

EYE GAZE AND SOCIAL DECISION MAKING: BEHAVIORAL AND FMRI STUDIES

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INTRODUCTION: Recent behavioral studies showed that people make more prosocial behaviors when observing eye-like stimuli (Haley & Fessler, 2005). On the other hand, gaze direction has been found to play an important role in social interaction (Carlin & Calder, 2013; Itier & Batty, 2009). Here, we aimed to investigate whether and how social decision making is influenced by the direction of eye gaze (Study I) and the neural correlates (Study II).

METHODS: We recruited 40 females (18~36 years old) in Study I and 30 females (20~29 years old) in Study II. All of them were right-handed and normal or corrected-to-normal vision. None of them reported history of neurological or mental disorders. Study I and II were approved by the local ethical committees in The University of Hong Kong and The East China Normal University, respectively.

Participants were asked to play in an economic exchange game task (Sun, Chan, Hu, Wang, & Lee, 2015; Zhang, Sun, & Lee, 2012) in which they made either prosocial or proself decisions spontaneously. Photos of direct and averted human eyes were shown in randomized order in respective trials as background. The photos were taken from 12 males and 12 females prior to these studies. The number of trials per photo type was 12 and 48 in Study I and II, respectively. The frequency of prosocial choices was measured in Study I. The blood-oxygen-level-dependent (BOLD) signals were collected in Study II using a 3T Siemens Trio Tim MR scanner (33 axial slices parallel to the AC-PC line, TR = 2000 ms, TE = 30 ms, flip angle = 90°, FOV = 192×192 mm², voxel size = 3.0×3.0×4.0 mm³).

RESULTS: In Study I, the direct gaze (mean±se: 52.1±3.8%) was found to be associated with more prosocial choices ($F(1,39)=7.448$, $p=0.009$) than the averted gaze (42.5±3.8%). In Study II, we found in the right striatum, which is a part of the reward-related brain areas, stronger activations for proself than prosocial decisions when the averted gaze was shown (MNI coordinates of the peak voxel: $x = 21$, $y = -3$, $z = 0$, cluster size = 6 voxels, peak Z value = 3.661); while no difference was detected for the direct gaze.

CONCLUSIONS: These results suggest that social decision making is indeed influenced by the gaze direction. The direct gaze may change the anticipated rewards of the proself and/or prosocial decisions, and thus increases prosocial choices.

KEYWORDS: Social Interactions; Other - eye gaze; social decision making; prosocial

PROVIDE REFERENCES IN AUTHOR DATE FORMAT :

- Carlin, J. D. (2013). The neural basis of eye gaze processing. *Current Opinion in Neurobiology*, 23(3), 450-455.
- Haley, K. J. (2005). Nobody's watching? Subtle cues affect generosity in an anonymous economic game. *Evolution and Human Behavior*, 26(3), 245-256.
- Itier, R. J. (2009). Neural bases of eye and gaze processing: The core of social cognition. *Neuroscience And Biobehavioral Reviews*, 33(6), 843-863.
- Sun, D. (2015). Neural Correlates of the Outcome Processing of Dishonest Choices: An fMRI and ERP study. *Neuropsychologia*, In press.
- Zhang, H. J. (2012). Impaired social decision making in patients with major depressive disorder. *Brain and Behavior*, 2(4), 415-423.