



Department of Psychology
The University of Hong Kong

香港大學心理學系

Brown Bag Lunchtime Seminar (Theme: Cognition and Neuroscience)

Neural correlates of contextually modulated depth perception in humans

12:30 p.m. – 1:30 p.m. | October 22, 2021 (Friday)

Rm 813, 8/F, The Jockey Club Tower | Centennial Campus | The University of Hong Kong



Nicole Hiu Ling WONG

Ph.D. student

Department of Psychology

The University of Hong Kong

Abstract

Binocular disparity, referring to the difference between the left and right retinal images, is a powerful cue that allows humans to extract depth information from object structures. We present findings from a series of experiments investigating how depth processing is modulated by contexts, specifically object relevance.

In Study 1, we measured behavioural and neural (fMRI) responses to depth information of 3D objects. Stimuli were disparity-defined geometric objects rendered as random dot stereograms (RDS), presented in plausible and implausible variations. We tested two tasks that targeted different aspects of depth perception: 1) a signal-in-noise (SNR) task that involved judging the depth position of a target embedded in noise, and 2) a feature task that involved discriminating the nearer of two consecutively presented targets. Depth sensitivity to implausible objects was lower than that of plausible objects. Multivariate representations for plausible and implausible objects were distinguishable along depth-relevant region V7, in addition to object-relevant lateral occipital cortex (LOC).

In Study 2, we investigated how V7 and LOC modulate depth processing based on object plausibility by applying transcranial magnetic stimulation (TMS) during the completion of a SNR task. We compared the depth sensitivities of plausible and implausible objects obtained during TMS over V7, LOC, and a control site. Depth sensitivity to implausible objects was higher relative to plausible objects during disruption of LOC and control site, suggesting a downweighing of depth calculations for plausible objects, consistent with previous data. TMS over right V7 resulted in higher depth sensitivity to plausible objects relative to implausible objects. This implicates V7 as a locus for contextual modulation of depth processing by changing the weighing of depth signals.

In Study 3, we examined whether differing levels of animacy and status (i.e., living versus non-living) of daily objects would affect depth processing. Results indicated that observers are most sensitive to living, low-animacy objects when making SNR depth judgements.

Taken together, we show that the weighing of depth signals is affected by object plausibility and biological relevance. Importantly, depth processing not only contributes to object-level processing but is in turn under the influence of object analysis. This indicates an intricate relationship between depth perception and object processing, and highlights a highly dynamic visual system.

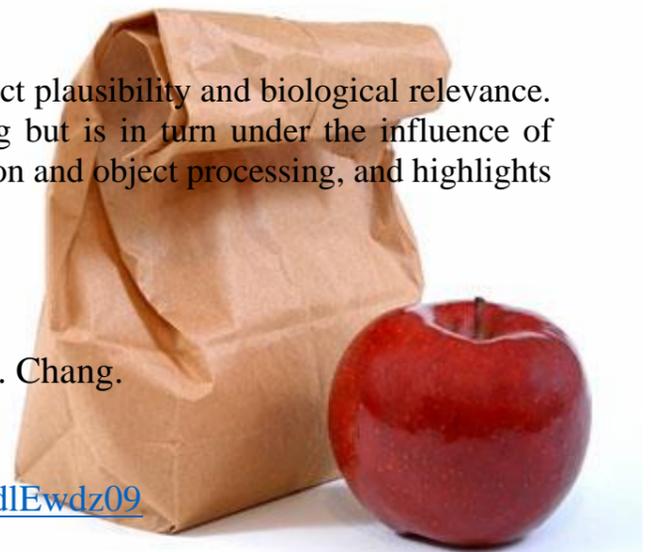
About the speaker

Nicole is a final year PhD student under the supervision of Dr Dorita H.F. Chang.

Zoom (For participants who couldn't attend the Seminar in person)

<https://hku.zoom.us/j/3951550048?pwd=SncvL3RYakEycUtpL29vdDJEdlEwdz09>

Meeting ID: 395 155 0048 | Password: psyc



~All are Welcome~

Enquiry: rpsyc@hku.hk