

Fantasy Fiction and Facial Recognition: Game of Thrones and the Rose in our Hearts

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ABSTRACT

This article is a review of Noad et al.'s "Familiarity enhances functional connectivity between visual and nonvisual regions of the brain during natural viewing" first appearing in the July 2024 issue of *Cerebral Cortex* from the perspective of a PhD researcher working on listeners' emotional responses to nature sounds measured both by both think-aloud protocol and facial recognition software.

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1. Introduction and Objectives

The cast of the TV adaptation of the *Game of Thrones* (GoT) universe is beautiful. They have remarkable, memorable faces, and when I recognise, for example, Sophie Turner as Jean Grey in *X-Men Apocalypse* (2019), it's a small but simple thrill. The settings are no less arresting. Researchers have recently explored the neural processes involved in recognising familiar faces and places by showing participants 12 minutes of footage excerpted from seasons 3 and 4 of HBO's most-watched series ever and international blockbuster. (1) They compared neural responses between familiar and unfamiliar viewers, including those with developmental prosopagnosia (face blindness), a condition that affects approximately 1 in 33 people. (2) Prior research on facial recognition has relied heavily on 2D, static images, and during natural viewing, substantial changes can occur in how a person's face or a scene is perceived. Why GoT? In a news release issued by York University, lead researcher on the study Kira Noad explained, "We chose to show participants footage from *Game of Thrones* because the series captivated people around the world with its strong characters and their deeply nuanced personalities." (3)

Nomenclature

General Linear Model (GLM): A statistical method used to analyse brain imaging data and identify regions of interest.

Inter-Subject Correlation (ISC): A measure used in the study to assess the similarity of brain activity between participants when exposed to the same stimuli, in this case, footage from Game of Thrones.

2. Methodology

A total of 73 participants were divided into four groups: control participants familiar and unfamiliar with the TV series GoT, and developmental prosopagnosic (DP) participants familiar and unfamiliar with GoT. While the 45 control participants had a median age of 19, the 28 DP participants had a median age of 47. MRI data were collected at the York Neuroimaging Centre using a 3T Siemens Magnetom Prisma MRI scanner with a 64-channel head coil. Data acquisition included gradient-echo EPI sequences and T1-weighted structural images. The study measured inter-subject correlations (ISCs) and functional connectivity within participants' brains. ISCs were calculated by correlating voxel time series within groups, and functional connectivity was measured between defined brain regions. Age had little influence on ISCs and functional connectivity after correction for multiple comparisons.

Participants also completed a behavioural test assessing their familiarity with GoT through narrative understanding, face recognition, and scene recognition. A localiser scan identified face-selective and scene-selective brain regions using three stimulus conditions: faces, scenes, and phase-scrambled faces. Faces had three viewpoints and were presented on a greyscale background, while scenes included various indoor and outdoor settings. Participants performed a task detecting colour changes in a fixation cross. Data analysis involved defining regions of interest (ROIs) using a general linear model (GLM) and clustering

algorithm. Face-selective ROIs included areas like the fusiform face area (FFA), occipital face area (OFA), and amygdala, while scene-selective ROIs included the occipital place area (OPA), parahippocampal place area (PPA), and retrosplenial cortex (RSC).

3. Results

Participants familiar with GoT showed significantly higher recall in narrative, person, and place recognition tests than unfamiliar participants. No significant differences were found in narrative recall between familiar controls and familiar DP groups, though differences emerged in person and place recognition. Neural analysis revealed higher ISCs in temporal, parietal, and frontal lobes for familiar participants, while unfamiliar participants showed higher ISCs in occipital and posterior temporal lobes.

Functional connectivity was notably higher in face and scene regions for familiar participants, especially involving the left fusiform face area (IFFA) and left inferior frontal gyrus (IIFG). The familiarity network exhibited enhanced connectivity with face and scene regions, reflecting a pattern influenced by familiarity, but familiar controls displayed greater face-specific connectivity compared to familiar DPs. Connectivity patterns within face and scene regions were similar across groups, with no significant differences in face- or scene-selective regions nor in connectivity between the familiarity network and these regions.

Face-selectivity and scene-selectivity analyses revealed greater face-selectivity in the left fusiform gyrus and greater scene-selectivity in the parahippocampal gyrus in controls. Significant differences were found in response to faces and scrambled faces in the OFA, FFA, and STS between controls and DPs, but not in scene regions.

4. Discussion

Familiarity is associated with a distributed network of brain regions that extend far beyond the visual cortex. Regions associated with personal knowledge and episodic memory, like the temporoparietal junction, medial prefrontal cortex, and hippocampus, showed strong responses to familiarity. The study found that the deficit in DP involves the visual encoding of faces, as evidenced by lower ISC in the occipital and temporal lobes.

1. The neural response to familiarity is dependent on a distributed network of brain regions.
2. Familiarity enhances functional connectivity between this network and face and scene regions.
3. Participants with deficits in face recognition showed attenuated responses and connectivity in these networks.

5. Conclusion

Natural viewing reveals a network of regions involved in our familiarity with people and places that extends far beyond the sensory cortex. Empirical studies that incorporate natural settings are invaluable for capturing real-world behaviours and contexts, often leading to more ecologically valid results than laboratory experiments and a richer, more nuanced understanding of social behaviour. (4) Controlled laboratory settings may be easier for researchers to manage, but artificial conditions can lead to behaviour and responses that might not occur in everyday life. In Solomon Asch's famous laboratory experiment, participants conformed to group opinion even when it was clearly wrong, demonstrating strong social pressure in a controlled environment, (5) but real-life group dynamics and conflict resolution strategies emerged during Sherif's Robbers' Cave experiment that were not evident in the laboratory. (6) Researchers investigating social and cognitive behaviour must leave laboratory settings for reliable results because, as W.B. Yeats so aptly points out, the faces of our loved ones and how they make us feel are dynamic and always changing:

All things uncomely and broken, all things worn out and old,
The cry of a child by the roadway, the creak of a lumbering cart,
The heavy steps of the ploughman, splashing the wintry mould,
Are wronging your image that blossoms a rose in the deeps of my heart.
The wrong of unshapely things is a wrong too great to be told;
I hunger to build them anew and sit on a green knoll apart,
With the earth and the sky and the water, re-made, like a casket of gold
For my dreams of your image that blossoms a rose in the deeps of my heart. (7)

6. Implications and Future Research

This research demonstrates the value and importance of innovative methods to capture data about emotional and cognitive responses to stimuli within real-world contexts. Although there is ongoing work on visual recognition, we also interact with and are guided by sound. How do we respond to frog song, recognise our mother's lullabies, and interpret the crackling of a fire? And how does the space in which we interact with these sounds impact how we think and feel?

7. Reviewed Article

Noad KN, Watson DM, Andrews TJ. Familiarity enhances functional connectivity between visual and nonvisual regions of the brain during natural viewing. *Cerebral Cortex*. 2024;34(7). doi: 10.1093/cercor/bhae285.

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