual disturbances is prevalent in healthcare settings, affecting various patient groups. It carries high morbidity, mortality, and economic burden. The underlying mechanisms of delirium remain unclear, leading to ineffective treatments. Genetics can offer valuable insights, yet there is limited genetic research on delirium. Our study aims to uncover genetic factors, focusing on delirium tremens (DT), delirium seen at alcohol withdrawal. We employ an inductive approach, starting with DT to broaden understanding across different delirium types to overcome the heterogeneity of delirium. We conducted a genome-wide association study (GWAS) comparing DT patients' genomes to alcohol use disorder patients without DT across three datasets (~750,000 samples), followed by meta-analysis and post-GWAS analysis. In the initial analysis, no genome-wide significant associations were found in the individual GWAS or meta-analyses performed. Nonetheless, there were several associations at the suggestive level near genes of interest. While findings suggest no significant genetic association, this may stem from GWAS limitations, such as the requirement of a large sample size and consistent phenotype definition. Future research may address these challenges and employ complementary methods like fine mapping and integration of multi-omics to enhance power and precision.

51. Alessandro Marinelli - Department of Neuroinflammation, UCL

POSTER TITLE
Preliminary investigation of excitation/inhibition balance in visual snow syndrome

AUTHORS
Marinelli A, Monteverdi A, Jolly A, Pontillo G, Foster M, Yiannakas M, Stutter J, Palesi F, D'Angelo E, Toosy A, Wong S, Gandini Wheeler-Kingshott CAM

ABSTRACT
Introduction: Visual snow syndrome (VSS) is characterised as the persistent presence of flickering tiny dots in continuous motion throughout the entire visual field and is associated with structural (Strik et al., 2022) and functional connectivity abnormalities predominantly in the visual network (VN). It is therefore theorised that structural network alterations in VSS lead to excitation-inhibition (E/I) imbalance. We utilise The Virtual Brain (TVB) to investigate E/I balance in the VN, and determine (i) if significant differences in E/I are observed between VSS and healthy controls and (ii) whether E/I is related to symptomatology.
Methods: Three individuals with VSS (34.8 (7.7) years) and nine healthy controls (35.6 (9.1) years) underwent structural MRI inclusive of T1-weighted (T1w) and diffusion-weighted images (DWI) plus resting-state functional MRI (rs-fMRI) on a3T Philips Ingenia Cx. Individuals with VSS completed WHO-5 and CORE-10 questionnaires of VSS symptomatology and completed additional symptom severity and impact on daily life questionnaires. Probabilistic tractography using 30 million streamlines in MRtrix was performed and combined with a custom brain atlas to obtain two subject-specific structural connectivity (SC) matrices representing conduction strength - as normalized number of streamlines - and connection distance of white matter tracts in the VN. Rs-fMRI was pre-processed with fmriprep and the BOLD time-series for each region within the VN was extracted. TVB modelling using the Wong-Wang model was then applied to the individuals SC matrices to simulate functional connectivity (FC) in the VN. The model is iteratively optimized using four parameters that describe E/I balance (global coupling (G), inhibition (Ji), excitation (JNMDA) and recurrent excitation (W+). Two sample t-test using the four parameters from the best fitting TVB model are then used to compare between VSS and healthy controls. Multiple linear regression was then performed to investigate the association between E/I parameters and VSS symptomatology questionnaire scores.
Results: The analyses did not reveal any statistically significant results.
Discussion: This work demonstrates the feasibility of investigating the E/I balance in a cohort of VSS subjects. Ongoing analysis will increase the sample size and allow us to draw more meaningful conclusions on E/I balance in VSS.

52. Angela Misak - UCL Research Department of Neuroscience, Physiology and Pharmacology

POSTER TITLE
Behavioural characterisation of the AppNL-G-F knock-in mouse model of Alzheimer's disease in the presence and the absence of the human tau transgene

AUTHORS
Misak A, Katsouri L, O'Keefe J, Burton S

ABSTRACT
Alzheimer's disease (AD) is a neurodegenerative disorder that leads to progressive deterioration of memory and cognition. This study aimed to characterise the behavioural phenotype of the humanised AppNL-G-F mouse model of AD at six and twelve months of

age. Additionally, we investigated how the presence of human tau (hTau) in the Mapt knockout background altered behaviour at twelve months of age.
We hypothesised that AppNL-G-F mice would impair cognition and locomotion, worsening with age, and that the presence of hTau would exacerbate these impairments.
The animals underwent a battery of behavioural tests comprising Open field, Elevated plus-maze, Y-maze, Novel arm Y-maze, and Light/Dark box. Data analysis is ongoing, but available results indicate no differences in locomotion or spatial working memory. Furthermore, it appears that AppNL-G-F, hTau, and Mapt-/- genetic modifications alter anxiety-like behaviour differently depending on the context. For instance, anxiety was heightened by the absence of Mapt in the Light/Dark box, but lowered by the presence of AppNL-G-F in the Elevated plus-maze. Additionally, the absence of both Mapt and hTau lowered anxiety further in the Elevated plus-maze. In the Open field test, the presence of AppNL-G-F increased thigmotaxis.

53. Praveen Mummaneni - Department of Neurological Surgery

POSTER TITLE
Inflammatory brachial plexitis mimics postoperative iatrogenic neurological deficits

AUTHORS
Mummaneni PV, Ambati V, Madugala N, Jamieson A, Anderson N, Shah V, Poncelet A

ABSTRACT
Introduction: To improve recognition, we describe our experience of post-procedural brachial neuritis (incidence:1/1000), a potential cause of misrepresented neurosurgical malpractice cases.

Methods: Postprocedural brachial neuritis patients from a single quaternary care institution were analyzed.

Results: We identified 6 postprocedural brachial neuritis patients with mean age 63.7 (range 50-75) years. Procedures included 5 multilevel cervical spine surgeries (2 ACDFs, 2 posterior fusions with laminectomies, 1 disc arthroplasty) and 1 intrajugular CVC placement. Average time to symptom onset was 1 week post-procedure (range 1 day-2.5 weeks). Initial symptom was moderate-to-severe shoulder (5), arm (4), and/or neck (1) pain. Subsequently, all developed axillary/shoulder weakness; 3 distal arm/hand weakness, 2 winged scapula, and 2 dyspnea/orthopnea. For diagnosis, two patients had confirmatory EMG, 1 had MR neurography confirming plexus inflammation, and 3 had both. Average time to accurate diagnosis was 3.1 months. Average number of clinicians seen prior to accurate diagnosis: 5. Treatments included opioids (5) and/or physical therapy (6). All experienced partial pain relief by 1-8 weeks; 2 had persistent pain requiring gabapentin past 6 months. All had motor deficits past 6 months.

Conclusion:
Recognition of brachial neuritis is difficult. Brachial plexitis has a prolonged course with typically only partial recovery at 6 months.

54. Jiaxin Pei - UCL Research Department of Neuroscience, Physiology and Pharmacology

POSTER TITLE
Effects of CYFIP2 and its pathogenic mutant R87C on neuronal development

AUTHORS
Pei J, Kittler J

ABSTRACT
CYFIP2, a member of the CYFIP (cytoplasmic fragile-X mental retardation protein (FMRP)-interacting protein) protein family, has been linked to several neurological disorders, including intellectual disabilities (ID), epileptic encephalopathy (EE), and Alzheimer disease (AD), highlighting their importance in normal brain functioning. CYFIP2 is an essential subunit of the WAVE regulatory complex capable of activating Arp2/3, an actin nucleation factor, to regulate actin remodelling in neurons. This regulation may be implicated in several essential neuronal development processes, including axonal elongation, dendrite arborisation and spinogenesis. To better understand the cellular and molecular functions of this protein and its potential role in disease, we investigated the impact of overexpressed CYFIP2, and an ID and EE associated form of CYFIP2, R87C, on neuronal development of rat embryonic neurons. Our findings suggest that CYFIP2 plays a role in reducing filopodia production during dendritic development and promoting dendritic spine formation, but that overexpression (OE) of either the CYFIP2 wildtype (WT) or R87C did not change axon elongation. These findings may also suggest a possible cellular and molecular basis of these diseases.

55. Georgia Ppasia - UCL Research Department of Neuroscience, Physiology and Pharmacology

POSTER TITLE
Plaque-induced synaptic targeting by microglia in an Alzheimer’s disease mouse model

AUTHORS
Ppasia G, Wood JI, Cummings DM, Edwards FA

ABSTRACT
Microglia, the brain’s main innate immune cell, express the surface protein TREM2 which is important in maintaining the location of microglia near Aβ plaques and activating subsequent phagocytic mechanisms. Mutations that increase the risk of developing Alzheimer’s disease have been detected in the TREM2 gene such as the R47H loss-of-function mutation. Studies have reported that TREM2 is essential for the microglial production of complement protein C1Q that initiates the classical complement cascade, important in tagging synapses for elimination.
We investigated the role of microglia in C1Q- and Aβ plaque-dependent phagocytosis of synapses in the AppNLF/NLF (NLF) Alzheimer’s disease mouse model with and without the Trem2 R47H mutation. Immunohistochemistry, super-resolution microscopy, and the Imaris software are combined to visualise 3D-reconstructed microglia, lysosomes, plaques, excitatory postsynaptic puncta and C1Q protein. The hypothesis is that C1Q production and synaptic engulfment by microglia are higher close to plaques and are dependent on unimpaired TREM2.

A marked reduction in synaptic puncta closer to the plaque was accompanied by an increase in C1Q levels and C1Q-tagged synapses. The volume of microglia and microglial lysosomes was also higher closer to plaques. Interestingly, we saw higher densities of HOMER1 accumulating inside microglia in NLFTrem2R47H compared to NLF mice.

56. Silvia Purro - UCL Institute of Prion Diseases

POSTER TITLE
AD knockin mouse models are a robust model to study Aβ influence on tau pathology

AUTHORS
Purro SA, Ravey J, Farmer M, Quarterman E, Turnbull C, Noble E, Nazari T, Linehan J, Brandner S, Farrow M, Walsh DM, Collinge JC

ABSTRACT
Alzheimer's disease (AD) is defined by the accumulation of tau tangles and amyloid-β (Aβ) plaques. The lack of animal models that can recapitulate Aβ and tau pathologies without overexpressing proteins has hampered studies regarding Aβ influence on tau pathology. We inoculated AppNL-F/NL-F (NLF) knockin mice, which express humanised Aβ and murine wild-type tau, with extracts from AD brains to analyse the contribution of Aβ and tau seeds to AD pathogenesis. We present a longitudinal analysis that outlines the temporal and topological emergence of Aβ and tau deposition upon injection of AD brain.
Only mice inoculated with AD brain extracts evinced early and prominent amyloid deposition. Parenchymal deposits extended to the cerebellum, a previously untargeted brain region. The extent of vascular amyloid exceeded that seen in NLF mice injected with control brain. Intense tau phosphorylation was seen only in AD-inoculated mice. Our findings suggest a correlation between late tau pathology and regions affected by early parenchymal Aβ deposition in AD-inoculated animals.
Our work establishes NLF mice as a physiologically relevant bioassay tool for studying temporal and mechanistic relationships between Aβ and tau pathology, vascular amyloid deposition and Aβ seeds bioactivity from human samples.

57. Dervis Salih - UK Dementia Research Institute at UCL

POSTER TITLE
Genetic variation associated with human longevity and Alzheimer's disease risk act through microglia and oligodendrocyte cross-talk

AUTHORS
Graham AC, Bellou E, Harwood JC, Yaman U, Celikag M, Magusali N, Botia JA, Sala Frigerio C, Hardy J, Escott-Price V, and Salih DA

ABSTRACT
Ageing underlies functional decline of the brain and is the primary risk factor for several neurodegenerative conditions, including Alzheimer's disease (AD). However, the molecular mechanisms defining chronological age versus biological age, and how this underlies AD pathogenesis, are not well understood. Our work reveals that genetic variation associated with AD is enriched in both microglial and oligodendrocytic gene networks, which show the strongest increases in expression with ageing in the hippocampus. Compellingly, longevity-

associated genetic variation is enriched in a single-cell genetic network expressed by homeostatic microglia, which may drive “inflammageing.” Thus, we observe that variants contributing to ageing and AD balance different aspects of microglial function. In conclusion, this work provides new insights into cellular processes associated with ageing in the brain. Our findings have important implications for developing biomarkers indicating the physiological age of the brain and new targets for therapeutic intervention.

58. Rob Wykes - Department of Clinical and Experimental Epilepsy

POSTER TITLE
Ketamine prevents the inverse haemodynamic response to spreading depolarization in ischaemic cortical tissue.

AUTHORS
Wykes RC, Flaherty S, Masividal-Codina E, Guimera-Brunet A

ABSTRACT
Spreading Depolarizations (SDs) spontaneously arise post-stroke and correlate with worsening outcome.
Traditional metal-based electrodes are limited in their ability to faithfully record DC-coupled potential shifts including SD. In contrast, Graphene micro-transistor arrays (gSGFETs) precisely record SDs without signal attenuation, distortion or voltage drift; and their transparency allows simultaneous blood flow imaging.
We applied multichannel gSGFETs to investigate bidirectional interactions between SDs and regional blood flow. Photothrombosis was used to induce cortical ischaemia.
A positive correlation between SD duration and localised perfusion deficit was observed. Where perfusion deficit was 35% lower than baseline values the haemodynamic response to SD was predominately vasoconstrictive. In mildly ischaemic tissue SD’s induced a biphasic haemodynamic response (vasoconstriction followed by vasodilation), and in relatively uncompromised tissued only vasodilation in response to an SD was observed. Thus gSGFET arrays can be used to map the continuum of SD-induced haemodynamic responses in real-time.
In ischaemic tissue, administration of ketamine narrowed the waveform of subsequent SD’s, converting SD-induced hypoperfusion within ‘at risk’ tissue to a transient hyperperfusion.
This study highlights the potential of gSGFETs for stroke research, as well as offering mechanistic understanding to the neuroprotective mechanisms of ketamine.

59. Yuheng Zeng - UCL Queen Square Institute of Neurology

POSTER TITLE
Structural connectivity changes in the ventral stream after posterior cerebral artery stroke causing sight loss

AUTHORS
Zeng Y, Ajina S, Leff A, Lambon Ralph MA, Starrfelt R

ABSTRACT
Introduction: The ventral stream, known as the "what pathway," plays a crucial role in object and form recognition. Damage to the ventral visual pathway from a posterior cerebral artery

(PCA) stroke can impair low-level and intermediate visual processing (colour and contrast perception), as well as high-level processing (face, word, and object recognition). However, the link between structural damage following a PCA stroke and functional deficits in the ventral stream remains unclear.

Aims and Hypotheses: This study aims to clarify how structural connectivity damage influences functional deficits in visual processing. We hypothesise that connectome graph metrics are correlated to ventral stream function deficits and microstructural integrity metrics of white matter tracts are associated with the performance on cognitive tasks.

Methods: From the macrostructural perspective, structural connectomes were constructed using the Virtual Brain Grafting method and constrained spherical deconvolution-based anatomically-constrained tractography in PCA stroke patients (N = 50). Region of interest (ROI) analyses evaluated diffusion tensor metrics within ventral stream tracts for both patients and healthy controls (N = 19) to provide insight into microstructural integrity.

Results and Discussion: The data analysis part should be finished before June.

Homeostatic and Neuroendocrine Systems | Elvin Hall

60. Nikhil Mummaneni - National Institute of Neurological Disorders and Stroke

POSTER TITLE
Cushing's disease patients demonstrate sex-dependent corticotrophin stimulated brain F-fluorodeoxyglucose uptake

AUTHORS
Mummaneni N, Asuzu D, Chittiboina P

ABSTRACT
Introduction: Cushing's disease is an endocrine condition caused by adrenocorticotropin-secreting pituitary adenomas. It is unknown if there are differences in brain metabolic activity in male versus female patients with Cushing's disease.
Methods: We utilized voxel-wise comparisons of the F-fluorodeoxyglucose (FDG) PET scans of eighteen Cushing's disease patients (15 females and 3 males) before and after corticotropin-releasing hormone (CRH) administration to determine whether CRH induces significant metabolic changes in the brain.
Results: Analysis of the adult male cohort revealed significant bilateral cerebral hemisphere increases in FDG uptake following CRH administration at the intersection of the frontal, temporal, and parietal lobes ($p=0.005$). Additionally, the adult male cohort exhibited a general decrease in FDG uptake in the occipital lobe ($p=0.004$) following CRH administration. Unlike the adult male subjects, the adult female cohort exhibited no significant change in the frontal, temporal, or occipital lobes but did exhibit a significant decrease in FDG uptake within a focal superior region of the right parietal lobe ($p = 0.033$) following CRH administration.
Conclusion: Overall, adult male patients exhibited greater metabolic changes following CRH administration than female patients, providing evidence of sexual dimorphism in Cushing's disease. Future studies warrant a larger cohort for further evaluation.

Neural Excitability, Synapses, and Glia: Cellular Mechanisms | Elvin Hall

61. Isabel Bravo-Ferrer - Cell and Developmental Biology

POSTER TITLE
Characterization of astrocyte secreted factors that protect synapses from degeneration

AUTHORS
Bravo-Ferrer I, Martin-Flores N, Dufor T, Rogdakis T, Buechler J, Lopes D, Palomer E, Li K.W, Smit G, Salinas PC

ABSTRACT
Synaptic degeneration correlates with cognitive decline in Alzheimer's disease (AD). Wnt signalling is crucial for synapse maintenance and growing evidence suggest that its deficiency contributes to synapse vulnerability in the context of AD. Induction of the expression of Dickkopf-1 (Dkk1), an specific Wnt antagonist required for amyloid-beta-mediated synapse loss, results in synapse degeneration, defects in synaptic plasticity, and memory in the adult hippocampus. However, long-term induction of Dkk1 in the adult mouse brain did not lead to progressive synapse loss. Proteomic studies using hippocampal synaptosomes revealed an upregulation of astrocytic markers at the peak of synapse loss. Using tissue clearing combined with 3D super-resolution microscopy, we found that Dkk1 increases the number of synapses wrapped by astrocytes. Furthermore, conditioned media from astrocytes treated with Dkk1 prevents Dkk1-mediated synapse loss in neurons, suggesting that this Wnt antagonist triggers the secretion of synaptic protective factors from astrocytes. Using proteomic analyses, we are currently characterizing the astrocyte protective secreted factors . Our results suggest a dual function of Dkk1: it triggers synapse loss by acting on hippocampal neurons and also by signaling to astrocytes to halt further synapse loss. These findings suggest that astrocytes can put a break to synapse degeneration in AD.

62. Gozde Caan - The UCL Division of Psychiatry

POSTER TITLE
Altered expression of sensory neuron sodium channels in the absence of Nav1.7

AUTHORS
Caan G, Wood JN, Iseppon F

ABSTRACT
Chronic pain presents a significant clinical challenge with limited therapeutic options. Voltage-gated sodium channels (Nav) play a crucial role in pain signalling. Studies in clinical genetics revealed that the loss of Nav1.7 function leads to a pain-free phenotype called congenital indifference to pain (CIP), and increased Nav1.7 activity contributes to chronic spontaneous pain. While pain-free mouse models replicating this mutation have been developed in adult mice, global knockout of Nav1.7 from birth is lethal. Selective knockout of Nav1.7 in sensory neurones in mice has circumvented this lethality. Interestingly, nociceptors in mice selectively lacking Nav1.7 from birth retain their ability to generate action potentials, unlike those in adult knockout models. This study aims to investigate potential compensatory

mechanisms in response to Nav1.7 loss. Nav1.1 may act as a compensatory mechanism, given that over 85% of Nav1.1 positive cells also express Nav1.7. Nav1.1, renowned for its pivotal role in epilepsy, is expressed within dorsal root ganglia (DRG), alongside other sodium channels. In addition, Nav1.1 has been found to associate with Nav1.7 in studies of epitope-tagged Nav1.7 mice. We employed immunohistochemistry, Western blot, and mass spectrometry to assess changes in Nav1.1 expression within the DRG after selective Nav1.7 knockout.

63. Emma Clark - Cell and Developmental Biology

POSTER TITLE
Visualising the spatial range of neuropeptide action

AUTHORS
Clark E, Goss-Sampson E, Jimeno Martín Á, Watteyne J, Beets I, Tolevska N, Barrios A

ABSTRACT
To survive, animals must adapt their behaviour to withstand changes in their environment. Such behavioural flexibility arises from alterations within neural circuits, mediated by molecules known as neuromodulators. A major class of neuromodulators are neuropeptides, which can diffuse extrasynaptically to alter circuit dynamics and composition. Neuropeptides have the potential to act on all receptor-expressing targets, yet they regulate behaviour in a specific manner by acting on distinct sets of neurons in different contexts. What mechanisms confer this circuit specificity to neuropeptide transmission?

To answer this question, we are adapting a system to visualise neuropeptide receptor activation in C. elegans. We are implementing the TANGO assay, which converts transient ligand-receptor interactions into stable expression of fluorescent transgenes, to map out the neurons that receive neuropeptide signals. Specifically, we are using Pigment Dispersing Factor (PDF) and its receptor (PDFR-1) as a model system, as PDF signalling mediates different behaviours depending on the source of release and context.

We will utilise the C. elegans TANGO strain to identify mechanisms that facilitate or constrain neuropeptide diffusion and spatial range of action. As many cognitive and mood-related disorders are caused by dysfunctional neuropeptide signalling, it is vital to understand how information is coded by neuromodulation.

64. Alexander Mascarenhas - UCL Research Department of Neuroscience, Physiology and Pharmacology

POSTER TITLE
Sulfite oxidase in astrocyte mitochondria generates nitric oxide during brain hypoxia

AUTHORS
Mascarenhas A, Christie IN, Hosford PS, Abramov AY, Angelova P, Theparambil SM, Gourine AV

ABSTRACT
The constant and sufficient supply of oxygen and nutrients to the brain is essential to support neuronal function. During hypoxia, cerebral blood flow increases to maintain oxygen delivery but the cellular and molecular mechanisms mediating this effect are incompletely understood. Here we describe a novel astroglial mechanism by which nitric oxide (NO), a potent vasodilator, is generated in the brain when oxygen availability is reduced.

The data obtained show that cortical astrocytes generate NO in response to hypoxia. This NO production was not affected by the pharmacological inhibition of nitric oxide synthase family of enzymes. Incubation of astrocytes with nitrite (100 μM) significantly enhanced the hypoxia-evoked NO production in astrocytes, suggesting the operation of a reductive mechanism of NO production. Sequencing data identified high expression of a molybdenum-containing enzyme sulfite oxidase (SUOX) in astrocytes. Inactivation of SUOX in cultured cortical astrocytes by incubation with tungstate (0.5 mM) or genetic knockdown of SUOX expression, abolished hypoxia-induced NO production. These data point to the existence of a reductive mechanism of NO production in astrocyte mitochondria which may be critical for the regulation of cerebral blood flow during brain hypoxia.

65. Haojie Sun - School of Pharmacy

POSTER TITLE
Unconventional intracellular signaling pathway underlying cholinergic muscarinic receptor-induced axonal action potential threshold plasticity in hippocampal neurons

AUTHORS
Sun H, Lujan R, Shah M

ABSTRACT
Acetylcholine is a neurotransmitter and neuromodulator that critically modulates cognition. We have shown that acetylcholine activates axonal muscarinic receptors in hippocampal dentate gyrus granule neurons to persistently lower the action potential (AP) threshold and enhance neuronal excitability, while the intracellular mechanism remain unknown. Here, we reported that cholinergic afferent stimulation or oxotremorine-M (Oxo-M), a muscarinic receptor agonist, application led to a persistent decrease in AP threshold and augmented neuron excitability. Oxo-M treatment also transiently depolarized the resting membrane potential (RMP) and enhanced input resistance (RN). Whilst G-protein inhibition by GDP-βS prevented the RMP depolarization and RN increase caused by Oxo-M, it had little effect on the sustained AP threshold reduction by Oxo-M or cholinergic afferent stimulation. In support, immunogold labelling with a pan Gα antibody indicated that Gα subunits were absent in axons. Instead, the long-term AP threshold decrease by muscarinic receptor stimulation was prevented by selective knockdown of beta-arrestin 2 in adult granule neurons. Further, two-photon Ca2+ imaging showed that muscarinic receptor activation-induced sustained Ca2+ entry into axons was abolished in β-arrestin 2 knockout neurons. Our findings, thus, strongly suggest that axonal and soma/dendritic muscarinic receptors differentially affect neuronal function by triggering distinct signaling mechanisms.

66. Megan Tomlin - Cell and Developmental Biology

POSTER TITLE
Concomitant changes in glial cells and synapse integrity in an Alzheimer's disease mouse model

AUTHORS
Tomlin M, Martin-Flores N, Salinas PC

ABSTRACT
Synapse loss is an early hallmark of Alzheimer’s disease (AD) that strongly correlates with cognitive decline. However, the underlying mechanisms remain poorly understood. Amyloid-β plaques are a characteristic pathology of AD but it is unclear whether synapse loss precedes or follows plaque deposition. It is also unclear whether changes in astrocytes and microglia, glial cells important for brain homeostasis and synaptic maintenance, precede or follow the formation of plaques. Using confocal microscopy and molecular approaches, we have evaluated changes in synapses and glial cells surrounding amyloid plaques in the hippocampus of NL-G-F mice, a knock-in AD mouse model. At 2-months, when no clear plaques are identified, no changes in synapse number, astrocytes or microglia are observed in NL-G-F mice compared to wild-type (WT) mice. However, at 5-months, excitatory synapses are significantly decreased close to the plaque, whilst astrocyte and microglia number and volume are significantly increased in NL-G-F mice. Moreover, expression levels of astrocyte and microglia inflammatory markers are observed. At 9-months, synapse loss and changes in glial cells are exacerbated. Our results suggest changes in synapse number and glial cells are concomitant indicating that amyloid plaques are drivers of synapse loss and glial cells in NL-G-F mice.

Novel Methods, Resources and Technology Development | Drama Studio

67. Padraig Gleeson - UCL Research Department of Neuroscience, Physiology and Pharmacology

POSTER TITLE
Integrating model development across computational neuroscience, cognitive science and machine learning using the Model Description Format - MDF

AUTHORS
Gleeson P, Sinha A, Crook S, Cohen JD

ABSTRACT
Computational neuroscience and Artificial Intelligence (AI) have long, overlapping histories of investigating how networks process inputs to make intelligent decisions. Researchers in both fields agree that the exchange of ideas, theories and techniques between them is imperative - both for enhanced, more brain-like machine learning (ML) applications as well as more efficient creation and analysis of computational models of healthy and diseased brains. However, there are many practical impediments to the exchange of research outputs between these domains, related to different formalisms, methods and software infrastructure used, as well as the varied backgrounds of researchers involved.

The goal of greater sharing of models and ideas between neuroscience and AI prompted the formation of the Model Exchange and Convergence Initiative (ModECI; https://modeci.org), which aims to develop a standard Model Description Format (MDF) that can be used to exchange models across disparate modelling software environments in machine readable form, and/or enable code generation for diverse hardware platforms. MDF supports models at many levels of analysis, from biophysically detailed individual neurons and synapses, to neural populations, and abstract tensor-based models, such as those widely used in ML. We hope MDF will become an essential tool for sharing models and insights into brain function between these often fragmented scientific domains.

68. Olivia Goff - Clinical and Experimental Epilepsy

POSTER TITLE
Development of a chimeric GPCR as a potential new autoregulatory gene therapy for focal, refractory epilepsy

AUTHORS
Goff O, Devenish SO, Patel SD, Ussingkaer L, Tian A, Kullmann DM

ABSTRACT
We are developing a new autoregulatory gene therapy for focal, refractory epilepsy that will overcome the limitations of previously developed chemogenetic tools, such as hM4Di which relies on application of exogenous drugs with deleterious side effects, and eGluCl, a chloride channel that is of invertebrate origin and relies in part on the chloride transmembrane gradient. We have exploited the diverse signalling of G-protein coupled receptors (GPCRs) to create a chimeric receptor that exhibits ‘inhibitory’ Gi/o signalling and is expected to locate to the post-synaptic membrane, positioned to respond during periods of excessive neuronal firing. We have used the TRUPATH assay to interrogate the G-protein selectivity of our

chimera and used AlphaFold2 prediction to provide support that our chimera maintains a functional site for G-protein interaction. Using whole-cell patch clamp of HEK293 cells stably transfected with Kir3.1/3.2 channels, we found our chimera activates GIRK-mediated current of the same magnitude as a wild-type Gi/o-coupled GPCR. The chimera's ability to reduce network burst activity is currently being investigated using primary cortical cultures with multi-electrode arrays, as well as the chimera's ability to maintain endogenous protein interactions responsible for its localization using co-immunoprecipitation.

69. Aanandita Kothurkar - UCL Institute of Ophthalmology

POSTER TITLE
Iterative bleaching extends multiplexity (IBEX) imaging facilitates simultaneous identification of all cell types in the vertebrate retina

AUTHORS
Kothurkar A, Patient GS, Noel NCN, Krzywańska AM, Chu CJ, MacDonald RB

ABSTRACT
Tissues are made up of multiple cell types with regional and cell-specific molecular differences. To understand the multicellular composition, and how it is altered during development, ageing and/or disease, we must visualise the complete cellular landscape. Currently, we have limited abilities to combine multiple markers or antibodies as many antibodies are raised in the same host and microscopes have finite numbers of channels that they can image simultaneously. To extend this capacity, we adapted a highly multiplexed immunohistochemistry technique called Iterative Bleaching Extends Multiplexity (IBEX) to the zebrafish retina, to perform sequential rounds of labelling on a single piece of tissue, followed by integration of the images with open-source software. We optimized fluorescent antibody micro-conjugation to simultaneously visualize all major cell types in the zebrafish retina with up to 11 cell-specific antibodies. We further combined IBEX with in situ hybridization chain reaction (HCR) to visualize mRNA expression within antibody-labelled cells. We also used IBEX on wholemount tissue to view spatial relationships between multiple cell types in 3D. Finally, we demonstrated the utility of IBEX in model organisms that have scarcity of tissue, such as killifish and Xenopus, to glean large amounts of information from small quantities of precious tissue

70. Praveen Mummaneni - Department of Neurological Surgery

POSTER TITLE
Machine learning powered calculators for the prediction of post-operative arm and neck pain in patients with cervical spondylotic myelopathy: a quality outcomes database study

AUTHORS
Mummaneni PV, Saggi S, Bydon M, Carreon L, Chan AK, Wang MY, Haid RW, Knightly JJ, Gottfried ON, Shaffrey CI, Virk MS, Glassman SD, Shaffrey ME, Park P, Foley KT, Coric D, Slotkin JR, Upadhyaya C, Potts EA, Tumialán LM, Chou D, Fu KG, Asher AL, Bisson EF

ABSTRACT
Background: Neck and arm pain are common symptoms in patients with cervical spondylotic myelopathy (CSM). Machine learning (ML) can predict improvement in neck and arm pain following cervical spine surgery in patients with CSM.

Methods: We performed a retrospective study using the multi-center prospective Quality Outcomes Database consisting of adult patients with CSM who underwent cervical spine surgery. 1141 patients were split into an 80% training cohort/20% testing cohort. Hyperparameter tuning was performed with 5 fold cross-validation (CV). Recursive feature selection was used to select key pre-operative variables for predicting achievement of the minimum clinically important difference (MCID) in visual-analogue scale (VAS) neck and arm pain following surgery. The final model was tested for accuracy on the testing cohort.

Results/Conclusion: ML models for predicting MCID in neck and arm pain achieved 80% and 75% cross-validation accuracy, respectively. Age, baseline neck/arm pain, modified Japanese Orthopedic Association score, EQ-VAS score, and BMI were identified as most important for predicting neck/arm following recursive feature selection. Final models for neck and arm pain achieved 80% and 75% for accuracy and AUROC during testing. Finally, we developed the first web interfaces to allow users to predict post-operative neck and arm pain in patients with CSM.

71. Brooke Nairn - UCL Ear Institue

POSTER TITLE
Refining the TeleRehabilitation Decision Support System for stroke patients: a patient-centric approach

AUTHORS
Nairn B, Bamiou DE, Koohi N

ABSTRACT
Purpose/aim: This project aims to enhance balance rehabilitation in older adults post-stroke by integrating AI-supported remote technology. Acknowledging the absence of a gold-standard protocol for balance rehabilitation post-stroke, together with today’s technology advancements we aim to gather feedback from clinicians and stroke survivors, to refine the Telerehabilitation Decision Support System (TeleRehab DSS) for stroke-tailored, individualised, and comprehensive balance rehabilitation.

Methods: Two focus groups were conducted at University College London between February- June 2023: 1) with 7 physiotherapists and 2 neurologists, and 2) with 8 older adult (50–80 years of age) stroke survivors. Both focus groups, included a presentation of the TeleRehab DSS system and exercises, followed by qualitative data collection through semi-structured interviews and open-ended discussion.

Results: Thematic analysis revealed common themes: appreciation for TeleRehab DSS's engagement but concern over setup burden; insoles discomfort; the need for improvements addressing stroke-specific issues such as aphasia and upper limb function; and suggestions for additional exercises.

Conclusion: Refinement of TeleRehab DSS is crucial to tailor technology driven rehabilitation that meets stroke survivors needs. These insights aim to optimize TeleRehab DSS as a patient-centric system for implementation within the proof-of-concept study while contributing to transformative technologies for inclusive balance rehabilitation in stroke.

72. Jannette Nassar Arbid - Department of Medical Physics and Biomedical Engineering

POSTER TITLE
A novel fMRI contrast: resting-state functional quantitative susceptibility mapping (rsfQSM)

AUTHORS
Nassar J, Kiersnowski OC, Fuchs P, Weil RS, Shmueli K

ABSTRACT
Background and Motivation: Changes in blood magnetic susceptibility underlie conventional Blood-Oxygen-Level-Dependent (BOLD) fMRI and quantitative susceptibility mapping (QSM) has been used in task-based functional QSM (fQSM) to reveal more localized, complementary brain activations than fMRI. Resting-state fMRI (rsfMRI) has advanced our understanding of the brain's intrinsic functional architecture by revealing brain connectivity networks, including the Default Mode Network (DMN). However, resting-state analysis of QSM has not yet been performed and may provide complementary information to conventional rsfMRI.
Aim: To perform a resting-state functional analysis using QSM (rsfQSM) and compare it to rsfMRI, focusing on the DMN.
Approach: We acquired 70 multi-echo EPI volumes in 7 healthy volunteers at 3T with 1.3-mm isotropic resolution. We used seed-based and independent component (ICA) analyses for rsfQSM and assessed the similarity of the DMN to that in rsfMRI using quantitative metrics.
Results: The DMN was detected in rsfQSM with spatial similarities to the DMN in rsfMRI. rsfQSM showed weaker and less extensive functional connectivity.
Impact: We computed resting-state functional connectivity from magnetic susceptibility maps for the first time, revealing similarities in the DMN compared to rsfMRI. This paves the way for new QSM-based explorations of brain function to potentially deepen understanding of neurological diseases.

73. Shereen Nizari - Centre for Advanced Biomedical Imaging

POSTER TITLE
Using non-invasive MRI to inform therapy by characterising fluid movement in the diseased brain

AUTHORS
Nizari S, Perera C, Harrison IF, Thomas DL, Lythgoe MF, Gourine A, Wells JA

ABSTRACT
Raised intracranial pressure (ICP) is a defining pathological feature of intracranial idiopathic hypertension and common forms of hydrocephalus. In many patients, hypersecretion of cerebrospinal fluid (CSF) is thought to be a critical driver of raised ICP. CSF is produced from the blood at the blood-CSF-barrier (BCSFB). There is an absence of non-invasive

means of accurate ICP measurement, preventing effective monitoring of CSF-production targeted therapy for these conditions. In this study, we demonstrate how a novel in vivo MRI technique can non-invasively capture modulation of ICP and pathology.

ICP was measured using a pressure sensor (Digitimer) in male C57BL6J mice. Hydrocephalus was induced by bilateral intracerebroventricular injections of 2mM FeCl3. We recently developed a novel MRI technique to assess BCSFB-function, acquired at 9.4T (Bruker) using arterial-spin-labelling MRI. To alter ICP and hydrocephalus pathology, aminophylline was intraperitoneally injected following baseline recordings or surgery.

Aminophylline administration resulted in a dose-dependent decrease in ICP with a concomitant dose-dependent decrease in BCSFB-function. In the hydrocephalus model, defined by increased ventricular volume, a pathological increase in BCSFB-function was prevented by aminophylline treatment. The non-invasive BCSFB-function technique therefore has the potential to inform therapy in the treatment of CSF-related disorders.

74. Sahil Patel - Department of Clinical and Experimental Epilepsy

POSTER TITLE
GRANPA: G-protein coupled Receptor Activated by Non-Prescription Agent - next generation chemogenetics with gene therapy potential

AUTHORS
Patel S, Devenish SO, Ussingkaer L, Silva LFA, Goff O, Mobbs J, Richardson A, Kaserer T, Thal D, Lieb A, Kullmann DM

ABSTRACT
Chemogenetics, including the muscarinic DREADDs, possess gene therapy potential in neurological disorders such as epilepsy and Parkinson’s disease. However, the activating ligands limit clinical translation due to either inducing deleterious side-effects (clozapine and olanzapine) or not being FDA/EMA approved (clozapine-N-oxide and C21). A quicker, safer route to the clinic is to identify clinically approved drugs that are safer compared to clozapine and olanzapine. Previous in silico docking and potassium channel activation studies revealed the over-the-counter anti-histamine diphenhydramine (DPH) as a weak agonist of hM4Di. We strategically mutated the orthosteric binding pocket of hM4Di to create a novel engineered chemogenetic, entitled GRANPA (G-protein coupled Receptor Activated by Non-Prescription Agent). This novel GPCR is a double mutant of hM4Di, a quadruple mutant of the wild type hM4 and is potently activated by DPH, with minimal molecular off-target effects. We have additionally acquired the cryo-EM structure of GRANPA-mGαsi bound to DPH. Finally, we validated GRANPA-DPH in vivo, demonstrating efficacy in anxiety models and anti-seizure effects in an acute pentylenetetrazole model. GRANPA is a next generation chemogenetic tool that displays in vivo efficacy, and lowers the barrier to clinical translation in comparison with hM4Di because of the favourable side effect profile of diphenhydramine.

75. Laura Porta - Sainsbury Wellcome Centre

POSTER TITLE
Derotator: a Python package to solve rotation artifacts in 3-photon calcium imaging

AUTHORS
Porta L, Weiler S, Cloves M, Sirmpilatze N, Felder A, Tyson A, Margrie T

ABSTRACT
Previous studies have demonstrated that V1 L6 neurons receive vestibular input that signals the angular velocity of horizontal rotation. Leveraging 3-photon calcium imaging, we can explore the activity of these deep layers. However, the current setup's low frame rate of approximately 6Hz, combined with high rotation speeds up to 200 rps, leads to significant artefacts in acquired images, impeding analysis with established tools like Suite2p. Thus, the need for a novel software solution is pressing. Leveraging insights from a prior line-by-line rotation algorithm, we introduce the Derotator package—a Python-based software. By utilising feedback from the rotation motor, this tool effectively reconstructs images, enabling comprehensive analysis of the data.

76. Bayard Rogers - The UCL Division of Psychiatry

POSTER TITLE
Evaluating frontoparietal network topography for diagnostic markers of Alzheimer’s disease

AUTHORS
Rogers B

ABSTRACT
Through analysis of secondary data, the present study examined the performance and distribution of N4/P6 ERPs across the frontoparietal network (FPN) using EEG topographic mapping. ERP measures and memory as a function of reaction time (RT) were compared between a group of (N = 63) mild untreated AD patients and a control group of (N = 73) healthy age-matched adults. A concurrent cross-modal associative memory test and 128-channel high-density EEG facilitated data collection. By targeting select frontal and parietal EEG reference channels based on N4/P6 component time windows and positivity; our findings demonstrate statistically significant group variations between controls and patients in N4/P6 peak amplitudes and latencies during cross-modal testing, though there was no interaction effect. Our results also support that the N4 ERP might be stronger than its P6 counterpart as a possible candidate biomarker. We conclude by visually mapping FPN integration existent in healthy controls, yet absent in AD patients during cross-modal memory tasks. The implications and limitations of these findings are discussed, as are foundations for future research in exploring processes and strategies that lead to identifying clinically useful biomarkers for the detection and treatment of AD.

77. Karin Shmueli - Department of Medical Physics and Biomedical Engineering

POSTER TITLE
Rapid high-resolution MRI for integrated structural and functional magnetic susceptibility and electrical conductivity mapping in the human brain

AUTHORS
Fuchs P, Kiersnowski OC, Nassar J, Arsenov O, Luo J, Shmueli K

ABSTRACT
Background and Motivation: In addition to standard functional MRI, emerging MRI techniques quantitative magnetic susceptibility mapping (QSM), electrical conductivity mapping (EPT) and, more recently, functional QSM, show promise in characterising neurodegenerative diseases. The electromagnetic tissue properties revealed by these techniques give valuable insight into tissue composition: iron and myelin (QSM), and ion content and mobility (EPT). However, each technique currently needs a separate time-consuming acquisition.
Aim: To develop a single, rapid acquisition for simultaneous structural and functional QSM and EPT, providing multi-modal contrasts to facilitate development of biomarkers for neurological diseases.
Approach: We developed a multi-echo 2D EPI sequence with 1.3 mm isotropic resolution and 4.02 s repetition time enabling acquisition of 70 timepoints in 5 min 22 s. We optimised QSM, EPT and fQSM reconstruction pipelines. To date, we have applied this sequence in 7 healthy volunteers and 6 patients with Parkinson's disease as part of an ongoing study.
Results: We have obtained high-quality structural QSM and EPT, alongside fMRI and fQSM activations from a visual stimulus alongside conventional T2*-weighted and susceptibility weighted contrasts.
Conclusions and Impact: The short (< 5.5 min) scan time allows this highly efficient acquisition to be incorporated into clinical studies of neurodegenerative diseases.

78. Nikoloz Sirmpilatze - Sainsbury Wellcome Centre

POSTER TITLE
Movement: a python toolbox for analysing pose tracking data

AUTHORS
Sirmpilatze N, Lo CH, Peri BD, Sharma D, Miñano S, Keshavarzi S, Tyson AL

ABSTRACT
The recent emergence of markerless pose estimation tools, such as DeepLabCut, SLEAP, and LightningPose, has revolutionised the study of animal behaviour. However, despite their popularity, there is currently no user-friendly, general-purpose approach for processing and analysing the pose tracks that these tools generate. To address this, we are developing movement, an open-source Python package that offers a unified interface for analysing pose data from multiple major pose estimation packages. During movement's early development, we are focusing on implementing versatile and efficient methods for data cleaning, filtering, and kinematic analysis. However, we plan to eventually include modules for more specialised applications, such as pupillometry and gait analysis. Other planned features involve analysing pose tracks within the spatial context of an animal's environment and integrating movement with neurophysiological data analysis tools. Importantly, movement is being designed to accommodate researchers with varying coding skills and computational resources, and will soon feature an intuitive graphical user interface. In addition, movement's development is transparent and robust, with dedicated engineers ensuring its long-term maintenance. Ultimately, we envision movement evolving into a comprehensive, all-around software suite for analysing animal behaviour.

79. Haeun Sun - UCL Queen Square Institute of Neurology

POSTER TITLE
Could intracranial stimulation in epilepsy be a platform for developing novel targets for psychiatric Deep Brain Stimulation?

AUTHORS
Sun H, Li N, Giampiccolo D, Litvak V

ABSTRACT
Deep brain stimulation (DBS) is an effective treatment for severe neurological conditions, notably Parkinson's disease, and has shown promise in drug-resistant psychiatric disorders such as obsessive-compulsive disorder (OCD) and major depression. However, identifying new DBS targets is challenging, often requiring multiple trial and error attempts. Animal models also present difficulties since relevant symptoms are hard to assess.
Intracranial EEG (iEEG) monitoring in epilepsy provides an opportunity to test stimulation at various sites in awake humans. However, iEEG electrodes are not intentionally targeted to areas of interest for psychiatric DBS. Our study aims to identify psychiatric symptoms that could potentially be impacted by stimulation at iEEG contact sites. We are using recently established methods based on normative functional and structural connectivity to analyse networks connected to brain areas highlighted in meta-analyses with psychiatric symptoms as keywords.
Our method was optimised and validated using outcomes from a large multicentre study on DBS for OCD. We then applied it to iEEG contact locations from eighty-seven patients implanted at the National Hospital for Neurology and Neurosurgery in recent years.
We will use our results to motivate a series of studies of stimulation effects on cognitive tasks validated in relation to specific psychiatric symptoms.

80. Rania-Iman Virjee - UCL Institute of Cognitive Neuroscience

POSTER TITLE
Investigating the heart-beat evoked potential: bridging gaps and building consensus in methodological approaches

AUTHORS
Virjee RI, Kandasamy R, Carmichael D, Yogarajah M, Garfinkel S

ABSTRACT
Introduction: Interoception involves the nervous system’s continuous monitoring of the body’s internal signals. The heartbeat-evoked potential (HEP), a cortical response time-locked to each heartbeat, is suggested as an implicit, marker of interoception. However, HEP studies are limited by the lack of consensus/standardisation in processing methods (PMs), and artefact correction (e.g. cardiac field artefact). This study aims to address and contribute to standardising HEP PM inconsistencies and develop a signal processing pipeline.

Methods and results: A literature review assessed current HEP PMs and parameters across EEG (electro-encephalogram) and MEG (magneto-encephalogram) studies, applying these to Temple University's scalp EEG dataset to investigate their effects on HEP extraction. Despite EEG's higher use (105 studies) compared to MEG (10 studies), significant parameter variability in EEG studies highlights the need for standardisation.

Sensitivity analysis revealed that the RR-interval (minimum time between heartbeats, p=0.014 C3), epoch amplitude threshold (data segment exceeding a set threshold, p=0.009 Fp1), and filter settings significantly affect HEP in frontal, central, and O1 channels (p=0.034 high-pass filter) before Bonferroni correction (α = 0.00036). Post-correction, these impacts diminish.

Conclusion: This study highlights the need for careful handling of HEP parameters, and critical HEP value reporting for field standardisation, reproducibility, and establishing a gold-standard.

81. Joseph Ziminski - Sainsbury Wellcome Centre

POSTER TITLE
Datashuttle: a toolbox for neuroscience project management and standardisation

AUTHORS
Ziminski JJ, Sirmpilatze N, Peri BD, Porta L, Keshavarzi S, Tyson AL

ABSTRACT
Inconsistent project structures and naming schemes remain a major obstacle to data sharing, collaboration and reproducibility in experimental neuroscience. Standardised data specifications (e.g. the Brain Imaging Data Structure (BIDS)) provide a robust solution but are necessarily restrictive and complex (and not yet extended to all neuroscience methodologies). Furthermore, implementing standardisation during data collection—throughout which data must be laboriously synchronised across multiple computers—places a significant burden on researchers. To address these issues, we have developed DataShuttle, an open-source Python package for the management of neuroscience project folders. DataShuttle automates the creation of standardised project folders and provides tools to conveniently transfer data between acquisition, storage, and analysis machines. Importantly, DataShuttle emphasises ease of adoption, implementing a lightweight, BIDS-inspired specification and featuring a cross-platform graphical user interface. We aim for DataShuttle to streamline the data management process and facilitate collaboration and reproducibility in neuroscience—and are enthusiastic about the prospect of extending our schema to other fields.

Sensory and Motor Systems | Drama Studio

82. Laura Andreoli - UCL Research Department of Neuroscience, Physiology and Pharmacology

POSTER TITLE
Influence of Early Life TRPV1-fibre Activation on Sensorimotor Circuit Development

AUTHORS
Andreoli L, Koch SC

ABSTRACT
Background: In mice, nociceptive behaviour refines during the first postnatal weeks, along with a CNS strengthening of nociceptive C-fibre inputs and a decrease of tactile A-fibre evoked excitability in the spinal dorsal horn. Peripheral sensory inputs maturation is thought to drive behavioural refinement, but the role of touch versus pain within this process, remains unclear.
Aim: To establish the functional impact of early-life TRPV1-C-fibre input upon the maturation of somatosensory and nociceptive behaviours.
Methods: In vivo chemogenetic activation of primary afferents was achieved via intraplantar injection of a Cre-inducible AAV9 coding for the excitatory hM3Dq-DREADD in TRPV1Cre mice. The DREADD ligand CNO was administered daily (i.p.) at one of two critical developmental periods: P8-P12 or P13-P17. Thereafter, hindlimb sensory-evoked behaviour and fine motor coordination were assessed using innocuous and noxious somatosensory tests, a gait analysis system (CatWalk-XT), and the beam walking assay.
Results: Chemogenetic activation of TRPV1-positive fibres at P8-P12 induced altered responses to innocuous stimuli without affecting sensorimotor behaviours in adulthood. In contrast, activation at P13-P17 led to significant sensory-motor deficits, whilst somatosensory-driven behaviour remained unchanged.
Conclusions: Activation of peripheral TRPV1-positive afferents at different times can recruit distinct motor programs during development, suggesting a cross-modal maturation of sensorimotor circuits.

83. Shanice Bailey - Sainsbury Wellcome Centre

POSTER TITLE
Multisensory processing of social information in the medial amygdala

AUTHORS
Bailey S, Regester D, Yin J, Chang X, Edwards M, Isogai Y

ABSTRACT
Instinctive social behaviours are crucial to survival. However, it remains unclear how the brain interprets the wide range of social sensory stimuli that drive ethologically appropriate actions. In mice, which depend heavily on the vomeronasal pathway to identify conspecifics, the medial amygdala (MeA) is a strong candidate for coordinating such responses, since this area receives dense vomeronasal inputs. Using Neuropixel 2.0 probes, we record from MeA in head-fixed animals and present a range of volatile, non-volatile, and tactile stimuli from conspecifics. We find that the MeA neurons respond reliably to all forms of stimulus modality, and stimulus identity can be decoded from population activity. Additionally, we observed a

biphasic population response profile to co-presentations of volatile and non-volatile cues. To identify the origin of the different phases of the response, we eliminated sensory neurons from the main olfactory pathway. We found that these inputs are necessary for the transient phase of biphasic responses, but play a minor role in decoding stimulus identity. We propose that olfactory information is flexibly processed and selectively integrated with multimodal sensory inputs to coordinate the expression of different social behaviours.

84. Celian Bimbard - UCL Institute of Ophthalmology

POSTER TITLE
The structure of population activity in mouse visual cortex is stable for weeks

AUTHORS
Bimbard C, van Beest E, Harris KD, Carandini M

ABSTRACT
The activity of neural populations in the cortex is remarkably structured, and this structure is thought to reflect the underlying circuits and guide the resulting computations. Is this structure invariant across days and months? Or does it change over time, similarly to the 'representational drift' reported for some sensory representations?
We recorded the activity of large populations of neurons in the visual cortex of awake mice with chronic Neuropixels probes, and tracked cells for over 100 days. For each daily recording and each pair of tracked neurons, we calculated the spontaneous correlation, the typical delay in spontaneous firing, and the signal correlation.
Both spontaneous and signal correlations were remarkably stable across days and months, especially when correlations were calculated at fast timescales (<30 ms bins). The neurons fired in sequences that were also stable across days. These sequences had the same order during spontaneous activity and in response to visual stimuli.
We conclude that the structure of neuronal population activity in visual cortex is highly stable, opposite to the described representational drift of sensory responses. This suggests that the underlying circuits are hard-wired, limiting not only the patterns that a population may produce but also their plasticity.

85. Antonia Constantinescu - UCL Research Department of Neuroscience, Physiology and Pharmacology

POSTER TITLE
The postnatal development of corticospinal projections in mice

AUTHORS
Constantinescu AM, Fabrizi L, Koch S

ABSTRACT
In newborn mice, the maturation of reflexive behaviours occurs over the first three postnatal weeks. This is thought to occur in part due to the maturation of the somatosensory corticospinal tract (S1-CST), which directly influences withdrawal reflexes to innocuous stimuli in the adult. However, it is unknown when the axonal projections of the S1-CST reach anatomical maturity to effectively engage local spinal circuitry. Here, we aimed to

anatomically map the postnatal maturation of the mouse S1-CST originating from the cortical representation of the hind limb (S1hl) into the lumbar spinal cord.

S1hl-CST projections were labelled by injecting mice at different postnatal days (P0-P56) with either a retrograde tracer, Fluoro-Gold, into the dorsal lumbar cord, or with a fluorescently-tagged anterograde AAV9 viral vector in the S1hl. S1hl-CST projections were found to extend to lumbar spinal segments at P9 and reach adult numbers of projections by P12. S1hl-CST axonal branching within the dorsal horn at this age, however, terminated widely throughout the dorsal grey matter, beyond the adult laminar termination patterns, which were not attained until P17.
Our results detail the timeline of S1-CST anatomical development in mouse and suggest that the delayed maturation of these projections could underlie somatosensory reflex immaturity.

86. Julie Fabre - UCL Queen Square Institute of Neurology

POSTER TITLE
Visual and visuomotor signals across the basal ganglia axis

AUTHORS
Fabre JMJ, Peters AJ, Carandini M, Harris KH

ABSTRACT
The basal ganglia link sensory input with motor actions; however, it remains uncertain to what extent their activity is related to sensory versus motor events. We used Neuropixels probes to record neural activity from the striatum, globus pallidus external (GPe), and substantia nigra pars reticulata (SNr) in head-fixed mice. We recorded in naive mice that viewed a range of visual stimuli, and in mice trained in two visuomotor association tasks, where stimuli were either associated with a movement or not. In naive mice, all three regions, and especially the striatum, contained a small fraction of anatomically localized visually-responsive and stimulus-selective neurons. In all three regions, training on the tasks increased the proportion of cells responding specifically to the movement-associated stimuli. Stimulus identity could be decoded better from the striatum than from GPe and SNr. These findings indicate that the basal ganglia, and especially the striatum, encode the properties of visual stimuli even if they are not associated with behaviors. Furthermore, after visuomotor training, the striatum, GPe and SNr robustly encode the movement-association of a stimulus, and the striatum additionally encodes stimulus identity.

87. Mansoureh Fahimi Hnazaee - Department of Imaging Neuroscience

POSTER TITLE
Generators of the frequency-following response in the subthalamic nucleus: implications for non-invasive deep brain stimulation

AUTHORS
Fahimi Hnazaee M, Zhao H, Hao S, Zhan S, Li D, Sun B, Cao C, Litvak V

ABSTRACT
While Deep Brain Stimulation (DBS) is effective treatment for several movement disorders, non-invasive stimulation modes have major clinical relevance. We report on a novel method

holding potential for non-invasive subthalamic nucleus (STN) stimulation. We used an auditory frequency-following response task (FFR), a popular tool for studying the auditory brainstem as the neural response in the cortical and midbrain generator, as it precisely reflects the ongoing dynamics of a speech or non-speech sound. We recorded EEG and DBS electrodes from 5 patients, in 4 from the STN, and one from the anterior thalamus and a number of cortical and subcortical areas located in the hippocampus and frontal regions, during an FFR at a frequency higher than the upper limit of phase-locking in the cortex (333Hz). Our results revealed a neural response local to the STN, but not other structures. This finding is novel. Auditory perception in the basal ganglia is rather unexplored, and the STN generator of the FFR has likely gone unseen due to the limitations of our tools and research focus. The potential clinical implications are far-reaching. Future research should investigate whether auditory stimuli at common electrical stimulation frequencies and waveforms of electrical DBS stimulation can induce clinical improvement.

88. Karolina Farrell - Francis Crick Institute

POSTER TITLE
Excitatory-inhibitory dynamics in auditory cortex during hallucination-like perception

AUTHORS
Farrell K, Schmack K

ABSTRACT
Hallucinations are a cardinal feature of psychosis, defined as the false perception of stimuli with the same confidence as veridical perception. Despite affecting between 1-3.5% of the global population, the neural mechanisms of psychosis are still unknown, and have been prohibitively difficult to study given the lack of translational animal models. We investigate hallucinations in mice using an auditory detection task that operationalises hallucination-like perception as false alarms with high confidence.

In schizophrenia, auditory hallucinations are more common than other sensory modalities, and have been linked to elevated auditory cortex activity. To better understand the mechanisms of this hyperactivity, we ask how excitatory and inhibitory neurons in auditory cortex respond during veridical and hallucinatory-like auditory perception in mice. We describe how the activity of these two genetically distinct neuron populations can be simultaneously imaged in freely-moving mice using a dual-colour Miniscope in our task. We ask how NMDAR blockade (via systemic administration of ketamine) influences this activity, with the specific hypothesis that ketamine preferentially inhibits parvalbumin-positive (PV+) inhibitory interneurons to disinhibit pyramidal neurons, thereby increasing the rate of high confidence false alarms. Finally, we explore whether chemogenetic inhibition of PV+ interneurons can replicate the effect of ketamine’s blockade of NMDARs.

89. Elizabeth Freeman - UCL Ear Institute

POSTER TITLE
Ears tuned for love: exploring the molecular control of the African malaria mosquito’s hearing

AUTHORS
Freeman EA, Suppermpool A, Ellis D, Bagi J, Tytheridge S, Andrés M

ABSTRACT
The African malaria mosquito, Anopheles gambiae, is a highly studied insect due to its role in the spread of malaria. Understanding the neurology behind key behaviours can lead to the discovery of novel insecticides against this mosquito. One key behaviour is hearing, as An. gambiae males use their sophisticated antennal ears to listen for the wing beats of females to identify partners for mating. They are the only insect with ears where an auditory efferent system, similar the mechanism of mammalian hearing, has been identified. Previous studies have identified the neurotransmitters GABA and octopamine- the insect ortholog of norepinephrine- to be part of this efferent system. We hypothesise that additional neurotransmitters may also be involved. Our study used transcriptomics to identify neurotransmitter and neuropeptide receptors that have potential involvement in the auditory system. A dopamine and ecdysone receptor, AgDopEcR, stood out in the analysis and was chosen for further study via RNA interference, laser doppler vibrometry, and mating assays to understand the potential role of dopamine and ecdysone in hearing. These results will add greater detail to the love story of mosquito hearing.

90. Zainab Khan - Department of Clinical and Movement Neurosciences

POSTER TITLE
Novel investigation of upper limb non-use in chronic stroke.

AUTHORS
Khan Z, Sporn S, Ward N

ABSTRACT
Introduction: Stroke is the leading cause of disability worldwide. 75% of stroke survivors have upper limb disabilities, often presenting non-use, where the weak arm is used less in daily life than expected from clinical assessments. The clinical implications are profound, yet non-use is not define, remaining poorly understood precluding the development of targeted neurorehabilitation strategies.

Aims: 1) Objectively quantify non-use based on movement kinematics using a 2D robotic device (KINARM Exoskeleton). 2) Investigate whether non-use is triggered by task difficulty.

Methods: 20 chronic stroke survivors were recruited from the Queen Square Upper Limb programme and completed 2 version of the standardised Object Hit Task on the KINARM. Participants were instructed to hit as many balls using 1) both arms and 2) the weak arm only. Task difficulty was increased over the course of both conditions with more balls dropping faster.

Results: Using kinematic analysis of the performance of the weak arm during the bimanual and unimanual condition, we detected non-use. Specifically, the weak arm was used disproportionally less in the bimanual condition. Furthermore, non-use increased with task difficulty and was not present when task difficulty was low.

Conclusions: Non-use can be objectively measured using movement kinematics, triggered by task difficulty.

91. Gokce Korkmaz - Department of Neuroinflammation, Queen Square Multiple Sclerosis Centre

POSTER TITLE
In Action Execution and Observation the Cerebellum Exerts a Differential Control over the Excitatory/Inhibitory Dynamics of Inter-Regional Effective Connectivity

AUTHORS
Korkmaz G, Lorenzi RM, Alahmadi AAS, Monteverdi A, Casiraghi L, D'Angelo E, Palesi F, Gandini Wheeler-Kingshott CAM

ABSTRACT
The cerebro-cerebellar loop is well known to be involved in motor planning and execution. However, the causal interaction between the cerebellum and cortical areas remains unclear. Dynamic Causal Modelling (DCM) estimates inter-regional effective connectivity and hierarchical activation of regions, combining priors with observed Blood Oxygenation Level Dependent signals. Here we applied DCM to functional MRI (fMRI) data obtained during a squeeze-ball task, in which subjects either applied a range of grip-forces (GF) guided by visual cues (action execution, AE) or observed a video of the same task without squeezing the ball (action observation, AO). In both tasks, active regions including bilateral primary visual cortex, left primary motor cortex, supplementary motor area with premotor cortex (SMAPMC), cingulate cortex, superior parietal lobule, and right cerebellum showed the same fixed effective connectivity. Interestingly, the cerebellar communication with other regions changed nature, from excitatory in AE to inhibitory in AO. Moreover, there were non-linear signal modulations between SMAPMC and cerebellum in AE, which were linear in AO. Thus, the presence of sensorimotor feedback in AE discriminates the way the cerebellum operates as a forward controller on SMAPMC. Further studies should investigate how sensorimotor control impacts on cerebro-cerebellar loop function and dysfunction in neurological diseases.

92. Anyi Liu - UCL Institute of Ophthalmology

POSTER TITLE
Apical dendrites drive surround responses in visual cortex

AUTHORS
Liu A, Harris KD, Rossi LF, Carandini M

ABSTRACT
Pyramidal neurons have prominent apical dendrites that are hypothesised to modulate somatic output. In the visual cortex, apical dendrites may receive contextual signals via top-down inputs and local inhibition. It is not known, however, what causal effects they play in driving or suppressing somatic activity, and how they shape a neuron's visual tuning.
We recorded activity of pyramidal neurons sparsely expressing GCaMP7s in layer 5 of visual cortex in awake mice before and after pruning their apical dendrites with two-photon dendrotomy. Together with the neuron's receptive field and orientation/direction selectivity, we measured properties that depend on sensory and behavioural context: size tuning and correlation with facial movements. Then we repeated these measurements after pruning the apical dendrite of 51% neurons (n=118, N = 6), sparing the others as controls.
Pruning the apical dendrite significantly reduced all visual response by a factor of 0.65 ($p<0.05$) compared to controls, but did not affect orientation/direction selectivity, nor change the neurons' correlation with facial movements. It did not decrease surround suppression:

neurons preferring small stimuli did not change their tuning. However, it reduced responses to large stimuli in neurons that preferred those stimuli.
In conclusion, the apical dendrite appears to deliver visual drive from distant parts of visual space to the neurons that prefer large stimuli. Additionally, it amplifies responses to stimuli within the receptive field. Finally, the apical dendrite does not seem to carry behavioural signals, which may instead arise from inputs to the basal dendrites.

93. Kaho Magami - UCL Ear Institute

POSTER TITLE
The susceptible brain: How short interruptions affect long term auditory scene representations – evidence from EEG

AUTHORS
Magami K, Pearce M, Chait M

ABSTRACT
The brain predicts future events by tracking stimulus context. Previous work has demonstrated a neural signature for this process in the sustained EEG response. It has been shown that listeners' brains represent the predictability of the ongoing stimulus and use this inferred model to process incoming information. Here we investigated how these context representations are affected by brief interruptions (e.g., phone notifications). Two hypotheses were considered: (a) interruptions and the ongoing context are separately represented in the brain, (b) interruptions are integrated into the representation of the context. Understanding these processes is crucial for unravelling the heuristics utilised by the brain for environment tracking and may also provide simple models for more complex phenomena like PTSD.
We used EEG measurements in 28 naïve participants passively listening to structured tone-pip sequences. Some scenes included unexpected tone-pips violating scene patterns. We observed that such interruptions affected ongoing scene representations: post-interruption brain states never reverted to pre-interruption states. An ideal observer model suggested that this reflects increased expectation of unpredictability after experiencing interruptions. These findings provide new insight into how dynamic environments are represented in the brain and how transient surprises may influence long-term processing, relevant to conditions like PTSD.

94. Jay Mavi - Department of Natural Sciences

POSTER TITLE
Source localisation of pain-related activity in the developing neonatal brain

AUTHORS
Mavi J

ABSTRACT
In early life, many neonates undergo medical procedures which involve tissue-breaking noxious stimuli. Given the host of long-term adverse effects associated with repeated noxious stimuli in infancy, elucidating the emergence of pain-related processing at the cortical level is of significant importance. Electroencephalography (EEG) is a commonly used technique within the field, partly due to its high temporal resolution; however, the inability to

infer the spatial distribution of cortical activity from EEG data has provided a barrier to research progress. A potential solution to this problem is EEG source localisation; a technique which algorithmically determines the cortical activations which may have given rise to observed EEG data. Utilising MRI-derived models of neonatal anatomy and the source localisation software package Brainstorm, we investigated the cortical response to a noxious stimulus in 126 infants of varying postmenstrual ages. In doing so, we provide the first example of distributed EEG source mapping of the neonatal brain following a noxious stimulus. Results indicated that regions associated with sensory processing and sensorimotor integration, such as superior parietal, inferior parietal, and paracentral areas, become preferentially activated relative to other regions throughout development. This may reflect the emergence of more refined encoding and processing associated with noxious stimuli.

95. Sherylanne Newton - UCL Ear Institute

POSTER TITLE
Absence of Embigin causes multi-system failure in C57BL/6N mice due to interaction with Cdh23-ahl

AUTHORS
Newton S, Aguilar C, Bunton-Stasyshyn R, Marcotti W, Brown SDM, Bowl MR

ABSTRACT
Cadherin23 (CDH23) is an integral component of tip links, which are essential for mechanical gating of the transducer channels in response to sound-induced deflection of the stereocilia bundle. In mouse the strain-specific Cdh23ahl allele, present in several inbred strains, predisposes the carrier to progressive hearing loss beginning at high-frequencies from 3-months of age. Recently, we demonstrated that the neural cell adhesion molecule (NCAM) Neuroplastin genetically interacts with the Cdh23ahl allele through an association between Cadherin23 and Plasma Membrane Calcium ATPase (PMCA) proteins. Here we investigate if the related NCAM, Embigin, is also required for hearing and whether it genetically interacts with the Cdh23ahl allele. We have undertaken phenotypic characterisation of an Embigin-knockout mouse mutant (Embtm1b) on both a standard C57BL/6N background (C57BL/6N-Cdh23ahl) and a co-isogenic background, where we have repaired the Cdh23ahl allele (C57BL/6N-Cdh23753A>G). Embtm1b/tm1b mice on a C57BL/6N background exhibit progressive high-frequency hearing loss beginning at 3-6 weeks of age with a concomitant reduction in DPOAE response output at the affected frequencies. This loss of sensitivity occurred in the absence of: hair cell loss; stereocilia dysmorphology; ribbon synapse loss; or, any other gross cochlear defect. Furthermore, the absence of Embigin resulted in embryonic brain and cardiac defects, and a related perinatal sub-viability. Contrastingly, Embtm1b/tm1b mice on the repaired C57BL/6N-Cdh23753A>G background exhibit normal hearing and viability. However, unlike in the case of Neuroplastin, there was no evidence of a physical interaction between Embigin and PMCAs using co-immunoprecipitation of cochlear lysates. We demonstrate that the presence of the Cdh23ahl allele affects phenotype expressivity of the Embigin mutant mice through a, so far, unknown genetic interaction. To our knowledge, these findings are the first to demonstrate deleterious effects of the common Cdh23ahl outside of the auditory system. This has important implications for all genetics studies using inbred strains harbouring the Cdh23ahl allele.

96. Eleni Petridou - UCL Research Department of Neuroscience, Physiology and Pharmacology

POSTER TITLE
Actions have consequences: how does the brain use sensory feedback to adapt behaviour across time and complexity scales?

AUTHORS
Petridou E, Bianco I.

ABSTRACT
Sensory feedback, the change in sensory input that arises from one's own movements, can be used to evaluate self-generated actions and inform subsequent behaviours. Such adaptations can occur over different time and complexity scales, ranging from acute adjustments of motor kinematics to long-lasting changes in behavioural strategies. However, the circuit mechanisms by which the brain uses sensory feedback to achieve these adaptations is still unknown. An experimentally accessible model to address this question is the larval zebrafish, which allows brain-wide circuit activity to be monitored during behaviour. By placing zebrafish in a virtual reality environment, we are examining how disruptions in visual feedback modulate the kinematics and structure of hunting, a visually driven behaviour during which the animal pursues its prey using finely calibrated motor actions. Specifically, our analysis focuses on the assessment of motor and temporal characteristics of individual predatory actions, the transition to subsequent actions withing a hunting sequence - potentially reflecting acute adaptations- to the overall duration of sequences and the initiation-abort probabilities the animals might display as a result of longer-term adaptions and previous experiences. In the future we will use whole-brain calcium imaging to identify changes in neural activity associated with these multiscale adaptations.

97. Irene Salgarella - Laboratory for Molecular Cell Biology

POSTER TITLE
Neural Mechanisms Underlying The Onset of Parenting By

AUTHORS
Salgarella I, Ammari R, Kohl J

ABSTRACT
Parenting is a social behaviour that is modulated by both hormones and experience (Kohl et al, 2018). While pregnancy hormones lead to an onset of parental behaviour before female mice encounter pups by remodelling galanin-positive neurons in the medial preoptic area (MPOAGal) (Ammari, Monaca et al., 2023), parenting can also be elicited in virgin females by repeated exposure to infants (Stolzenberg, Rissman, 2011), a process called sensitization.
My project will address whether these different routes to parenting act on the same, or different, circuit nodes. My behavioural assays have shown that four days of pup exposure can increase the maternal performance of virgin females to match that of mothers, although, post-exposure, only some mice maintain enhanced caregiving. Sensory deprivation experiments suggest that vomeronasal and / or tactile stimuli are required to trigger this behaviour.

In sensitized females, MPOAGal neurons show an increased frequency of both excitatory and inhibitory postsynaptic currents, but only the amplitude of the former is increased, and no changes in spine density are observed. This implies that the neural adaptations contributing to sensitization are predominantly presynaptic, with the possibility of postsynaptic alterations. My project will thus make crucial contributions towards our understanding of plasticity in instinctive behaviour circuits.

98. Sina Tootoonian - Sensory Circuits and Neurotechnology Laboratory

POSTER TITLE
Understanding the input-output transformation of the olfactory bulb

AUTHORS
Tootoonian S, Ackels T, Schaefer AT

ABSTRACT
Understanding a brain area requires specifying both what function it performs and how neurons and synapses implement that function. Modern high-density neural recordings and high-resolution connectomics provide ever larger datasets for such understanding and require methodologies that efficiently combine them into neuroscientific insights. The easy accessibility, rich structure and dynamics, and behavioural importance of the mouse olfactory bulb (OB) make it an enticing testbed for developing such methodologies. To determine the function of the OB we used calcium imaging to record both the input and output responses of hundreds of glomeruli to nearly 50 odours. These revealed a striking decorrelation of odour representations from input to output. To determine how this decorrelation function was implemented, we simulated linear models of the OB and fit their connectivity to match observed output representations given those at the input. By constraining the connectivity we determined the contributions of different motifs to the implementation. We then applied theoretical analyses to describe connectivity solutions in terms of the geometry of the input and output representations. Our work demonstrates how physiological recordings can be fruitfully combined with computational and theoretical approaches to provide an understanding of neural computation testable by modern connectomic datasets.

99. Giulia Zuccarini - UCL Research Department of Neuroscience, Physiology and Pharmacology

POSTER TITLE
Neural circuits underlying hunting sequence generation in larval zebrafish.

AUTHORS
Zuccarini G, Bianco IH

ABSTRACT
Animals accomplish complex goal-directed behaviors by chaining together simpler motor actions into behavioral sequences, but it is not well understood how the brain organizes such action sequences.
In larval zebrafish, hunting is an innate, visually guided behaviour, composed of a sequence of specialised motor outputs dynamically selected and tuned in response to a changing visual input. In previous work we identified a population of pretectal neurons that command

hunting initiation, and neurons in the nucleus isthmi required to sustain the behaviour. However, little is known about the neural dynamics of these or other neural populations during extended hunting.
By combining a closed-loop virtual hunting assay with calcium imaging, we monitored neural activity during extended hunting sequences and identified activity related to the progression of the hunting sequence per se, specifically in a small population of cells of the intermediate hypothalamus.

Other (History of Neuroscience, Public Awareness of Neuroscience, Resource Posters) | Drama Studio

100. Philippa Chapman - UCL Research Department of Neuroscience, Physiology and Pharmacology

POSTER TITLE
On the regulation of arterial blood pressure by an intracranial baroreceptor

AUTHORS
Chapman P, Korsak A, Kellett D, Marina N, Gourine A

ABSTRACT
There is evidence for the existence of an intracranial baroreceptor mechanism(s) capable of sensing changes in cerebral blood flow; however, little is known about the sensitivity of this mechanism and its interaction with peripheral baroreceptors. The aim was to characterise the cardiovascular responses to changes in cerebral perfusion induced by manipulations of intracranial pressure (ICP).

Experiments were performed in adult Sprague-Dawley rats, anesthetized with urethane. The lateral cerebral ventricles were cannulated to record and manipulate ICP.

The resting ICP in rats anesthetized with urethane was 6.2 ± 0.7 mmHg (n=8). Following a craniotomy that reduced ICP to 0 mmHg, arterial blood pressure (ABP) decreased. Restoring the integrity of the intracranial space increased ABP to the baseline level. Progressive increases in ABP were observed in response to increases in ICP. In the absence of inputs from the arterial baroceptors the ABP responses to ICP increases were preserved. Analysis of the cardiovascular responses to the electrical stimulation of the aortic depressor nerve suggested baroreflex re-setting at raised ICP.

These data demonstrate that the intracranial baroceptor mechanism is sensitive to changes in cerebral perfusion and at raised ICP, the baroreflex control of sympathetic vasomotor activity is reset, compensating for reduced brain perfusion.

101. Janet Clark - Division of Intramural Research Programs

POSTER TITLE
UCL-NIMH Joint Doctoral Training Program in Neuroscience

AUTHORS
Clark J, Roiser J

ABSTRACT
The UCL – National Institute of Mental Health (NIMH) Joint Doctoral Training Program in Neuroscience is an accelerated graduate program for exceptional students. The NIMH and UCL employ some of the most accomplished neuroscientists in the world and offer an outstanding educational experience. This graduate training program brings together two powerhouses of neuroscience research and allows students to conduct collaborative research between two laboratories, one at UCL, the other at the NIH. Unlike many US graduate programs, students in the UCL-NIMH Program choose their area of research, and

their mentors, before completing their application. Students are registered in the UCL Doctoral School and receive a PhD from UCL in 4 years or less. Scholarships include students' fees, stipend, health benefits and a travel allowance. UCL graduate students in Neuroscience can participate in the program as Advanced Scholars visiting the NIH for 1 to 2 years as part of their graduate training. This program is administered by the NIMH Intramural Research Program Office of Fellowship Training and Co-Directed by Dr. Janet Clark, Director, NIMH IRP Office of Fellowship Training and Dr. Jonathan Roiser, Professor of Neuroscience and Mental Health, Institute of Cognitive Neuroscience, Division of Psychology & Language Sciences at UCL.

102. Igor Tatarnikov - Sainsbury Wellcome Centre

POSTER TITLE
The BrainGlobe initiative - developing open-source computational neuroanatomy tools

AUTHORS
Tatarnikov I, Felder AA, Plattner V, Sirmpilatze N, Miñano S, Graham W, Tyson AL

ABSTRACT
The BrainGlobe initiative provides open-source computational tools for seamless neuroanatomical analysis and visualisation of microscopy imaging data. Neuroanatomy is key to understanding the brain. However, current tools are often specialised for a single model species or image modality and lack sustained support post-publication. The BrainGlobe Atlas API provides a generalised framework for representing multiple anatomical atlases within and across species, allowing our tools to be uniquely interoperable. Further, through the use of napari, we provide an easy to use graphical interface for all steps of an analysis pipeline, from data preprocessing to visualising outputs. Our goal is to empower users with easily accessible analysis and visualisation tools that can be ready for use within minutes on a standard laptop. At present, we maintain 30+ repositories with ~10k monthly downloads and 60+ code contributors.

Our team is continually working on addressing the needs of the community. Currently, efforts are underway to broaden the types of microscopy data registrable into the BrainGlobe ecosystem with brainglobe-registration, using elastix to register 2D slices, 3D sub-volumes, and whole brain data. Additionally, we are developing brainglobe-stitch, a package for stitching large tiled 3D imaging datasets (300+ GB). This package will be available as a napari plugin to allow efficient previewing of the fused dataset.

103. Laetisha Witoyo - Institute for Global Health

POSTER TITLE
Examining factors that may affect the career success of consultant neurologists in the United Kingdom

AUTHORS
Witoyo LA, Kapsetaki ME

ABSTRACT
Equitable representation is key for successful clinical and research work.This study examined whether there are disparities in gender, perceived skin colour, education, academic productivity, and career progression among UK neurologists. Data were collected

from online sources. A total of 1010 consultant neurologists were found to be working in the UK. There was predominance of men at consultant level, with a university affiliation, and with a full professor position. All 24 female full professors had white skin colour. Less black or brown neurologists had obtained a PhD and were consultants. Less females were currently affiliated with a university and had obtained their medical degree from a top university. Male and white neurologists had higher bibliometrics. Neurologists with a shorter surname had more citations. The surname's complexity was negatively associated with the h-index and citations. The names of top university graduates (for medical degree) had less syllables. Neurologists with a popular forename had higher bibliometrics. Male neurologists with more masculine names were more likely to be top university graduates (for medical degree) and had higher bibliometrics. In conclusion, this study revealed that there are gender, skin colour, education, academic productivity, and career progression inequalities among UK consultant neurologists.