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## Do you Know this Celebrity? Eye Tracking in a Concealed Information Test with Famous Faces

Camélia Ciocan, Mariya Novopashyna, Hugues Delmas, Céline Paeye

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C. Ciocan, M. Novopashyna, H. Delmas & C. Paeye  
Université Paris Cité, Laboratoire Vision Action Cognition, F-92100 Boulogne-Billancourt, France

## Introduction

The **concealed information test** (CIT) has been designed to detect if a person is concealing knowledge about the relevance of an item. Classically, familiar and unknown items are presented sequentially to observers while various indices (e.g., heart rate, eye movements, etc.) are measured. Recently, Lancry-Dayan et al. (2018)<sup>[1]</sup> proposed a new version of this test that included a short-term memory task to maximize differences between responses to items. Participants were asked to memorize four pictures of faces that included faces of relatives (see the Methods section for a description of their protocol). Authors observed that participants looked at the familiar face during the first second and then tended to avoid it. This specific orientation-avoidance pattern occurred even in participants instructed to conceal their familiarity with the known faces (in a spontaneous or a guided manner). The few looks at the familiar faces likely reflected an efficient encoding process for these faces, which representations already exist in long-term memory.

Interestingly, faces of relatives and celebrities yield to indistinguishable results in classical CIT<sup>[2]</sup> (i.e., CIT without a short-term memory task). In a first experiment, we attempted to reproduce Lancry-Dayan et al.'s<sup>[1]</sup> results **using celebrities' faces** in a short-term memory CIT.

In addition, Lancry-Dayan et al.<sup>[1]</sup> even observed the aforementioned orientation-avoidance pattern in participants that were instructed to thwart the test by looking equally at all faces (countermeasure group). In a second experiment, we **tested the robustness of the short-term memory CIT** by proposing in addition to instructions some explanations on expected patterns or feedback on participants' oculomotor behavior.

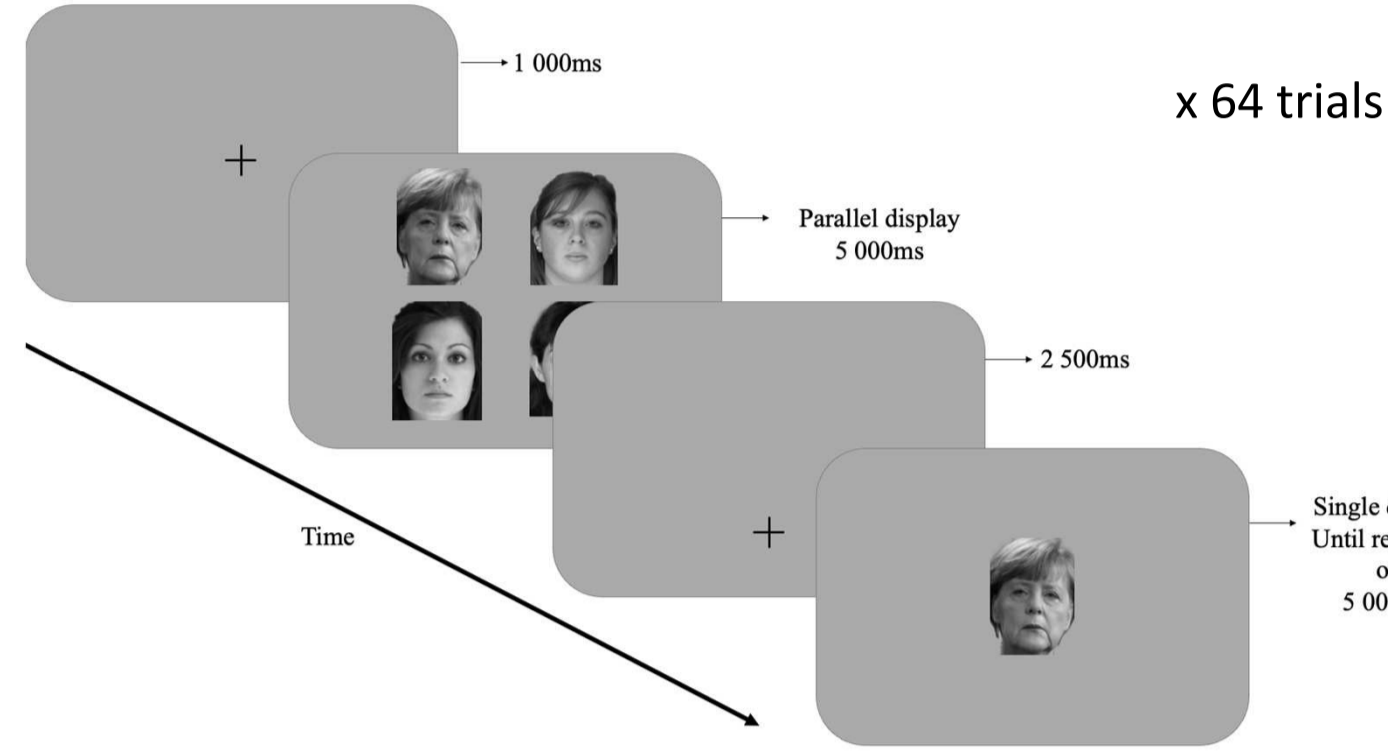
## Methods

### • Short-term memory CIT

Participants were first asked to memorize four faces displayed simultaneously (one of these faces was a celebrity in 50% of the trials).

These faces were then replaced by a single face, famous or not. Participants had then to indicate whether this face was present in the preceding display.

Groups of participants differed according to the instructions they received.



### • Experiment 1 (N=45; Age: 18-40) Reproduction of Lancry-Dayan et al.'s<sup>[1]</sup> study with photos of celebrities

**Control group:** Short-term memory task

**Concealment group:** Short-term memory task + conceal familiarity with famous faces.

**Simple countermeasure group:** Short-term memory task + conceal familiarity with famous faces by looking equally at all faces.

### • Experiment 2 (N=30; Age: 18-40) Robustness of countermeasures

**Enhanced countermeasure group:** Video instructions (similar as the simple countermeasure group) with additional graphs of Lancry-Dayan et al.'s<sup>[1]</sup> results + a reminder of Lancry-Dayan et al.'s<sup>[1]</sup> graphs after half of the trials.

**Feedback group:** Video instructions (similar as the simple countermeasure group) with additional graphs of Lancry-Dayan et al.'s<sup>[1]</sup> results + feedback on their own oculomotor behavior after half of the trials.

### • Material

• EyeLink® 1000+

• 64 pictures (56 unknown faces & eight famous faces; 50% female faces). Non famous faces were taken from Vieira et al.'s (2014)<sup>[3]</sup> and Ebner et al.'s (2018)<sup>[4]</sup> databases.

• All pictures were black & white front view full faces with a neutral expression.

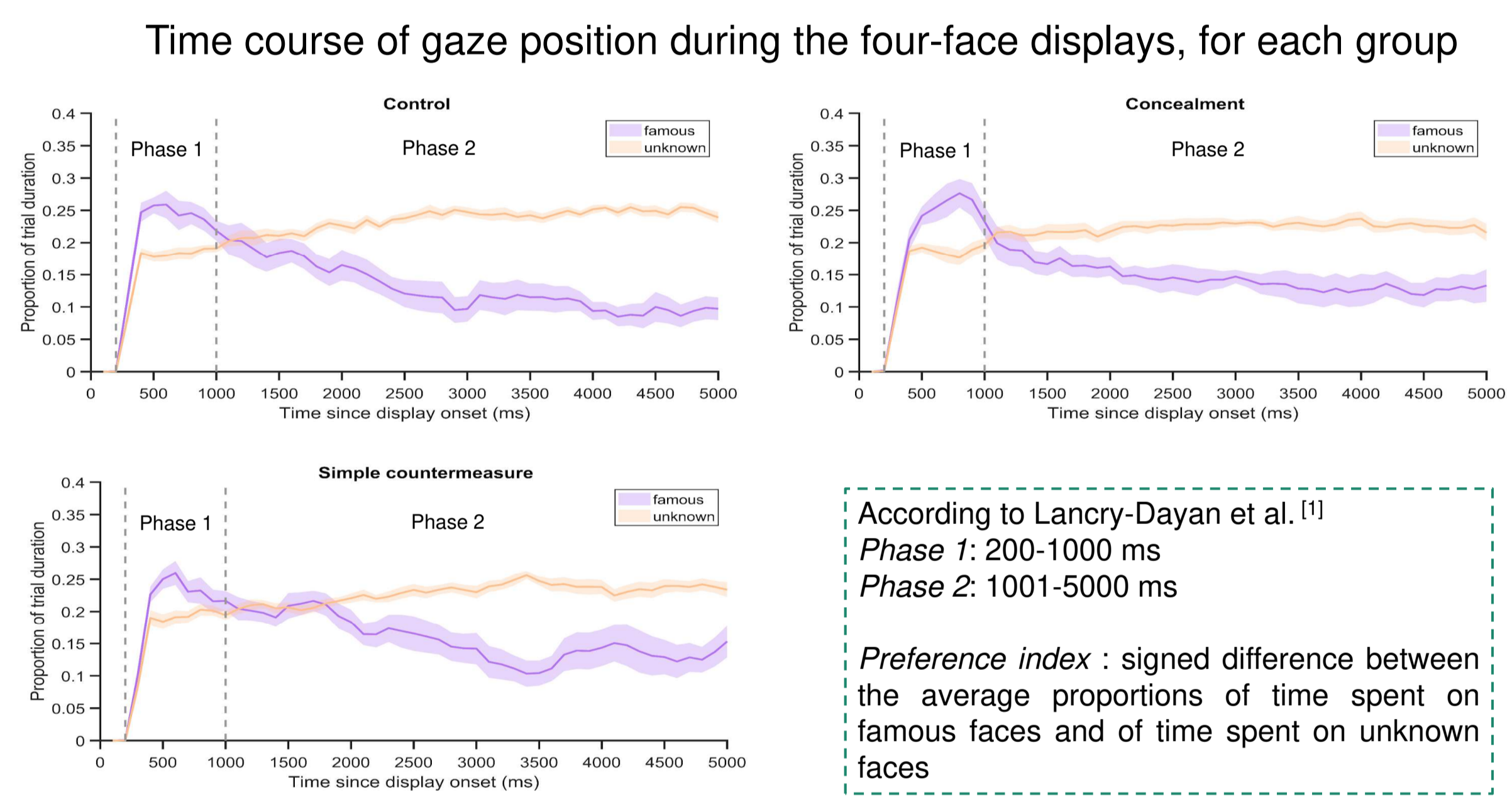
**Hypothesis experiment 1:** We should observe similar results as Lancry-Dayan et al.<sup>[1]</sup>.

**Hypothesis experiment 2:** We should observe differences between groups.

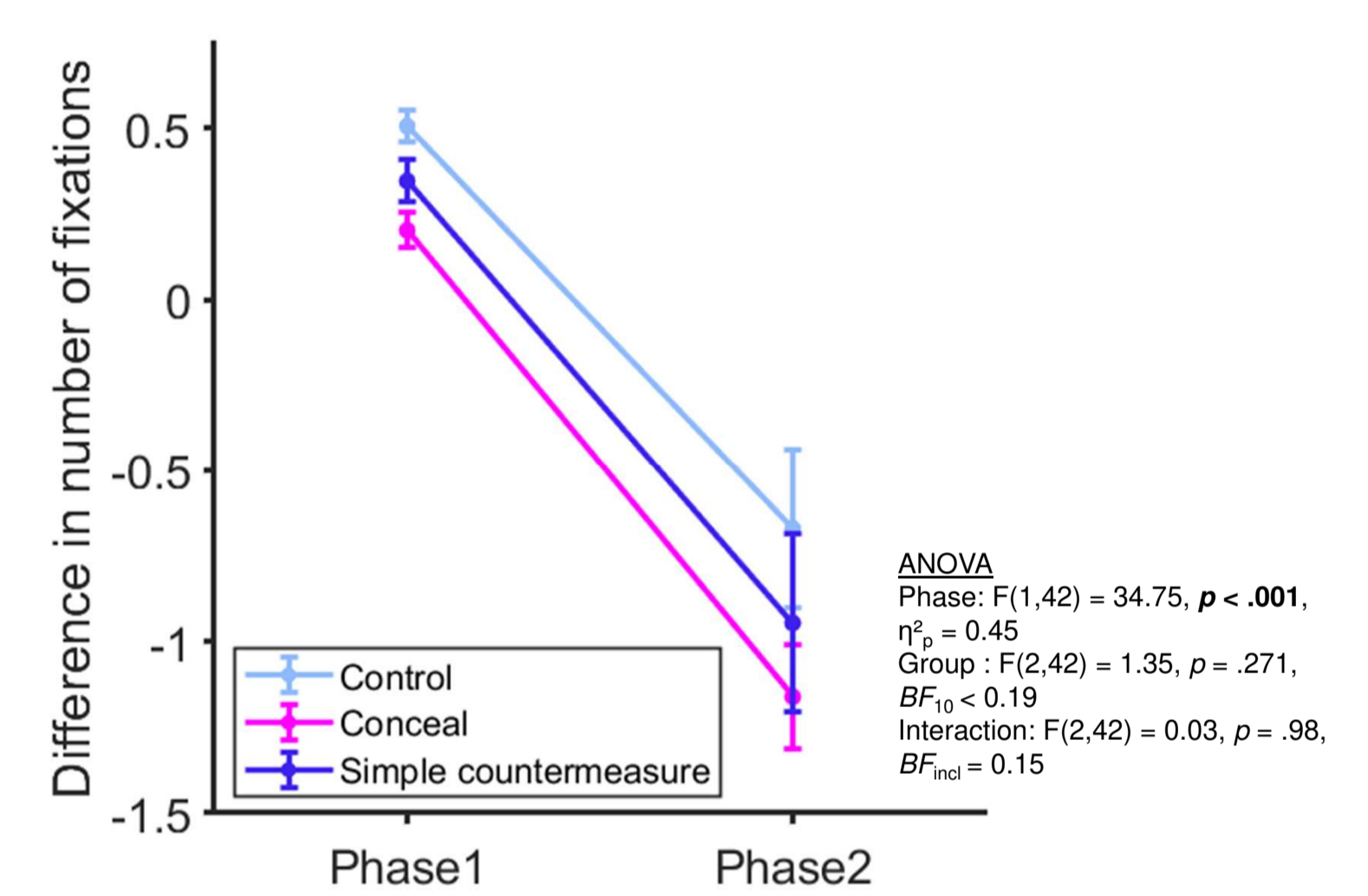
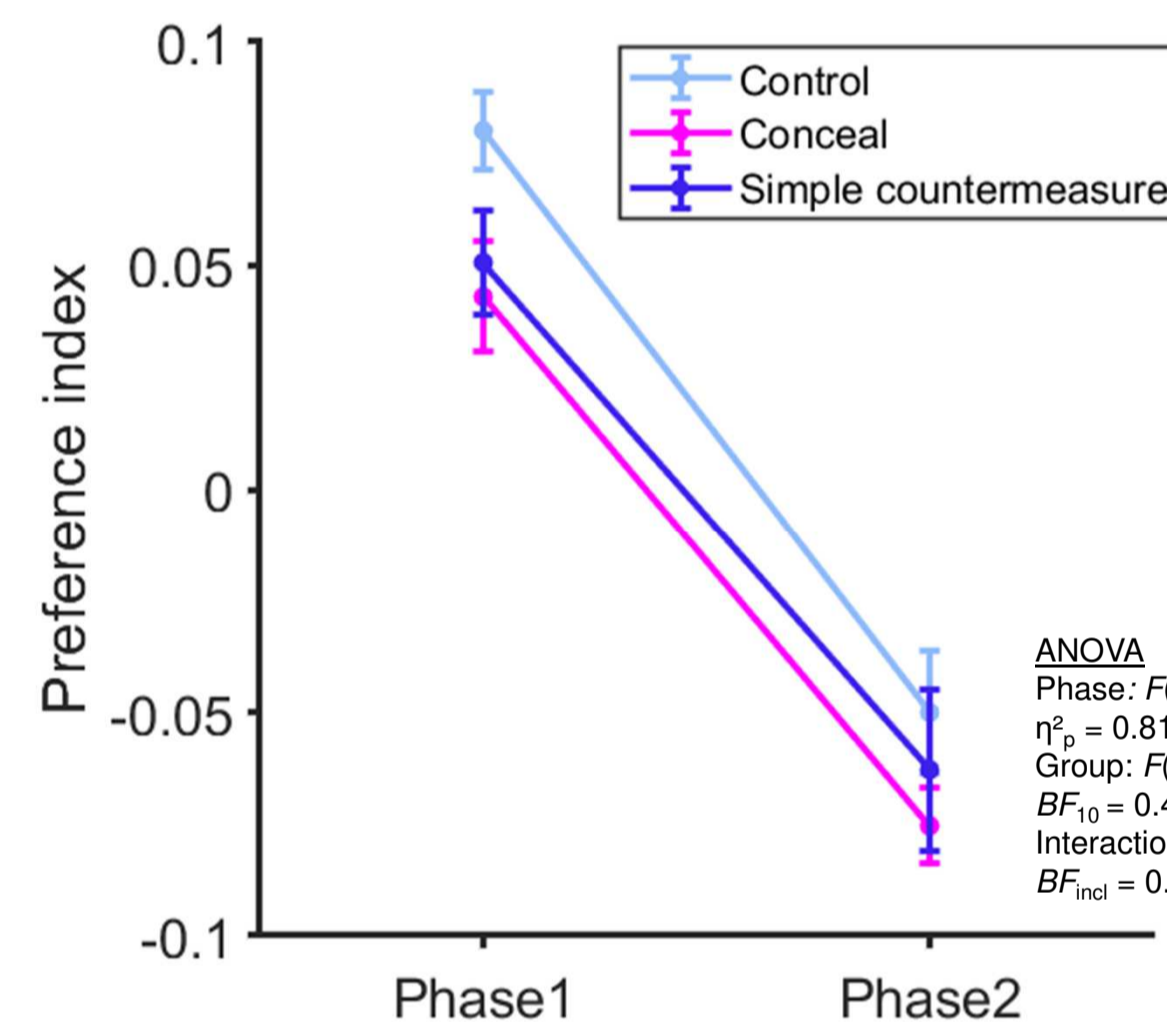
## Results

### Four-face parallel displays

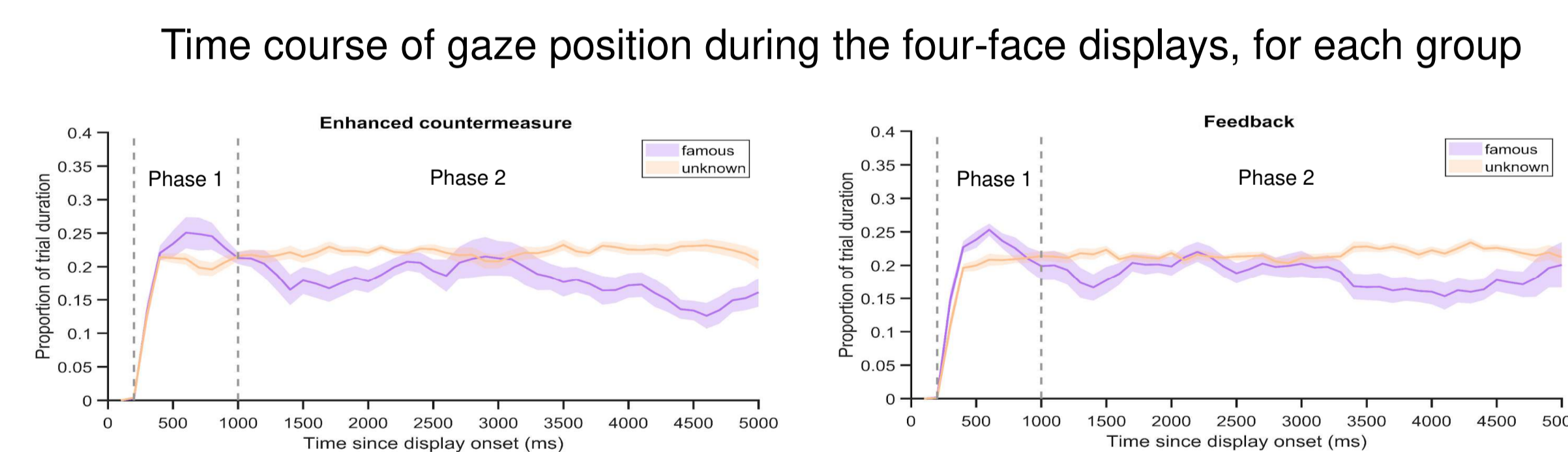
#### • Experiment 1: Reproduction of Lancry-Dayan et al.'s<sup>[1]</sup> study with celebrities' faces



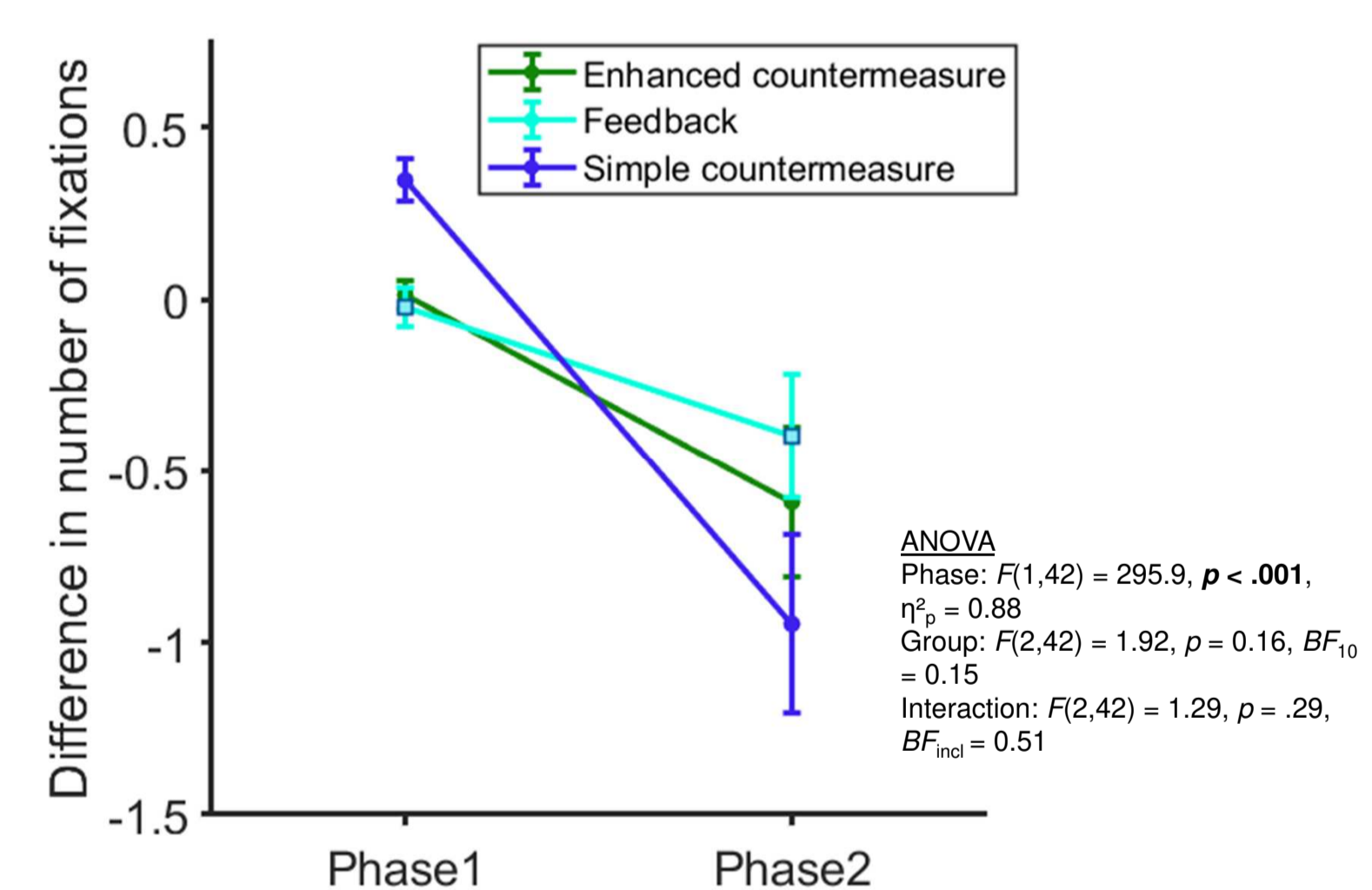
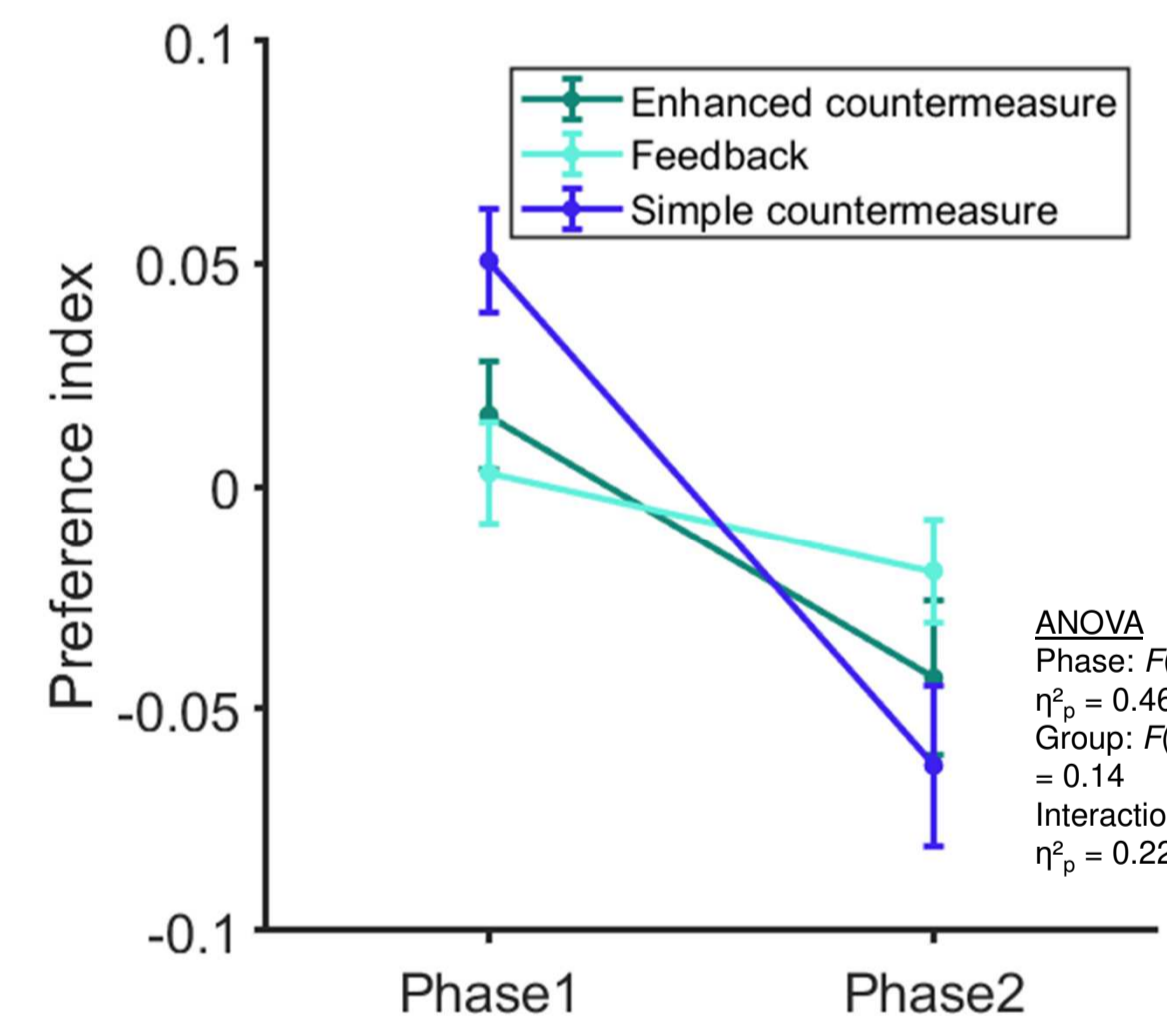
The effect of Phase was significant, but there was no effect of Group nor interaction on preference indices and on differences in the number of fixations.



#### • Experiment 2: Differences between faces and phases were attenuated in the feedback group.

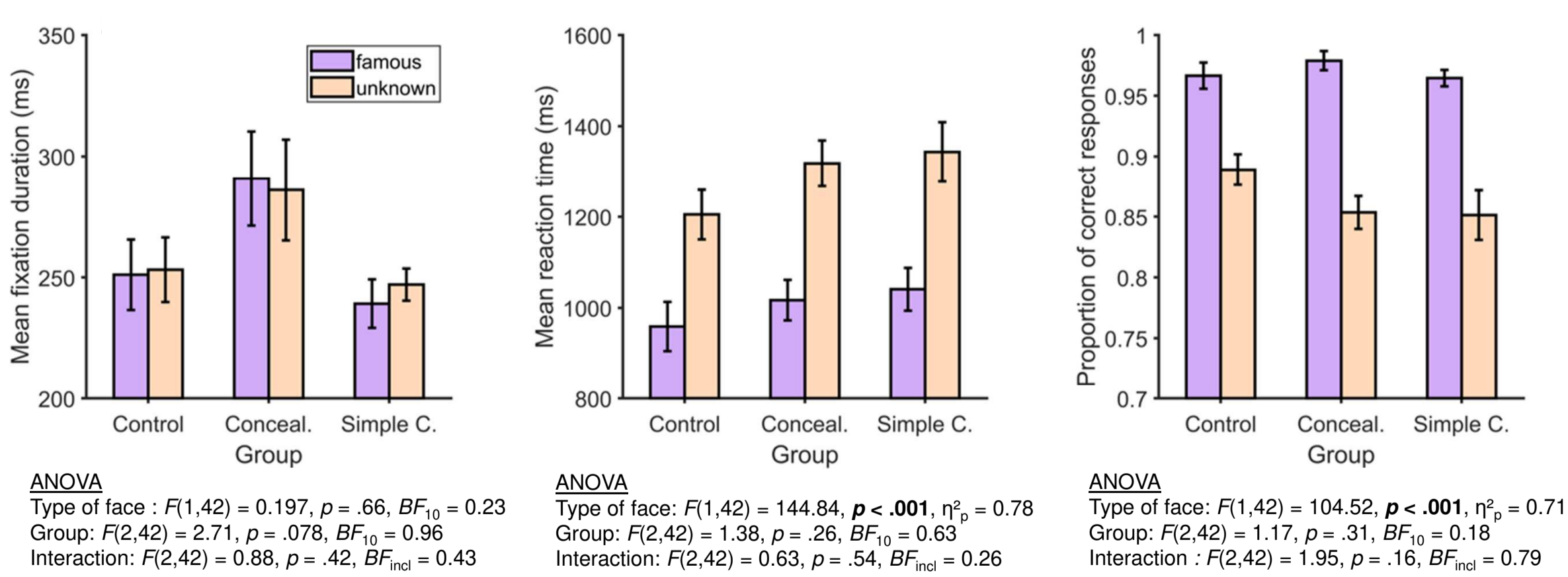


The interaction between Phase and Group on preference indices reached significance.



### Single displays

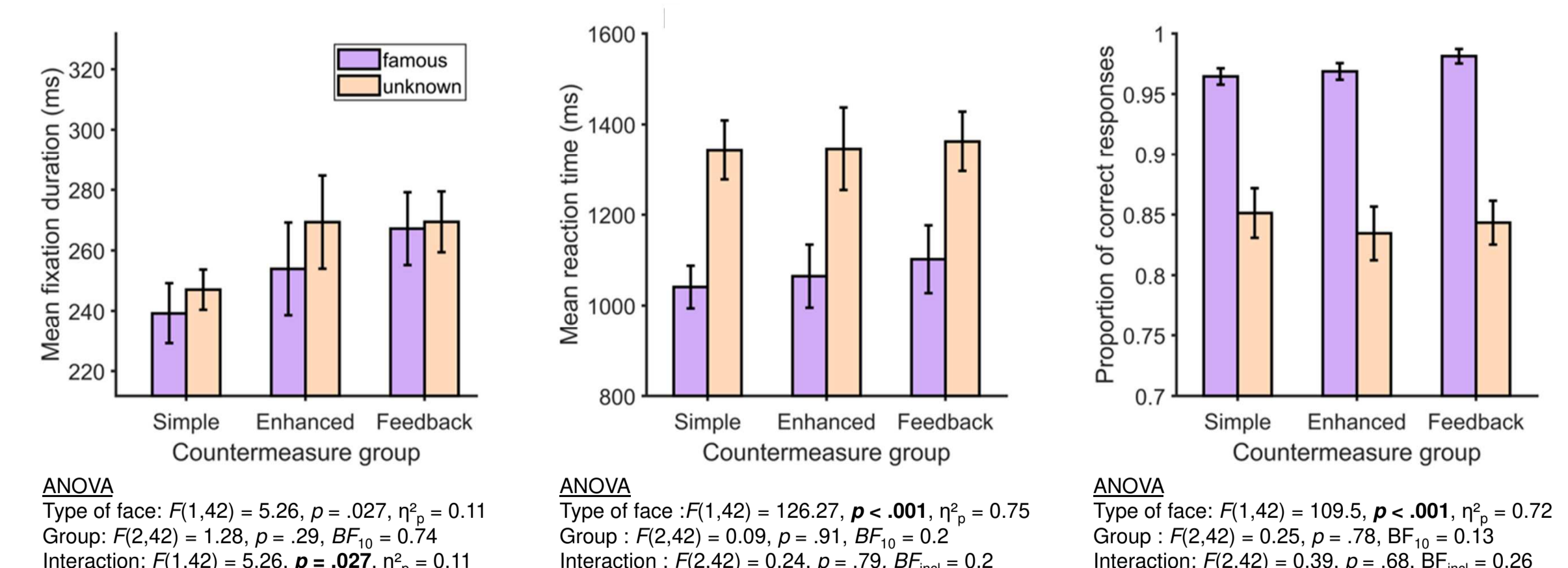
#### • Experiment 1



Participants responded faster and more accurately when a famous face was presented in the single display in comparison to a non-famous face.

Importantly, instructions had no effect on performance in the short-term memory task.

#### • Experiment 2



## Conclusion

By using photos of celebrities instead of relatives, we obtained similar results as Lancry-Dayan et al.<sup>[1]</sup>. These results are also consistent with previous work on classical CIT<sup>[2]</sup>. We observed a gaze orientation towards famous faces during the first second of the presentation, followed by an avoidance from them. Ocular patterns were not modulated by simple instructions. In contrast, the only way to equate the time spent on each face was to provide feedback on individuals' oculomotor behavior in addition to detailed explanation about the expected results. These results suggest that the inclusion of a memory task in the CIT makes this test resistant to countermeasures (cf. simple, enhanced countermeasure groups), at least to a given extent.

## References

<sup>[1]</sup> Lancry-Dayan, N., Oryah, C., Nahari, T., Ben-Shakhar, G. & Pertzov, Y. (2018). Do You Know Him? Gaze Dynamics Toward Familiar Faces on a Concealed Information Test. *Journal of Applied Research in Memory and Cognition*, 7(2), 291–302.  
<sup>[2]</sup> Millers, A. E., Hope, L., Hillstrom, A. P. & Vrij, A. (2017). Tracking the truth: The effect of face familiarity on eye fixations during deception. *The Quarterly Journal of Experimental Psychology*, 70(5), 930–943.  
<sup>[3]</sup> Vieira, T. F., Bottino, A., Laurentini, A. & De Simone, M. (2014). Detecting Siblings in Image Pairs. *The Visual Computer*, 30(12), 1333–1345. doi: 10.1007/s00371-013-0884-3  
<sup>[4]</sup> Ebner, N. C., Riediger, M. & Lindenberger, U. (2018). FACES: A database of facial expressions in young, middle-aged, and older women and men (publicly available datasets). Max Planck Society.