

Newsletter



- **Prof. Yin WU's research investigated the neural mechanisms underlying human social cognition and behavior using fMRI and fNIRS**
- **New at UBSN: an MRI-compatible response system is now available**
- **Celebrating UBSN Neuroscience Conference and Workshops 2026**
- **Congratulations to the winners of UBSN Best Paper Award 2026**



Investigating the neural substrates of human social cognitive behavior

Prof. Yin WU

High Testosterone Levels Lead to Increased Selfishness and Its Neural Mechanism

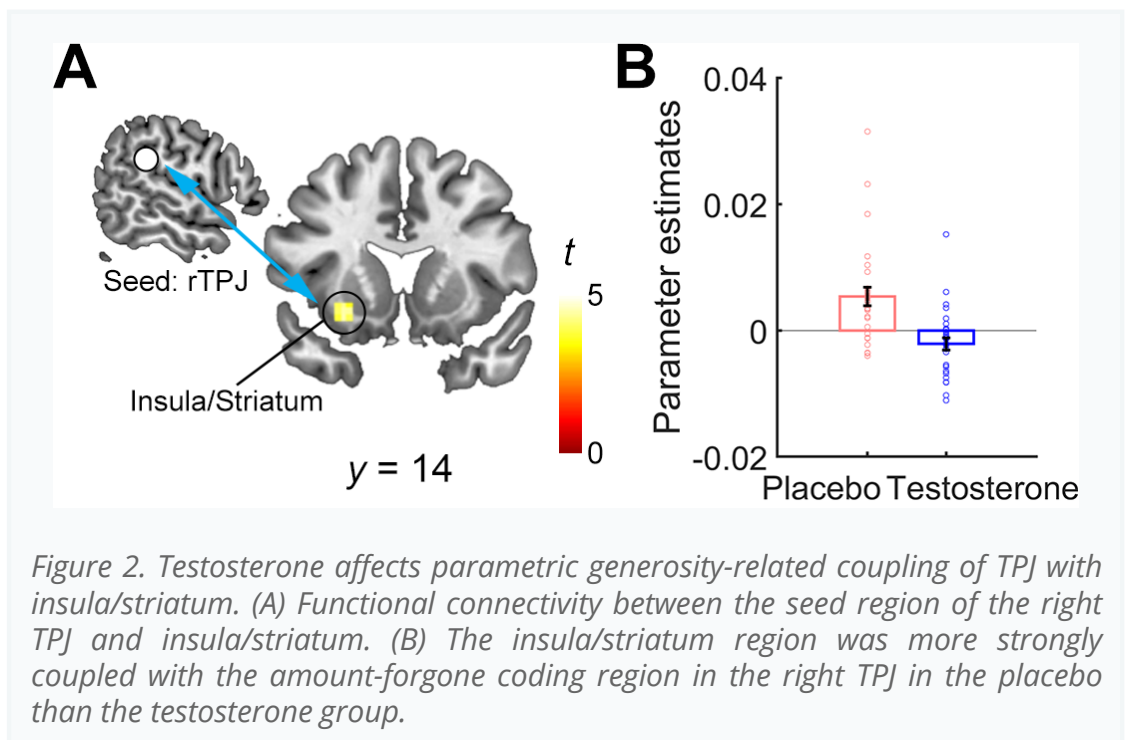
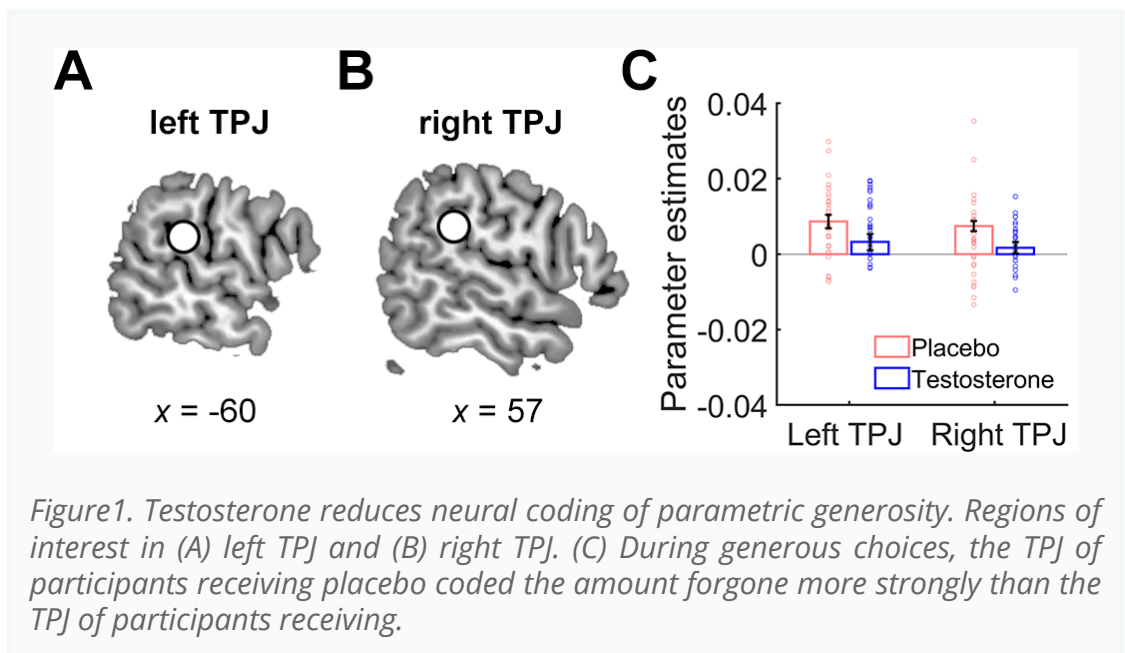
Testosterone is the primary male sex hormone. It helps build muscle, strengthen bones, and boost sex drive. Its links to aggression, competition, and social dominance have long been documented, but how it influences social cognitive behavior in the brain has remained unclear. Prof. WU's research team set out to find the neural mechanism underlying this effect.

They recruited healthy young men and gave half of them testosterone gel, the other half placebo, which followed the randomized double-blind experimental design. Then, they asked the participants made a series of monetary decisions while lying inside an MRI scanner. MRI tracks blood flow in the brain, showing which areas become active during specific tasks. During each trial, participants saw a number from 1 to 100, indicating how close they felt to another person (1 = best friend, 100 = stranger). They then chose between a generous option (both got money) and a selfish option (only they got more money). By varying the amount of money they could keep, the task directly measured their willingness to forgo personal gain for another's benefit.

The results showed that testosterone made men less generous – but only toward strangers. In the brain, the researchers focused on the temporoparietal junction (TPJ), a region that helps us understand others' thoughts and feelings, like an empathy center. In men who received placebo, TPJ activity increased the more money they gave away. In men who received testosterone, that



brain response was muted. Testosterone also weakened the connection between the TPJ and the striatum, a deeper brain area that processes reward and motivation. Normally, these two regions work together to make sharing feel good; however, the results indicated that testosterone disrupted this conversation.





This study shows that generosity isn't just a moral choice but also has its biological foundation. By revealing a clear hormonal and neural pathway, it helps explain why we sometimes ignore strangers in everyday life, and why competition can override cooperation.

Understanding Cognitive Flexibility and Stability in Pilots using fNIRS

Effective goal-directed behavior requires a delicate balance between two mental abilities. Cognitive flexibility is our capacity to switch attention or adjust strategies when circumstances change. Cognitive stability, on the other hand, is our ability to stay focused on the current task while ignoring distractions. Traditionally, these two abilities have been seen as opposites: the more flexible you are, the less stable, and vice versa. But real-world performance often demands both abilities at the same time.

Pilots offer a fascinating window into studying this balance. In the cockpit, they must continuously monitor instruments, communicate with air traffic control, navigate, and manage the aircraft, while filtering out irrelevant information to ensure aviation safety. A pilot who is too rigid may fail to adapt when unexpected weather or system failures arise; one who is too easily distracted may miss critical warnings. Understanding how expert pilots manage this stability-flexibility dilemma could reveal what makes them exceptional and inform better training for the next generation.

To investigate this topic, Prof. Wu's team recruited licensed pilots and non-pilots based in Hong Kong. The participants completed a computerized task designed to measure how well they can switch between different rules and resist interference from competing information while recording their brain activity through functional near-infrared spectroscopy (fNIRS) imaging. Importantly, the researchers went beyond simply comparing average accuracy and



reaction time. They also examined behavioral variability, which indicates how much a person's performance fluctuates from trial to trial.

The implications of this research extend far beyond the laboratory. Hong Kong is one of the world's most important aviation centers.



Its airport is consistently ranked among the busiest international passenger airports globally. Given this prominence, ensuring the highest standards of pilot performance is not just a matter of professional interest but also a matter of public safety and economic necessity. Ultimately, this research bridges basic cognitive science with real-world expertise, showing that how consistently we perform may be just as important as how well we perform.

Publications related to the article:

- Huang, H., Guo, Y., Lu, J., Li, F., & Wu, Y. (2026). Cognitive Framework for Aircraft Piloting: A Core Cognition Set. *Behavioral Sciences*, 16(8), 1348.
- Long, J., Lu, J., Hu, Y., Tobler, P. N., & Wu, Y. (2025). Testosterone administration increases the computational impact of social evaluation on the updating of state self-esteem. *Biological Psychiatry: Cognitive Neuroscience and Neuroimaging*, 11(4): 406-415.
- Liu, S., Tobler, P., Hu, Y., & Wu, Y. (2025). How testosterone administration affects learning to avoid harm in healthy men: A double-blind, placebo-controlled study. *Biological psychology*, 109108.
- Ou, J., Wu, Y., Hu, Y., Gao, X., Li, H., & Tobler, P. N. (2021). Testosterone reduces generosity through cortical and subcortical mechanisms. *Proceedings of the National Academy of Sciences*, 118(12), e2021745118.



Prof. Yin WU

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Research Institute for Sports Science and Technology (RISports), The Hong Kong Polytechnic University



Prof. WU is an Associate Professor of psychology in the Department of Applied Social Sciences, The Hong Kong Polytechnic University. He obtained his PhD degree from University of Cambridge. His research interests are cognitive neuroscience and decision neuroscience, with a focus on the role of hormones in human social cognition and decision-making. For example, his key research questions include how testosterone influences economic decision-making such as risk choice. How does testosterone influence social preference such as altruistic behavior? To address these questions, Prof. WU combines behavioral experiments with brain imaging and hormone measurement. His research findings have been published in leading journals such as PNAS, Proceedings of the Royal Society B: Biological Science, Psychoneuroendocrinology and Hormones and Behavior. Prof. WU has been awarded research grants from Hong Kong Research Grant Council, National Natural Science Foundation of China and Alexander von Humboldt Foundation.

Q1: *Your research found that testosterone reduced generosity specifically toward strangers, not close friends. Does this suggest an evolutionary mechanism where biological drives prioritize kin or established social bonds over broader societal cooperation?*

“Yes, it suggests that there are evolutionary mechanisms underlying human prosociality.



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Q2: Could intrinsic biological factors, such as circulating testosterone concentrations or androgen receptor sensitivity, predict or modify the neural and behavioral responses to exogenous testosterone manipulation?

“Yes, there are some published studies showing that the effects of testosterone administration critically depend on individuals' androgen receptor genetic polymorphism and prenatal testosterone exposure in the womb.”

Q3: In the pilot study, what are the potential confounds in comparing licensed pilots to non-pilot controls (e.g., years of training, baseline cognitive aptitude, or flight hours), and how might the use of behavioral variability as a dependent measure mitigate or amplify these concerns?

“Licensed pilots and non-pilots inherently differ in years of training, baseline cognitive aptitude, and cumulative flight experience. To partial out the potential effect of these variables, we treat flight hours and relevant demographic variables as continuous covariates in our statistical models, thereby enabling us to statistically isolate the influence of flight experience when comparing group differences in task performance.”

Q4: Given that fNIRS offers lower spatial resolution but greater ecological validity than MRI, what trade-offs did you face in choosing fNIRS for the pilot study, and how might the choice of imaging modality shape the conclusions drawn about expertise-related neural adaptations?

“One of the primary reasons for choosing fNIRS over MRI is ecological validity. MRI requires a supine position, head restraint, and a noisy magnetic environment, conditions that substantially differ from a pilot's real working context and that may induce stress or alter cognitive strategies. fNIRS, in contrast, allows participants to sit upright, respond through manual buttons, and even engage in cockpit-like interactions, thereby better preserving the real-world relevance of our task.”



Celeritas Fiber Optic Response System



The **Celeritas Fiber Optic Response System (Celeritas system)** is an MRI-compatible response system designed to support task-based fMRI studies. The system consists of an interface console, a joystick, and a left-hand five-button Button Response Unit (BRU). The BRU and joystick comfortably fit small to large hand sizes and are constructed entirely of non-metallic components, completely eliminating metal from inside the magnet room. The units communicate button presses through fiber optic cabling, which connects to the interface console located in the control room through an available waveguide.

Joystick Features:

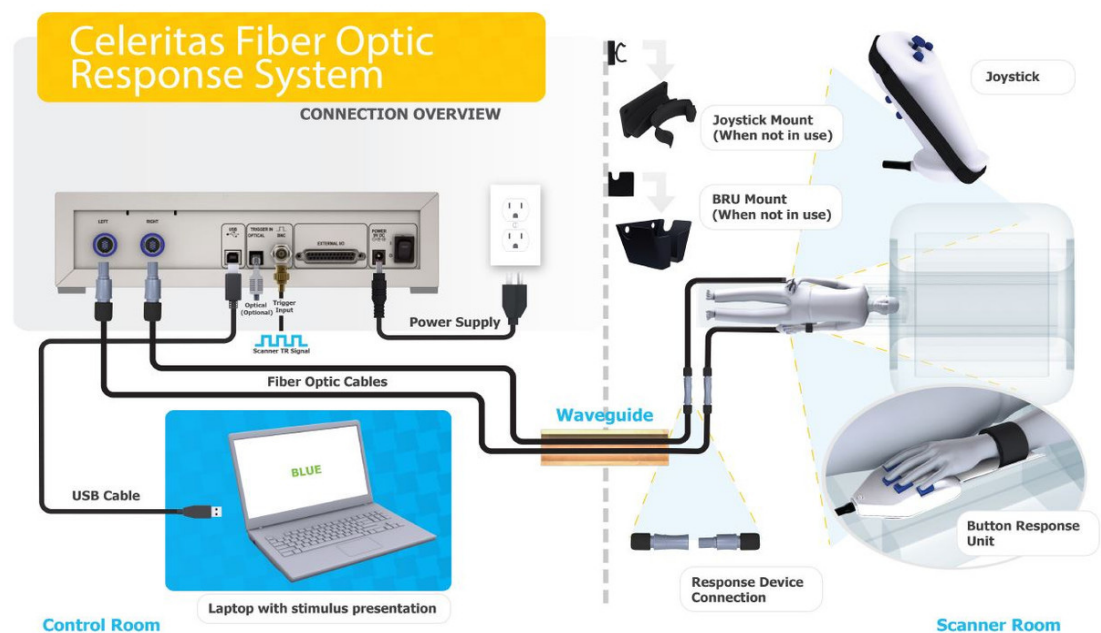
- Omnidirectional analog stick with four buttons
- Comfortable ambidextrous design
- Hand strap for comfortable positioning
- Molded from chemical resistant, medical grade, biocompatible plastic
- Contains no metal or conductive materials



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BRU Features:

- Ergonomic design
- Wrist strap and adjustable wrist sled for a more comfortable fit and to reduce participant non-conformance (i.e., dropping the button units, participant losing finger positions)
- Tactile indicator on index finger button to remind the participant of correct finger placement (five-button BRU only)
- Molded from high-impact, chemical resistant, medical grade, biocompatible plastic
- Contains no metal or conductive materials



For enquiries, please contact Dr. Joseph LAI (joseph-hc.lai@polyu.edu.hk)



UBSN Neuroscience Conference & Workshops 2026

UBSN successfully held its second Neuroscience Conference on 27 June, 2026. The event brought together a distinguished lineup of keynote speakers, plenary presenters, and academic peers for a day dedicated to cutting-edge scientific exchange.

The conference opened with welcoming remarks from Prof. Cheng DONG and UBSN Director Prof. Marco PANG. Attendees engaged in fruitful discussions on the latest developments in neuroscience research throughout the day. The event concluded with closing remarks from UBSN Associate Director Prof. Hualou LIANG, who thanked participants for their valuable contributions and collaborative engagement.





Recent Events

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The conference featured a series of insightful keynote presentations. Prof. Yoshihiro NODA opened the session by presenting his research on identifying refined neuropsychiatric biomarkers using TMS-EEG co-registration and exploring universal clinical epidemiological insights through large-scale TMS registries. Prof. Sheng HE shared his findings on feedback processing and attention in the human brain, while Prof. Bing ZHANG provided valuable perspectives on the practice and progress of cognitive neuroimaging genetics.

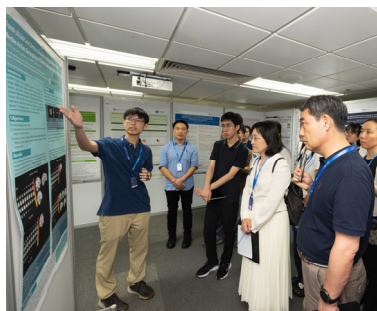
Distinguished researchers from PolyU showcased pioneering studies. Prof. Sonata Suk-Yu YAU explored the neuro-mechanisms underlying the antidepressant effects of both acute and chronic physical exercise. Prof. Ran TAO presented his work on the neural mechanisms of Cantonese lexical tone, tracing its path from feature representation to cognitive flexibility.

Prof. Yoshihiro NODA and Prof. Sheng HE also conducted two concurrent workshops on 28 June and shared valuable insights with our participants throughout the full-day program.



Recent Events

UBSN
SEP
2026



The event featured vibrant poster presentations that generated strong interest and spirited academic exchanges among attendees. UBSN also celebrated research excellence by presenting the 2026 UBSN Best Paper Awards and Best Poster Awards to recognize outstanding research contributions.

The prestigious Best Paper Awards were presented to Prof. Sonata YAU, Prof. Georg S. KRANZ, and Prof. Feng PAN in recognition of their outstanding research publications. The Best Poster Awards were presented to Dr. Tongyu MA, Mr. Akhlaq HUSSAIN, and Mr. Jerry TSE for their excellent poster presentations. UBSN extends its warm congratulations to all awardees on their remarkable achievements and contributions to neuroscience research.



Animal TMS training session

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2026



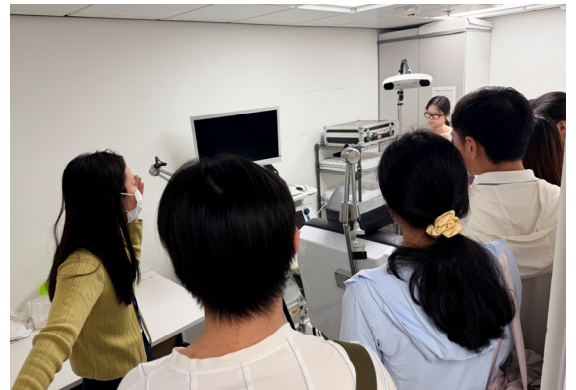
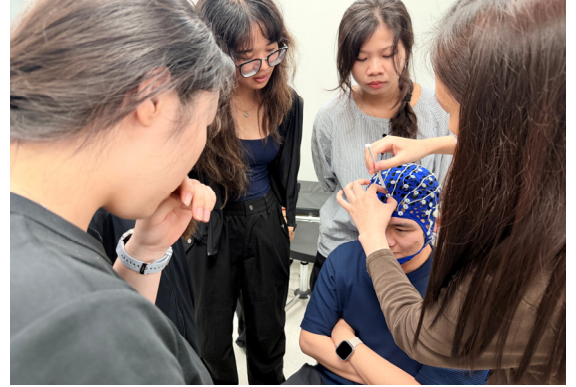
On 6 Aug 2026, UBSN hosted a specialized training workshop dedicated to Transcranial Magnetic Stimulation (TMS) in animal models. The session combined informative lectures, technical demonstrations, and interactive hands-on practice, offering researchers a comprehensive foundation in both data acquisition and experimental analysis.

The workshop provided in-depth coverage of the underlying physical principles, safety considerations, and evolving technologies used to adapt TMS for small-animal studies. Attendees explored practical techniques essential for high-precision research, including animal positioning, motor threshold (MT) determination, and key stimulation protocols.



Recent Events

UBSN
SEP
2026



Visited by students participating in the DRC Summer Immersion Programme in July 2026



UBSN's summer of academic exchange began in July 2026 with visits from six groups of postgraduate students participating in the DRC Summer Immersion Programme. The students explored UBSN's facilities through in-depth laboratory tours and practical workshops using the stereotaxic frame and mobile EEG system. Participants were also introduced to the MRI system and its screening procedures and gained insights into advanced neuroscience research facilities. Each tour concluded with the presentation of UBSN souvenirs.



Recent Events

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2026



Visited by students from Western Sydney University in July 2026



Visited by Prof. Danial from the Faculty of Health and Life Sciences at the Management and Science University, Malaysia in August 2026



During July and August 2026, UBSN welcomed students from Western Sydney University and Prof. Danial, a lecturer and researcher from the Faculty of Health and Life Sciences at Management and Science University (MSU), Malaysia, for academic exchange visits.

These exchanges fostered meaningful discussions, strengthened international collaborations, and showcased UBSN's advanced research facilities, providing visitors with firsthand exposure to the University's vibrant research environment.



Congratulations to the winners of *UBSN Best Paper Award 2026*

UBSN is delighted to announce the results of the UBSN Best Paper Award 2026. This year, we received a remarkable number of impressive applications, and we extend our sincere appreciation to all the applicants. After a rigorous evaluation process by our panel of judges from the UBSN Management Committee, we are delighted to announce the winners of Gold, Silver, and Bronze Awards.

Gold Award

Prof. Sonata YAU (Department of Rehabilitation Sciences)

"Rapid antidepressant effect of single-bout exercise is mediated by adiponectin-induced APPL1 nucleus translocation in anterior cingulate cortex" published in **Molecular Psychiatry**

Silver Award

Prof. Georg S. KRANZ (Department of Rehabilitation Sciences)

"Investigating the hemodynamic response to iTBS of the left DLPFC: a concurrent iTBS/fNIRS study" published in **Brain Stimulation**

Bronze Award

Prof. Feng PAN (School of Optometry)

"The Role of Connexin 36 Gap Junctions in Retinal Ganglion Cell Death After Corneal Alkali Burns" published in **Investigative Ophthalmology and Visual Science**

Each winner will receive funding support for using UBSN equipment to encourage their ongoing pursuit of impactful research. Please join us in congratulating the winners of the UBSN Best Paper Award 2026 for their excellent achievements!



Events Ahead

MARK YOUR CALENDAR

9 – 11 September 2026, 9:00am – 5:30pm

“EEG and NeuroScan CURRY 9” Training Workshop

Venue: AG710

Co-organizer: Tronda Electronics Ltd.

Speakers:

- Reyko Tech (Software Developer, Compumedics Neuroscan)
- William Oliver (Clinical & Research Specialist for CURRY)

11 November 2026, 4:00pm – 5:00pm

Seminar: "Neural mechanisms of naturalistic reading comprehension: Insights from the alignment between the human brain and LLMs"

Speaker: Dr. Chanyuan Gu

Department of Language Science and Technology, The Hong Kong Polytechnic University

19 November 2026, (please stay tuned!)

“Tobii Eye Tracking” Training Workshop

Co-organizer: Tronda Electronics Ltd.

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