# Are you looking at me? Exploring eye scan patterns of TBI and control groups when viewing static and dynamic facial affect

Leanne Greene, Sheffield Hallam University, UK
Dr Lynne Barker, Sheffield Hallam University, UK
Dr John Reidy, Sheffield Hallam University, UK
Dr Nicholas Morton, Rotherham Doncaster and South Humber NHS Trust, UK
Alistair Atherton, Sheffield Community Brain Injury Rehabilitation Team, UK

## Abstract

**Objectives:** TBI frequently leads to socioemotional problems but the mechanisms underpinning these are not well understood. Social interactions are dynamic and impairments in modulating relationships create a barrier to rehabilitation and community re-integration. We investigated eye scan patterns of TBI and controls viewing static/dynamic facial expressions.

**Design:** A factorial design compared correct response, reaction time, fixation duration/count to areas of interest (eyes, nose, mouth) across six emotions (anger, disgust, fear, happy, sadness and surprise).

**Methods:** Seventeen TBI participants were recruited from regional NHS trusts. Seventeen age/gender matched controls were recruited using stratified opportunity sampling. Images from the Amsterdam Dynamic Facial Expression Set (ADFES) were presented on a Tobii T120 Eye Tracker screen. Multivariate and correlational methods were used to analyse data.

**Static Results:** Controls had significantly greater fixation durations and counts to eyes and were faster and more accurate at identifying emotions than the TBI group. The TBI group focused more on the nose compared to controls. Higher scores on the ADFES corresponded to faster responses across all emotions for all participants and positive relationships between empathy, emotion recognition and fixation patterns were shown.

**Dynamic Results:** Controls were more accurate at identifying emotions than the TBI group but no group differences were found for gaze patterns. There was a positive correlation between correct scores on the ADFES and empathy scores across all emotions for all participants.

**Conclusions:** Visual strategies underlying the recognition of static/dynamic facial expressions may differ. Irregular gaze patterns could underpin some socioemotional problems after TBI but other cognitions, e.g. retrieval of social knowledge or response selection, may play a role. Findings advocate further eye tracking research with TBI cohorts, and illustrate potential for innovative sociocognitive rehabilitation approaches post-TBI. The key limitation was the small sample size which will hopefully be rectified in further work.

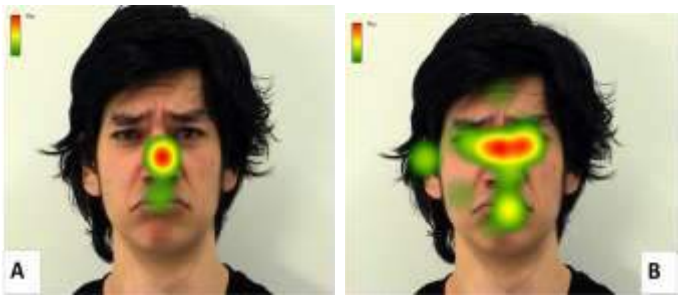



**Figure 1. A heat map to illustrate the disparity between eye scan patterns for a male TBI participant (A) and a matched control participant (B) when viewing a static sad facial expression. The heat map displays the number and length of fixations using the different colours with red indicating maximum levels.**

## Publications

Babbage, D.R., Yim, J., Zupan, B., Neumann, D., Tomita, M.R. & Willer, B. (2011). Meta-analysis of facial affect recognition difficulties after traumatic brain injury. *Neuropsychology,* 25, 277-285. doi: 10.1037/a0021908

Barker, L.A., Andrade, J., Romanowski, C.A., Morton, N. and Wasti, A. (2006). Implicit cognition is impaired and dissociable in a head-injured group with executive deficits. *Neuropsychologia,* 44 (8), 1413-1424.

Blais, C., Fiset, D., Roy, C., Saumure Règimbald, C. and Gosselin, F. (2017). Eye fixation patterns for categorizing static and dynamic facial expressions. *Emotion,* 17 (7), 1107-1119.

Douglas, J.M., Vassallo, S. and White, E. (2011). Visual scanning in the recognition of facial affect in traumatic brain injury. *I-Perception,* 2 (4), 250.

Mancuso, M., Magnani, N., Cantagallo, A., Rossi, G., Capitani, D.,Galletti, V., Cardamone, G. and Robertson, H. (2015). Emotion recognition impairment in traumatic brain injury compared with schizophrenia spectrum: similar deficits with different origins. *The Journal of Nervous and Mental Disease,* 203 (2), 87-95.

Van der Schalk, J., Howk, S.T., Fischer, A.H. and Doosie, B. (2011). Moving faces, looking places: validation of the Amsterdam Dynamic Facial Expression Set (ADFES). *Emotion,* 11 (4), 907-920.



## Biography

Leanne has a BSc in Psychology, an MSc in Applied Cognitive Neuroscience and is near the completion of her PhD which has investigated social cognition and saccadic eye scan patterns in TBI and control cohorts. She currently works as an Assistant Psychologist for Rotherham Doncaster and South Humber NHS Trust in the Neuro Rehabilitation Outreach and Stoke team. Socioemotional problems post-TBI are often not assessed or rehabilitated (Kelly, McDonald & Frith, 2016) and Leanne is passionate about raising awareness of social cognition after TBI and in the future developing contemporary and ecologically valid clinical assessments and rehabilitation programmes.

01302 796336

l.greene@shu.ac.uk

Oral or poster presentation