

The impact of changes in appearance and context on face learning

Introduction

The recent **cost-efficient hypothesis**^{1,2} postulates that we memorize faces through coarse-to-fine processing based on **relative stability** of facial features. At first, face representations would be compressed as parsimonious large-scale representations and refine over time with observed variation in appearance and encounters in varying contexts.

The present study aimed at testing whether the relative variability of appearance (via peripheral hairstyle changes) and variability of context (via changes in background scenes) during face learning affect the reliability of facial representations.

We hypothesised that:

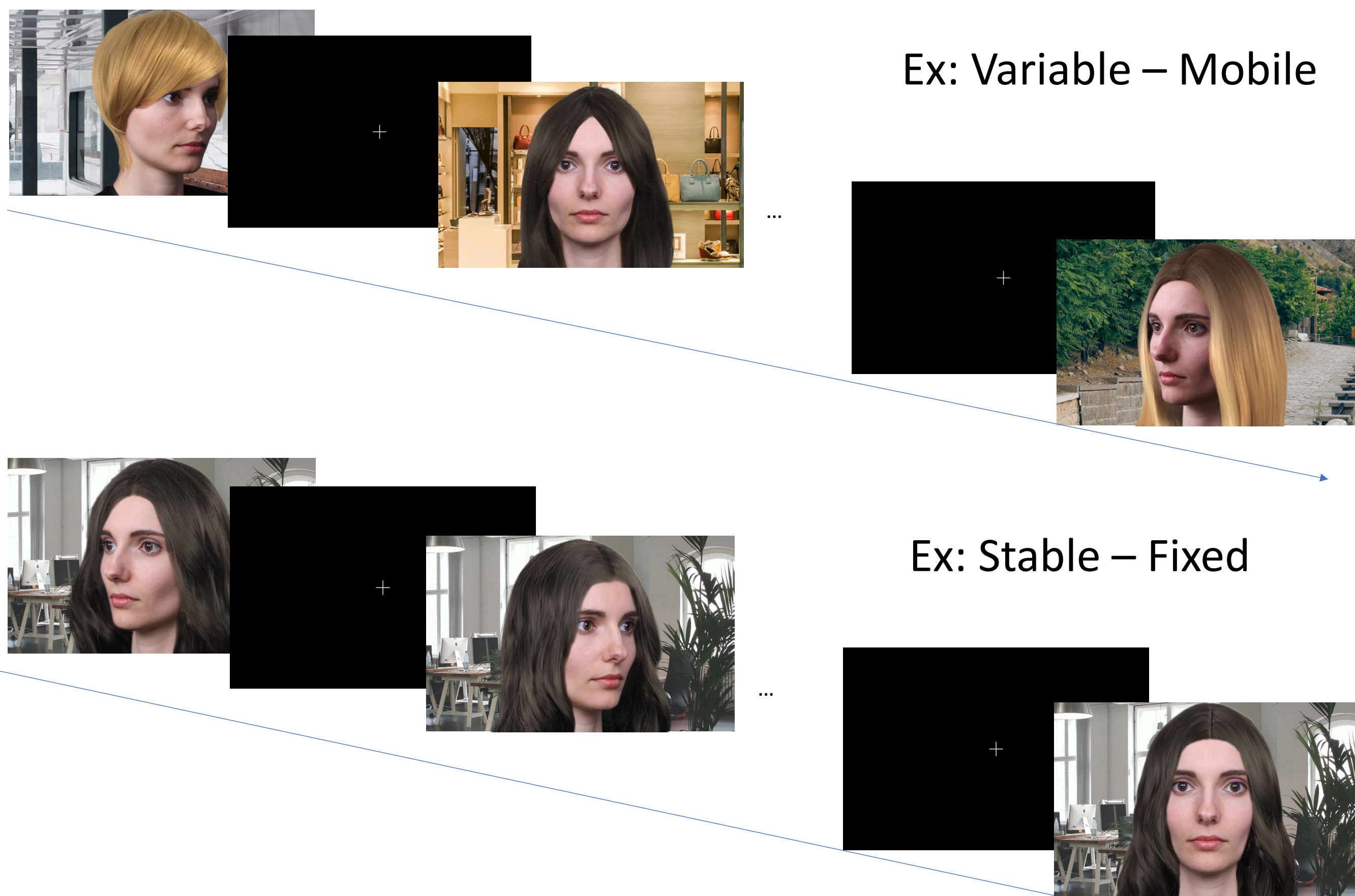
- 1) Variability in appearance will promote the encoding of stable inner features because observed variations make large-scale peripheral information insufficient for later recognition.
- 2) Stable encoding contexts will foster _less reliable coarse representations by cueing that gross (contextual and facial) information is sufficient for later recognition.

Methods

Procedure: Speeded old/new recognition task manipulating:

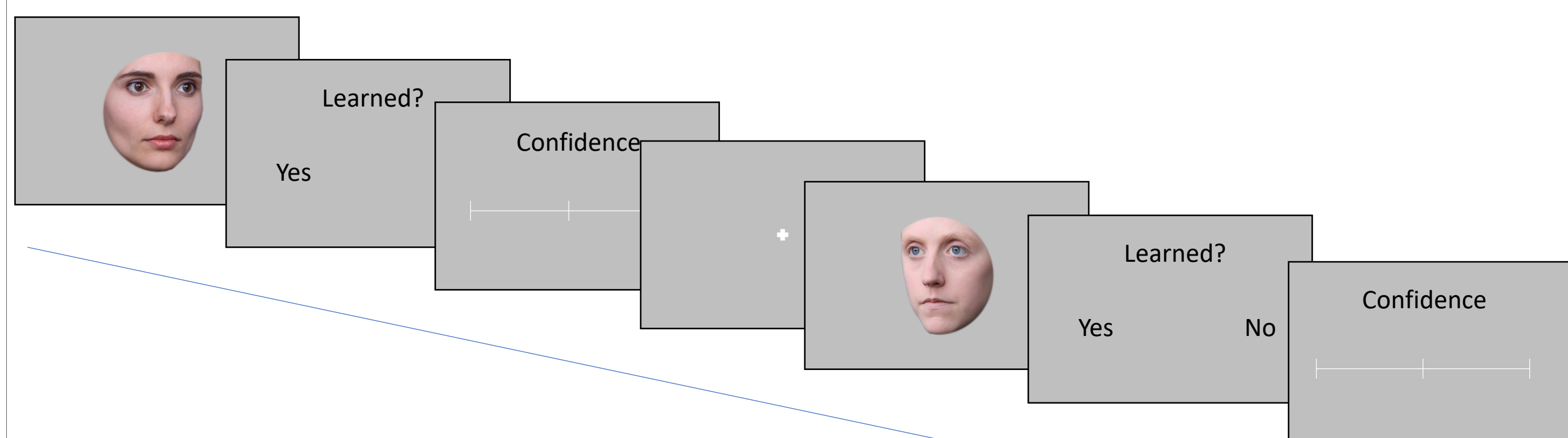
- Variability of appearance (**stable** vs **variable**)
- Variability of context (**fixed** vs **mobile**)

➤ Learning phase: 8 identities x 6 pictures



➤ Delay: 20min

➤ Test phase: 16 identities (8 foils) x 6 trials



➤ Participants:

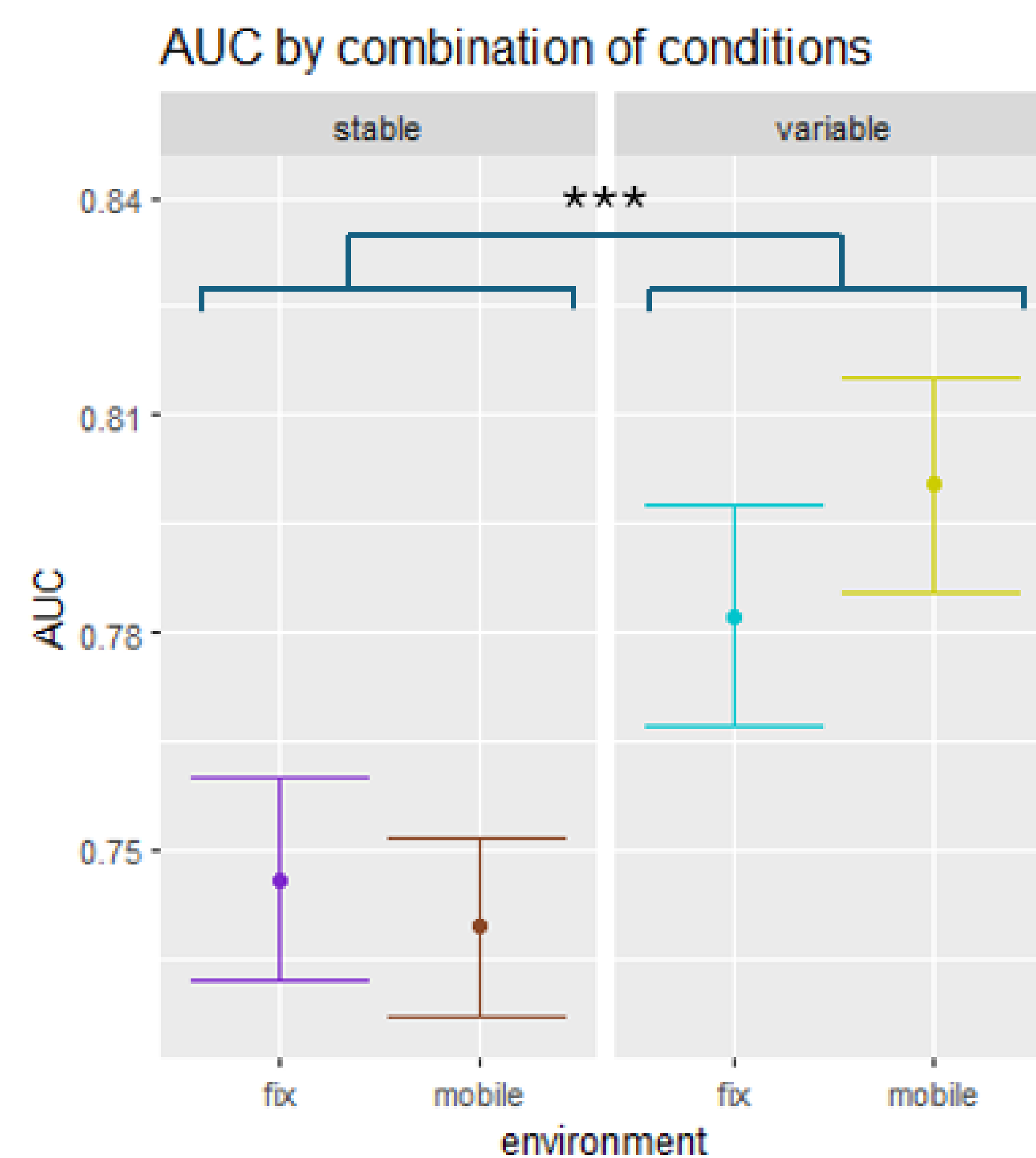
254 participants (pairwise t-tests, GPower3.1) divided into 3 (56/170/254) for sequential analysis (stopping rule: significant interaction effect on AUC)

➤ Dependent variables:

- Precision: Hit/FA rates combined with confidence ratings to calculate ROC curves
- Speed: Correct response time
- Eyetracking data: fixation time on faces

Results: 1st interim analysis (n=56)

➤ Precision : AUC



Linear Mixed Model

- LMM hairstyle: $\beta = .036$, $\sigma_\beta = .020$, $p < 2e-16$
- LMM context: $\beta = -.007$, $\sigma_\beta = .020$, $p = 0.74$
- LMM interaction: $\beta = .025$, $\sigma_\beta = .028$, $p = 0.38$

Fixation time on face as co-factor in the LMM:

- LMM fixation: $\beta = -.0327$, $\sigma_\beta = .0349$, $p = 0.35$

(Figure 1: Area under ROC curve per conditions; ***: $p < 0.001$)

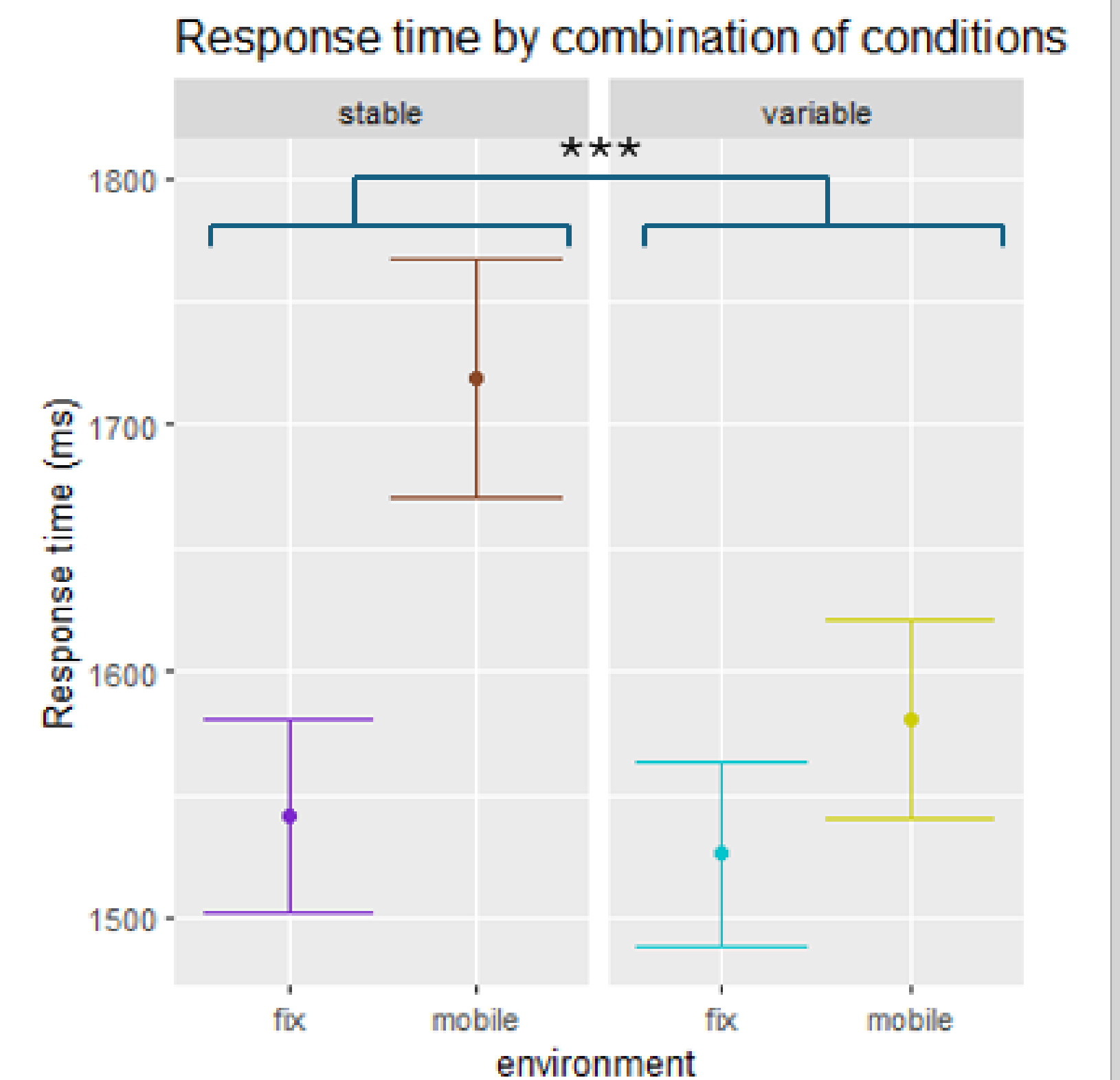
➤ Speed: Response time

Generalized Linear Mixed Model
(family = inverse.gaussian, link = identity)

- GLMM hairstyle: $\beta = 88.45$, $\sigma_\beta = 16.55$, $p = 9.1e-08$
- GLMM context: $\beta = -21.66$, $\sigma_\beta = 16.09$, $p = 0.18$
- GLMM interaction: $\beta = 33.39$, $\sigma_\beta = 23.70$, $p = 0.16$

Fixation time on face as co-factor in the GLMM:

- GLMM fixation: $\beta = 48.63$, $\sigma_\beta = 62.11$, $p = 0.43$



(Figure2 Response time per conditions, ***: $p < 0.001$)

Discussion

- In line with previous studies^{2,3}, variability of appearance yields more reliable representations of inner diagnostic features
- However⁴, variability of context does not significantly affect facial encoding.
- Eyetracking data suggest that observed differences are not reliant on attentional processes
- We will continue acquiring data until we met the planned 254 participants or an interaction effect is significant

References

1. Devue, C., & de Sena, S. (2023). The impact of stability in appearance on the development of facial representations. *Cognition*, 239.
2. Reedy, M., & Devue, C. (2019). New perspective on face learning: Stability modulates resolution of facial representations in the optimal observer.
3. Corpuz, R. L., & Oriet, C. (2022). Within-Person Variability Contributes to More Durable Learning of Faces. *Canadian Journal of Experimental Psychology*, 76(4), 270-282.
4. Smith, S. M., & Handy, J. D. (2014). Effects of varied and constant environmental contexts on acquisition and retention. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 40(6), 1582-1593.

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➤ OSF: <https://osf.io/6gp8b>

➤ Qr code

