



HAL
open science

The influence of emotion and empathy on gaze patterns when exploring controlled static and ecological dynamic faces

Antoine Coutrot, Astrid Kibleur, Marion Trousselard, Barbara Lefranc, Céline Ramdani, Karolina Stepien, Déborah Varoqui, Jonas Chatel Goldman

► To cite this version:

Antoine Coutrot, Astrid Kibleur, Marion Trousselard, Barbara Lefranc, Céline Ramdani, et al.. The influence of emotion and empathy on gaze patterns when exploring controlled static and ecological dynamic faces. Vision Science Society (VSS), May 2021, St Pete, Florida, United States. Vision Sciences Society Annual Meeting Abstract. hal-03268874

HAL Id: hal-03268874

<https://hal.science/hal-03268874>

Submitted on 23 Jun 2021

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

The influence of emotion and empathy on gaze patterns when exploring controlled static and ecological dynamic faces

A. Coutrot^{ab*}, A. Kibleur^c, M. Trousselard^d, B. Lefranc^d, C. Ramdani^d, K. Stepien^b, D. Varoqui^c & J. Chatel Goldman^c

^a LIRIS, CNRS, Université de Lyon, France

^b LS2N, CNRS, Université de Nantes, France

^c Open Mind Innovation, France

^d Institut de Recherche Biomédicale des Armées, France

* corresponding author: antoine.coutrot@liris.cnrs.fr



Introduction

The influence of facial emotions on gaze patterns when exploring faces is still debated.

Previous research reported that the relative proportion of fixations on the different face areas is (1,2) or is not (3,4) modulated by the expression processed. While most previous studies used static face images or simulated dynamic facial expressions (3), we propose to test how these findings generalize to more ecological spontaneous dynamic expressions of emotion.

Methods

We recorded the eye movements of 170 participants, while they categorized the valence of static and dynamic emotional faces. Static emotions were performed by actors from the classic Karolinska Directed Emotional Faces database (5), while dynamic emotions were genuine natural facial expressions from ordinary people, filmed in natural but standardized conditions (DynEmo database, (6)). Participants completed a questionnaire to evaluate their empathy profile. We used the Questionnaire of Cognitive and Affective Empathy (7) and clustered participants into 4 empathy profiles: Mature (N=55, 15 males), Affective (N=45, 25 males), Cognitive (N=44, 30 males), and Low (N=22, 15 males).

Effect of emotion in static faces

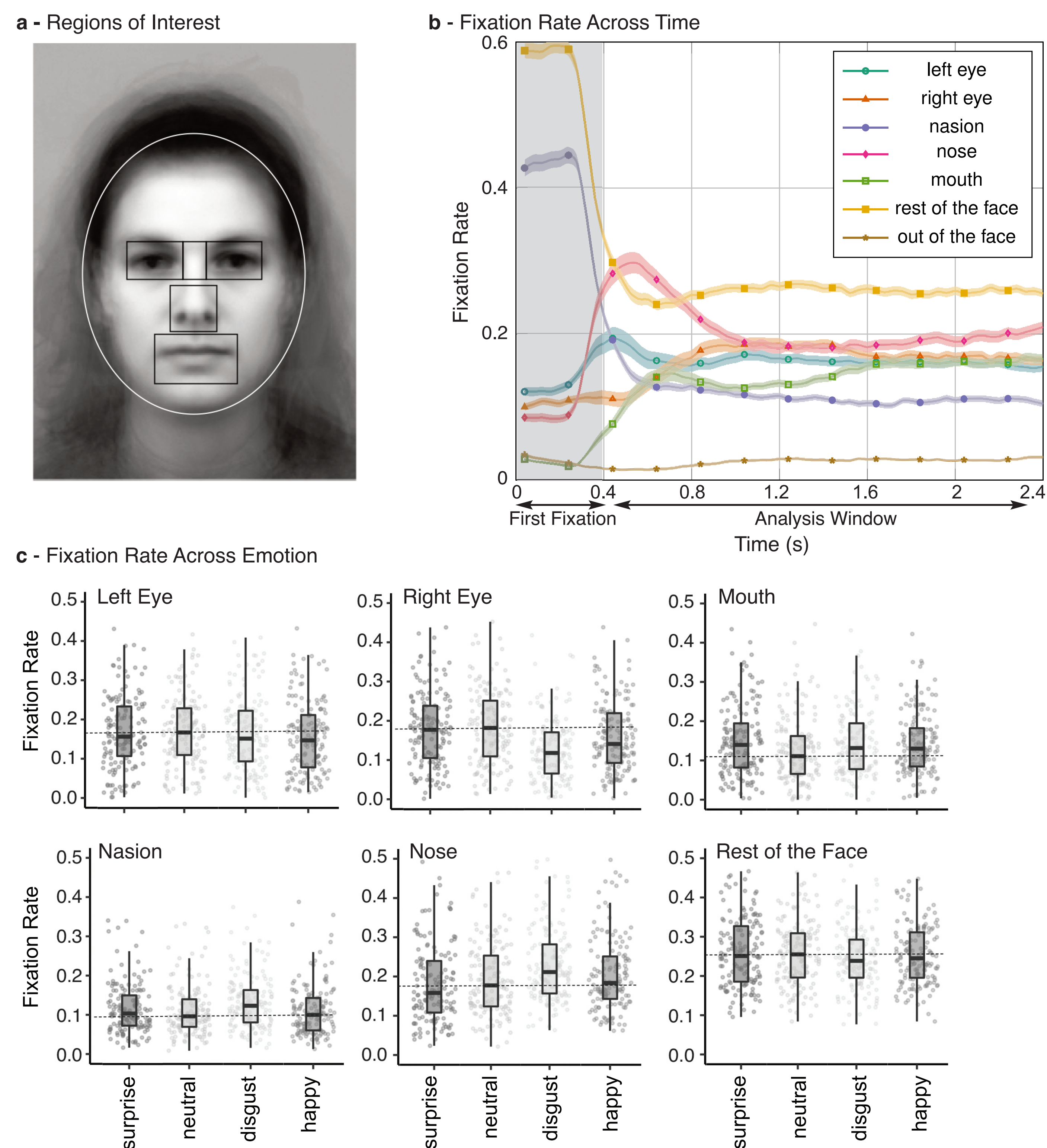


Figure 1 - Eye movements in static stimuli | a- Average static face with the Regions of Interest (ROIs). b- Fixation rate in each ROI across time, averaged across all static stimuli. Fixation rates have been averaged within 40 ms time windows (to simplify the plot, the curve markers do not correspond to the sampling rate). Error bars represent standard errors. b- For each emotion, averaged across time within the analysis window. The horizontal dashed lines represent the fixation rate for the Neutral condition.

References

[1] Eisenbarth & Alpers. Happy Mouth and Sad Eyes: Scanning Emotional Facial Expressions. *Emotion* 2011
 [2] Schurgin *et al.* Eye movements during emotion recognition in faces. *Journal of Vision* 2014
 [3] Blais *et al.* Eye Fixation Patterns for Categorizing Static and Dynamic Facial Expressions. *Emotion* 2017

Effect of emotion in dynamic faces

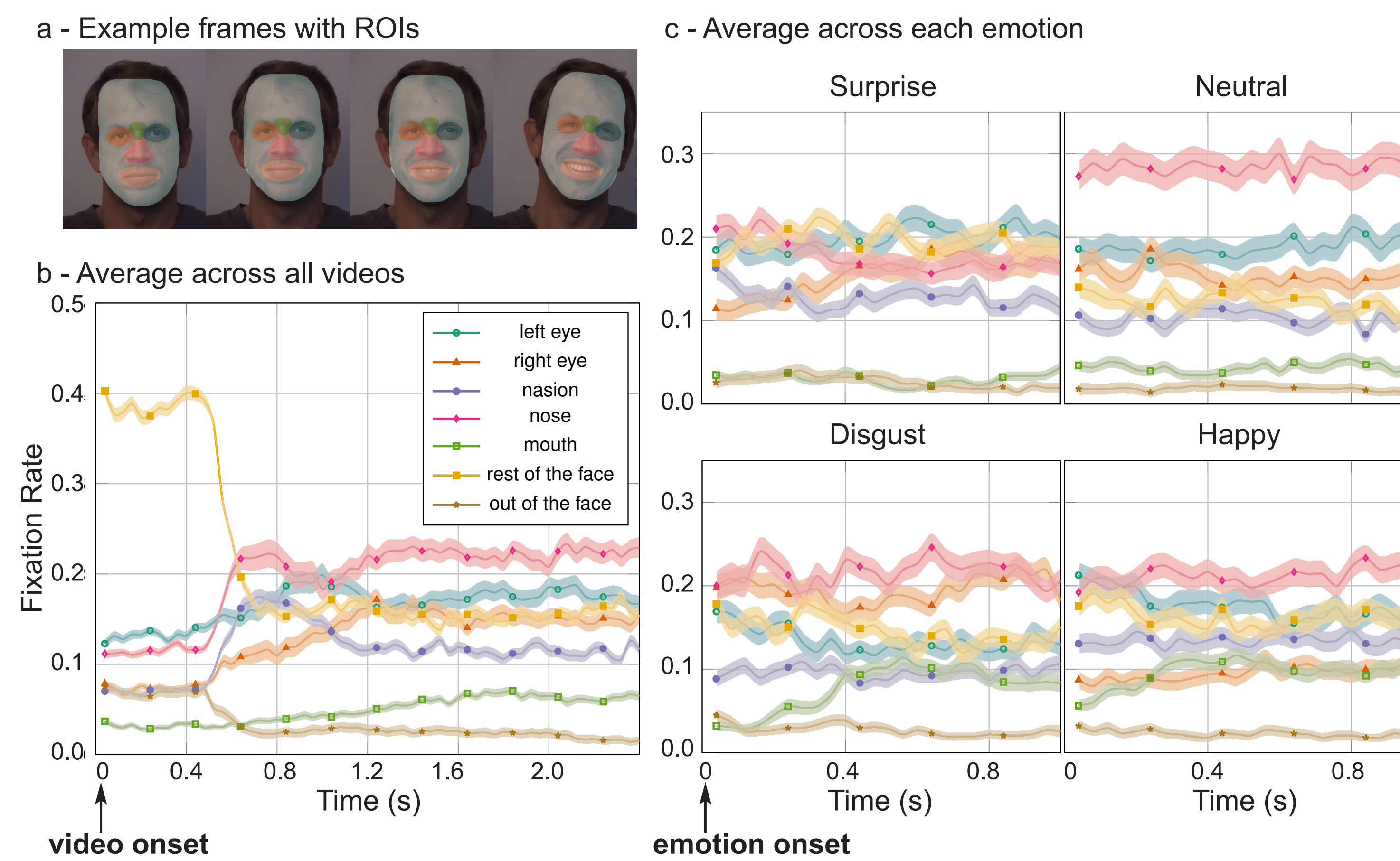


Figure 2 - Eye movements in dynamic stimuli | a- Four illustrative frames of a 'happy' dynamic face with the Regions of Interest (ROIs). b- Fixation rate in each ROI across time, averaged across all dynamic stimuli. Dynamic stimuli have been aligned on the beginning of the video. c- Fixation rate in each ROI across time, averaged within each emotion. Dynamic stimuli have been aligned on the beginning of the emotion (neutral starts have been randomly sampled in the video). Fixation rates have been averaged within 40 ms time windows (to simplify the plot, the curve markers do not correspond to the sampling rate). Error bars represent standard errors.

Results

We found strong similarities between the gaze patterns in static (Fig 1) and dynamic (Fig 2) conditions.

We used Linear Mixed Models with fixation rate in ROI as response, gender, emotion, and empathy profile as fixed effects and participants id as random effect. We found a main effect of emotion on fixation rate on all facial regions of interest (left and right eye, nasion, nose, mouth, rest of the face).

In both static and dynamic stimuli, participants in the Mature empathy group gazed more at the left eye than participants in the Low empathy group. In static stimuli Hedge's $g = 0.50$, 95%CI=[0.43 0.56], in dynamic stimuli Hedge's $g = 0.34$, 95%CI=[0.22 0.46].

Effect of empathy in static faces

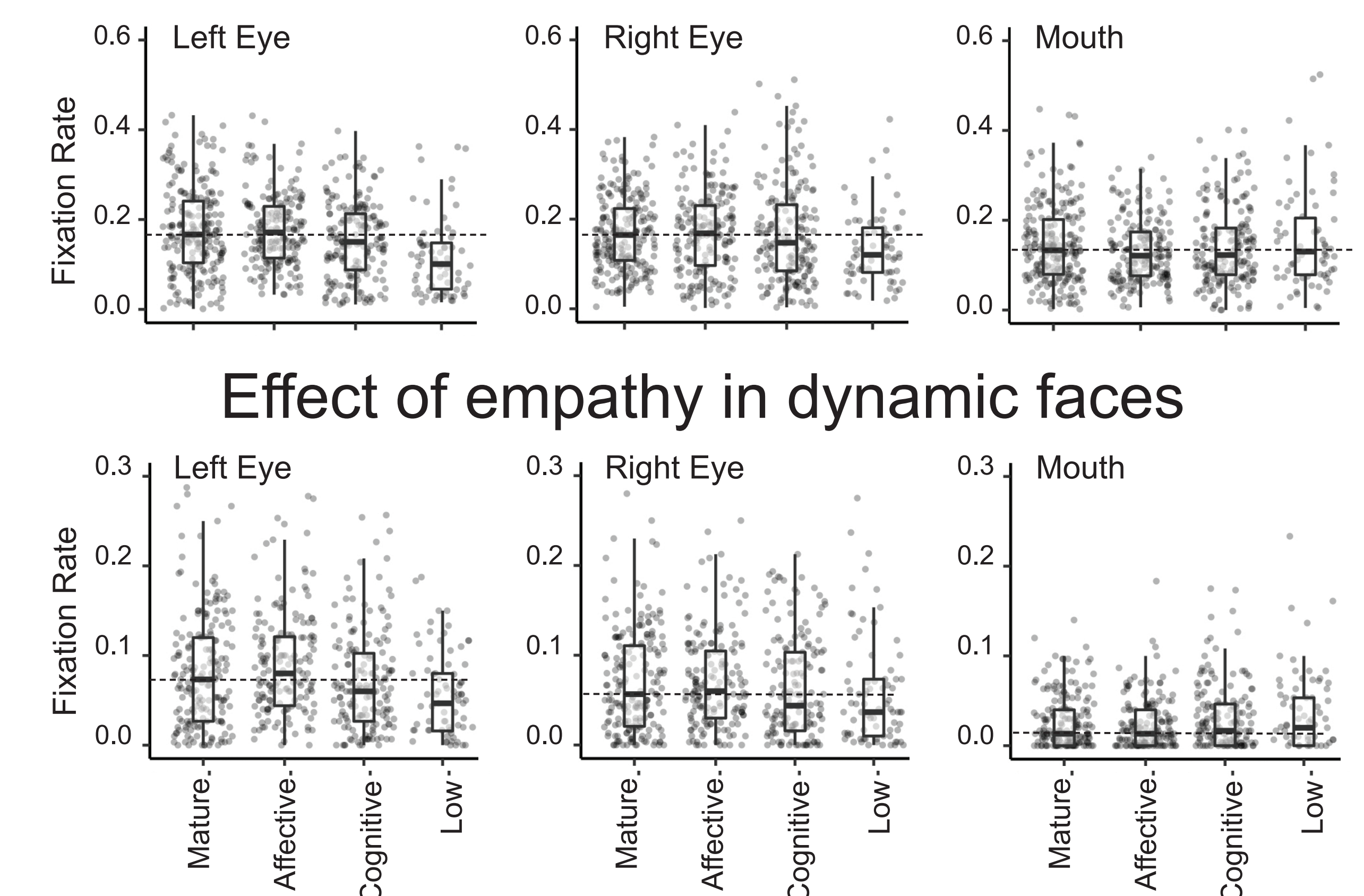
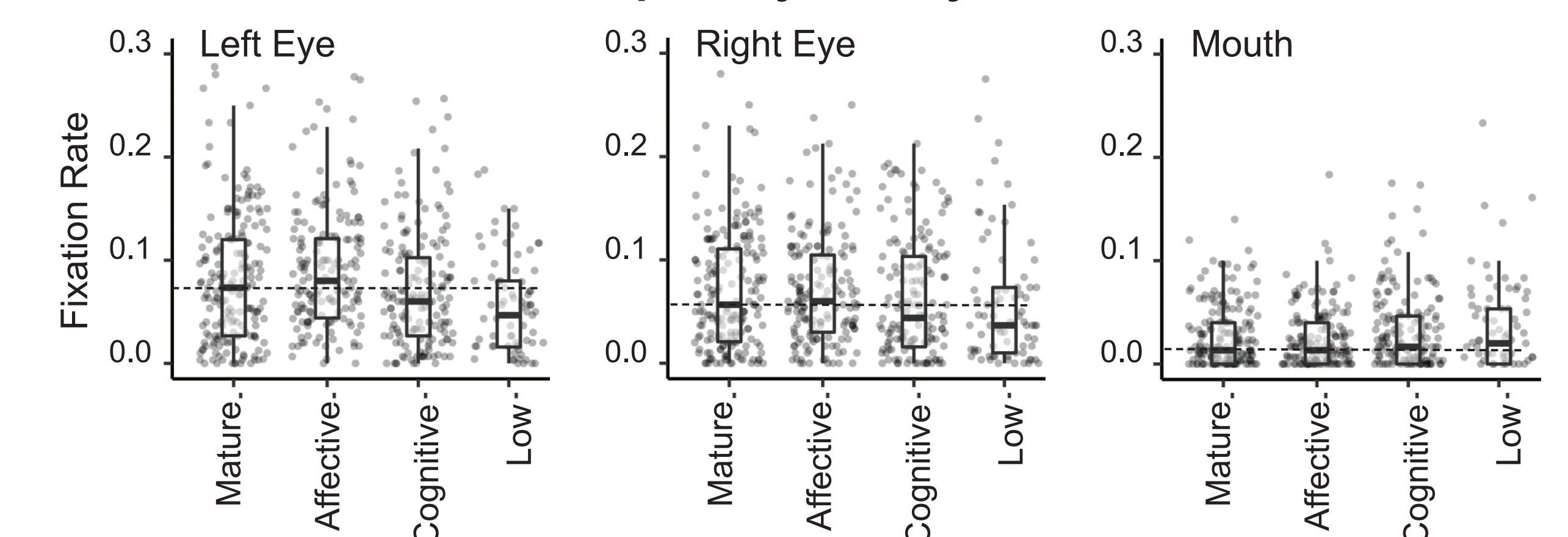


Figure 3 - Effect of empathy on eye movements | For each empathy profile, fixation rate per ROIs averaged across time within the analysis window. The horizontal dashed lines represent the fixation rate for the Mature profile.

Effect of empathy in dynamic faces



Conclusions

Our results suggest that moderate differences in gaze behavior like the ones associated with the observer's empathy profile can generalize from a classic and well controlled static dataset, to a more ecological and dynamic dataset.

Furthermore, we did not find any effect of gender on fixation rates. This suggests that the previously reported stronger left eye bias in females [8,9] may well be the due to women being on average more empathetic than men.

[4] de Boer *et al.* Eyes on Emotion: Dynamic Gaze Allocation During Emotion Perception From Speech-Like Stimuli. *Multisensory Research* 2020
 [5] Lundqvist *et al.* The Karolinska directed emotional faces (KDEF) Karolinska Institutet 1998
 [6] Tcherkassof *et al.* DynEmo: A video database of natural facial expressions of emotions. *The International Journal of Multimedia* 2013

[7] Reniers *et al.* The QCAE: A questionnaire of cognitive and affective empathy. *Journal of Personality Assessment* 2011
 [8] Coutrot *et al.* Face exploration dynamics differentiate men and women. *Journal of Vision* 2016
 [9] Sokhn *et al.* A left eye bias for female faces. *IEEE Knowledge and Smart Technology*