Abstract # 1131

SCAN ME

DO SUPER RECOGNIZERS PROCESS FACES MORE HOLISTICALLY? EVIDENCE FROM EYE MOVEMENT DATA

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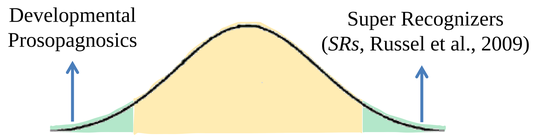
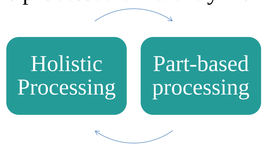
INTRODUCTION

- Face recognition ability resides upon a continuum within the typical population.



- Human face is processed differently from other objects.



- Holistic processing can be tested by using several experimental methodologies:
  - ***Inversion Task***

Inversion effect: Face recognition performance decreases when faces are inverted.

  - Composite-Face Task
  - Part-Whole Task

- SRs process faces more holistically than controls (e.g., Bobak et al., 2016; Russell et al., 2009).
- Yet, there is no study extensively examining eye movement strategies of SRs.

PRESENT STUDY

Aim: Investigate face processing strategy differences between SRs and non-SRs by using the inversion task and eye movement methodology.

Cambridge Face Memory Test-Long Form (*CFMT+*) → Learning Phase → Recognition Phase *(inversion manipulation)*

Eye movements were recorded by Tobii T60

PREDICTIONS

- **When faces are inverted,**
  - Recognition memory performance would decrease
  - Fixation duration would decrease while fixation count would increase.
- **If SRs process faces more holistically than non-SRs**, inversion effect would be more pronounced for them.

Inversion effect
[(upright-inverted) / (upright + inverted)]

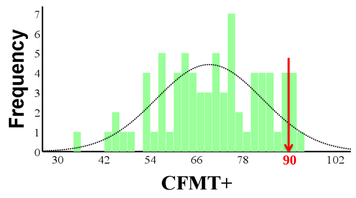
EXPLORATORY QUESTION

- At which phase of the inversion task would eye movements be more related to face recognition ability?
  - Learning vs. Recognition

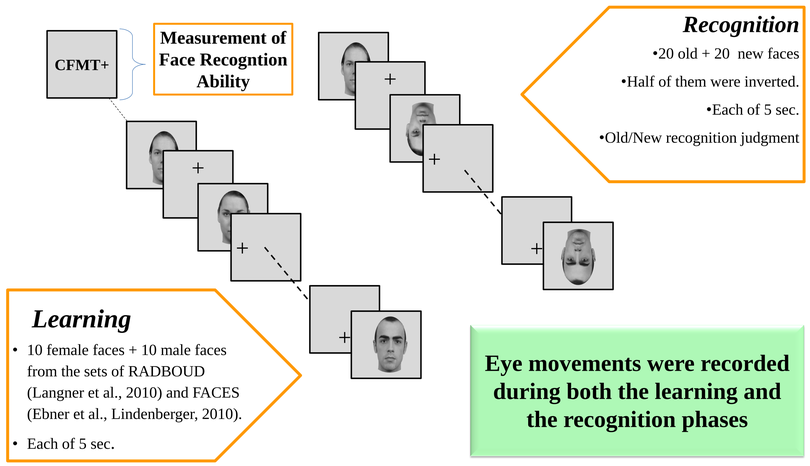
METHOD

Participants

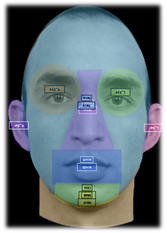
- N_{total}= 76 (M_{age}=20.15, 85% female)
- M_{CFMT+} = 69.27 *out of 102*, SD_{CFMT+}=13.42
- N_{SRs}= 5 super recognizers
  (> 90 on CFMT+, Russell et al., 2009)



Procedure



Areas of Interest (AOI)



- Whole face
- Inner face parts
  - Eyes
  - Nose
  - Mouth

Eye Movement Parameters

- Major parameters:
  Fixation duration and ***fixation count***
- But several other parameters were also estimated (*total fixation duration*, *fixation before etc.*)
- For both learning and recognition

Analyses

Eye Movements + Recognition Memory Performance (sensitivity & response bias)

- ***Analysis of variance***
  → 3 groups based on ± 1 SD of CFMT+ mean
- ***Correlational analysis***
  → CFMT+ as a continuous variable
- ***Case comparisons for SRs***

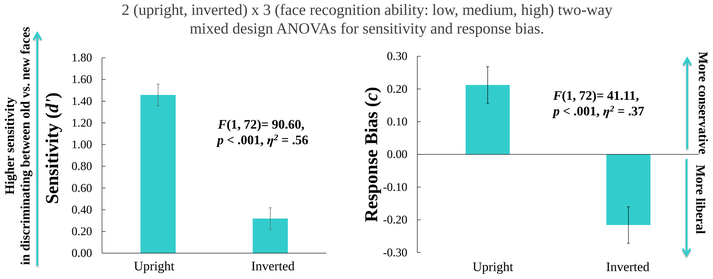
DISCUSSION

- To our knowledge, **this is the first study** that extensively investigates how eye movements during both learning and recognition influence face recognition ability.
- Inversion effect was observed for all participants **regardless of** their face recognition ability.
  - No clear evidence that holistic processing in SRs was associated with their extraordinary face recognition ability.
  - **Larger inversion effects on eye movements for only two of the five SRs**, but not on memory performance.
- The role of eye movements during learning vs. recognition:
  - Face recognition ability was **more related to eye movements during learning** than to those during recognition.
- ***Bobak et al. (2016)*: SRs spent more time examining the inner features of faces than did controls.
  - Without any recognition task.
- When eye movements during **recognition** were examined, **no** significant interaction of AOI and face recognition group was observed in the present study.

RESULTS

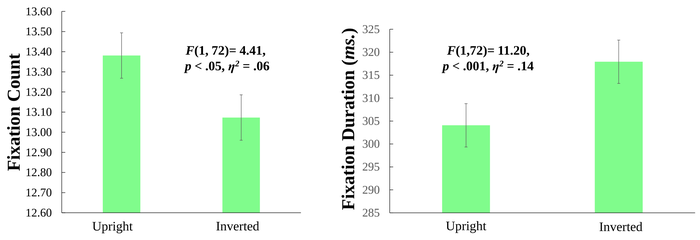
1 Recognition Memory Performance

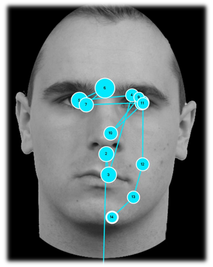
2 (upright, inverted) x 3 (face recognition ability: low, medium, high) two-way mixed design ANOVAs for sensitivity and response bias.



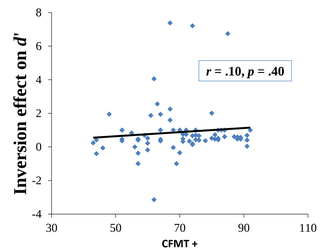
2 Eye Movements During Recognition

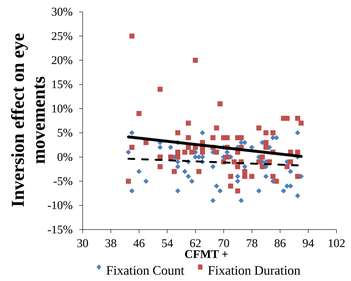
2 (upright, inverted) x 3 (face recognition ability: low, medium, high) two-way mixed design ANOVAs for fixation count and fixation duration on the whole face.





3 Correlational Analysis on Recognition





Fixation Duration
***r*= -.07, *p* = .53**

Fixation Count
***r* = -.20, *p* = .09**

4 Correlational Analysis on Learning

	Whole Face	*Eyes*	*Nose*	*Mouth*
Fixation Count	*n.s.*	*r*= .33 *p*=.004 ↑	*n.s.*	*r*=-.26 *p*=.03 ↓
Fixation Duration (ms.)	*n.s.*	*n.s.*	*n.s.*	*n.s.*
Fixation Before (count)	*n.s.*	*r*= -.23 *p*=.03 ↓	*n.s.*	*r*=.25 *p*=.03 ↑
Total Fixation Duration	*r*= .33 *p*=.005 ↑	*n.s.*	*n.s.*	*n.s.*

- There were no significant correlations between CFMT+ scores and eye movement parameters for the recognition phase (all *p*'s>.05).

5 Case Analyses

	Inversion Effect on: Fixation Count	Fixation Duration	*d'*
SR1	**%11** *t*=-3.04, *p*=.004 ↑	**%9** *t*=2.16, *p*=.03 ↓	*n.s.*
SR 2	**%8** *t*=-2.13, *p*=.04 ↑	**%6** *t*=1.88, *p*=.06 ↓	*n.s.*
All other SRs	All remaining comparisons were nonsignificant (*p* >.05)		

- Modified t-tests were conducted based on Crawford et al., 2010.
- Each SR was compared individually to those participants whose CFMT+ scores were in between ±1 SD of the CFMT+ mean.

REFERENCES

Crawford, J. R., Garthwaite, P. H., & Porter, S. (2010). Point and interval estimates of effect sizes for the case-controls design in neuropsychology: Rationale, methods, implementations, and proposed reporting standards. *Cognitive Neuropsychology, 27*, 245-260.
Bobak, A. K., Parris, B. A., Gregory, N. J., Bennetts, R. J., & Bate, S. (2017). Eye-movement strategies in developmental prosopagnosia and "super" face recognition. *The Quarterly Journal of Experimental Psychology, 70*(2), 201-217.
Ebner, N. C., Riediger, M., & Lindenberger, U. (2010). FACES—A database of facial expressions in young, middle-aged, and older women and men: Development and validation. *Behavior Research Methods, 42*(1), 351-362.
Langner, O., Dotsch, R., Bijlstra, G., Wigboldus, D. H., Hawk, S. T., & Van Knippenberg, A. D. (2010). Presentation and validation of the Radboud Faces Database. *Cognition & Emotion, 24*(8), 1377-1388.
Russell, R., Duchaine, B., & Nakayama, K. (2009). Super-recognizers: People with extraordinary face recognition ability. *Psychonomic Bulletin & Review, 16*(2), 252-257.

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