



VSS 2020

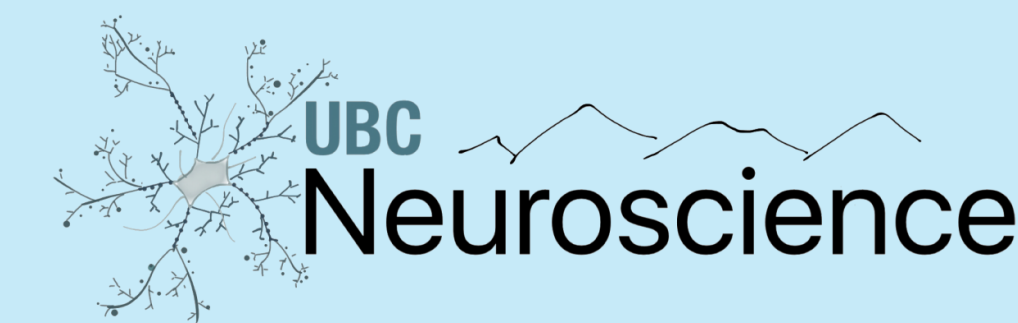


Gender- and age-contingent face aftereffects and the Hebbian normalization model

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INTRODUCTION

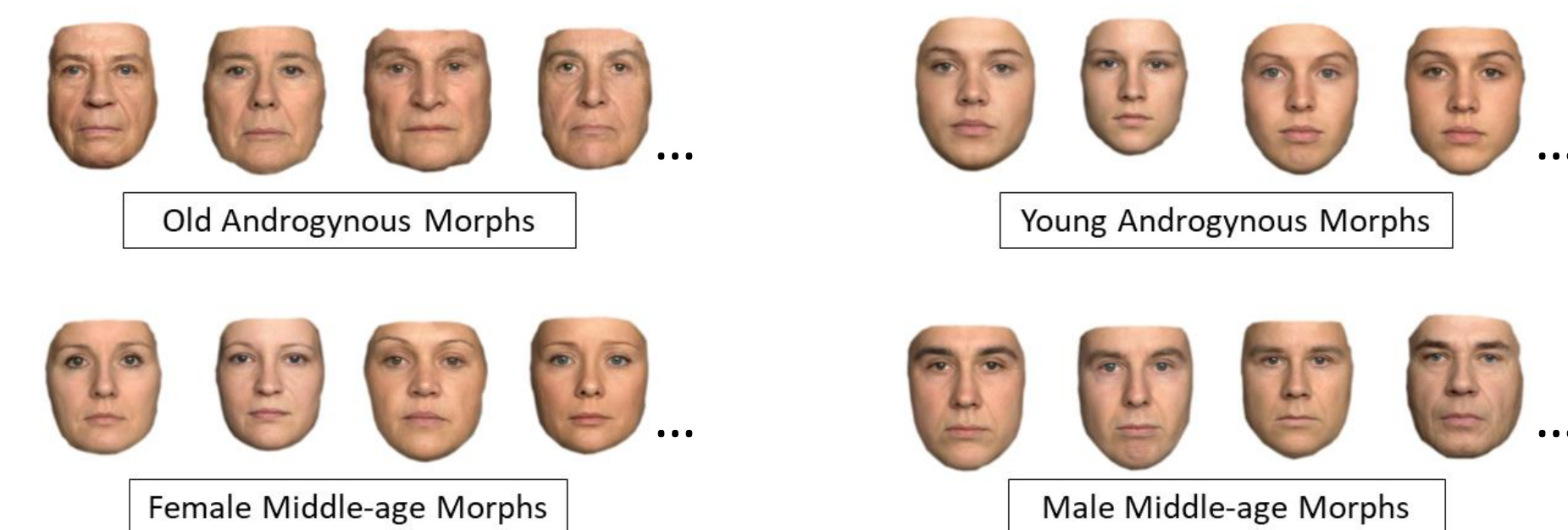
- Classical adaptation: response to a biased distribution of stimuli
- Contingent adaptation: Consistent with the Hebbian normalization model¹, neurons also adapt to 2nd-order statistics²
- Both first-order and contingent adaptation have been reported in the perception of various properties, e.g. orientation^{3,4}
- Does contingent adaptation apply to high-level perceptual features?

SUBJECTS AND STIMULI

Participants: N = 20 (12 females, mean age: 26)

Stimuli:

- 4 each: young male (YM), young female (YF), old male (OM), old female (OF)
- All 4x4 = 16 pairs morphed to make: young androgynous (YA), old androgynous (OA), middle-aged male (MM) and middle-aged female (MF)



Initially, participants viewed:

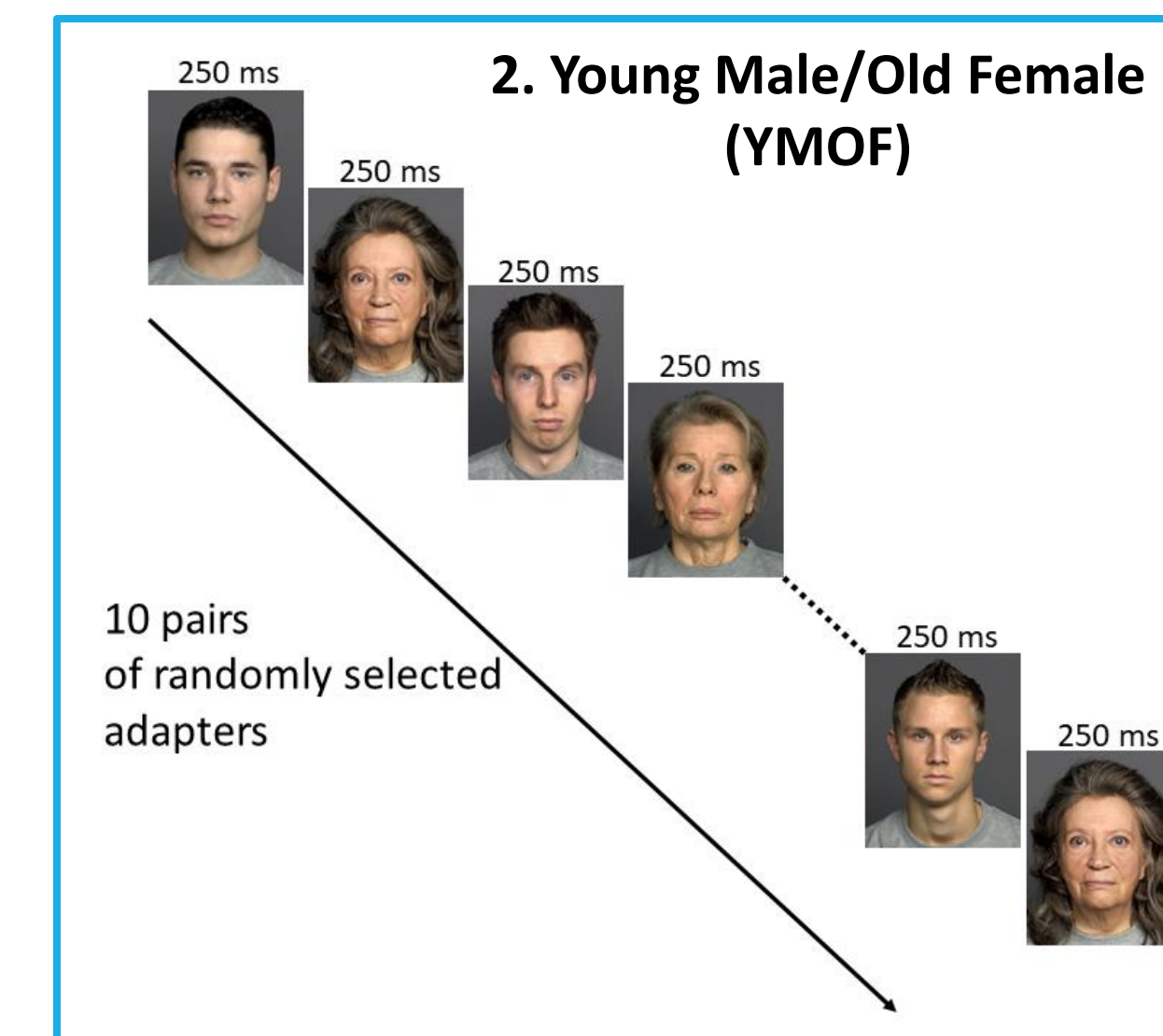
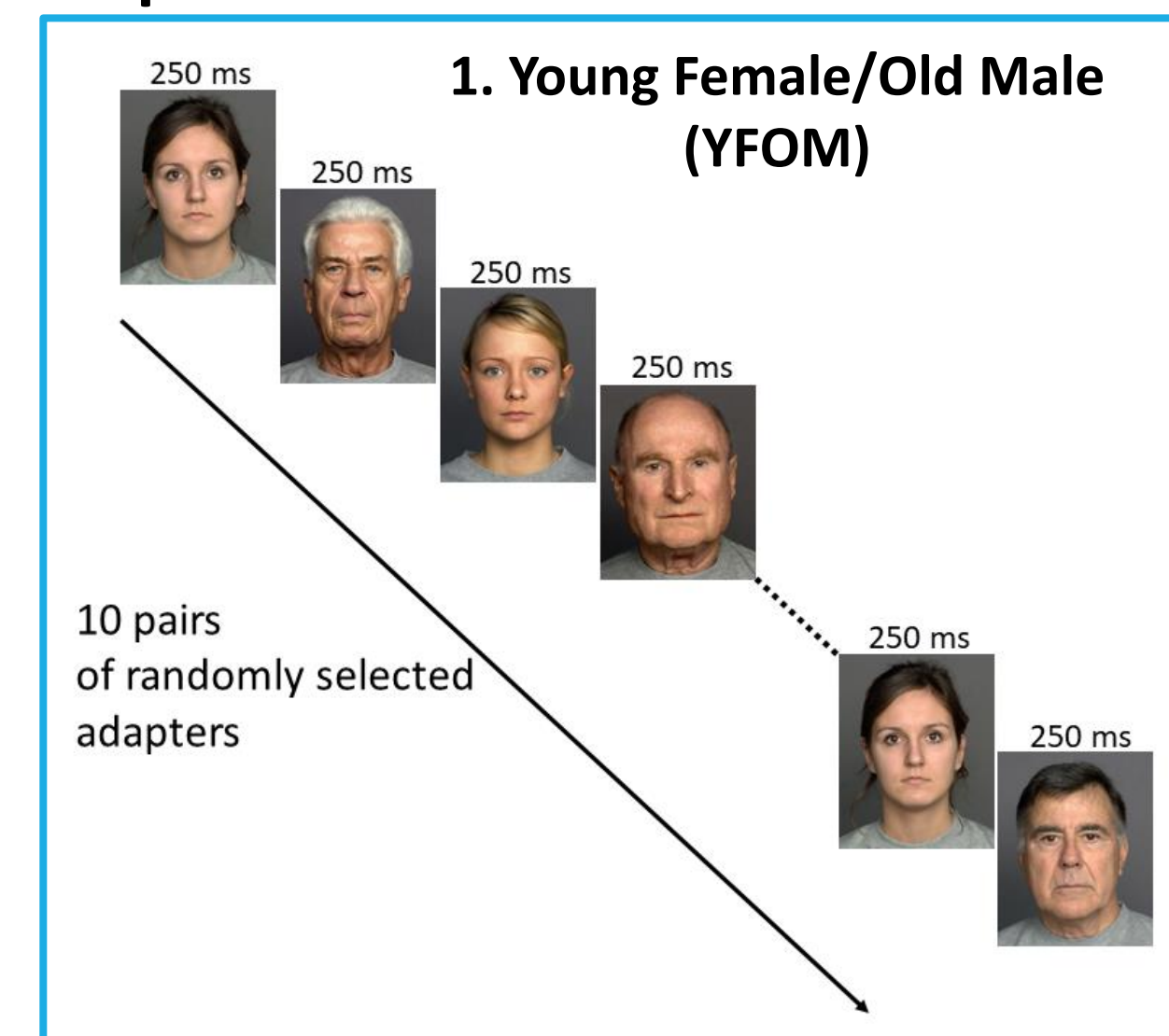
- all *MM morphs* and gave an estimate for the average age of those morphs (MM mean).
- all *MF morphs* and gave an estimate for the average age of those morphs (MF mean).

DESIGN

Trials:

20 adapters → 1 test face

Two Adaptation Sessions:



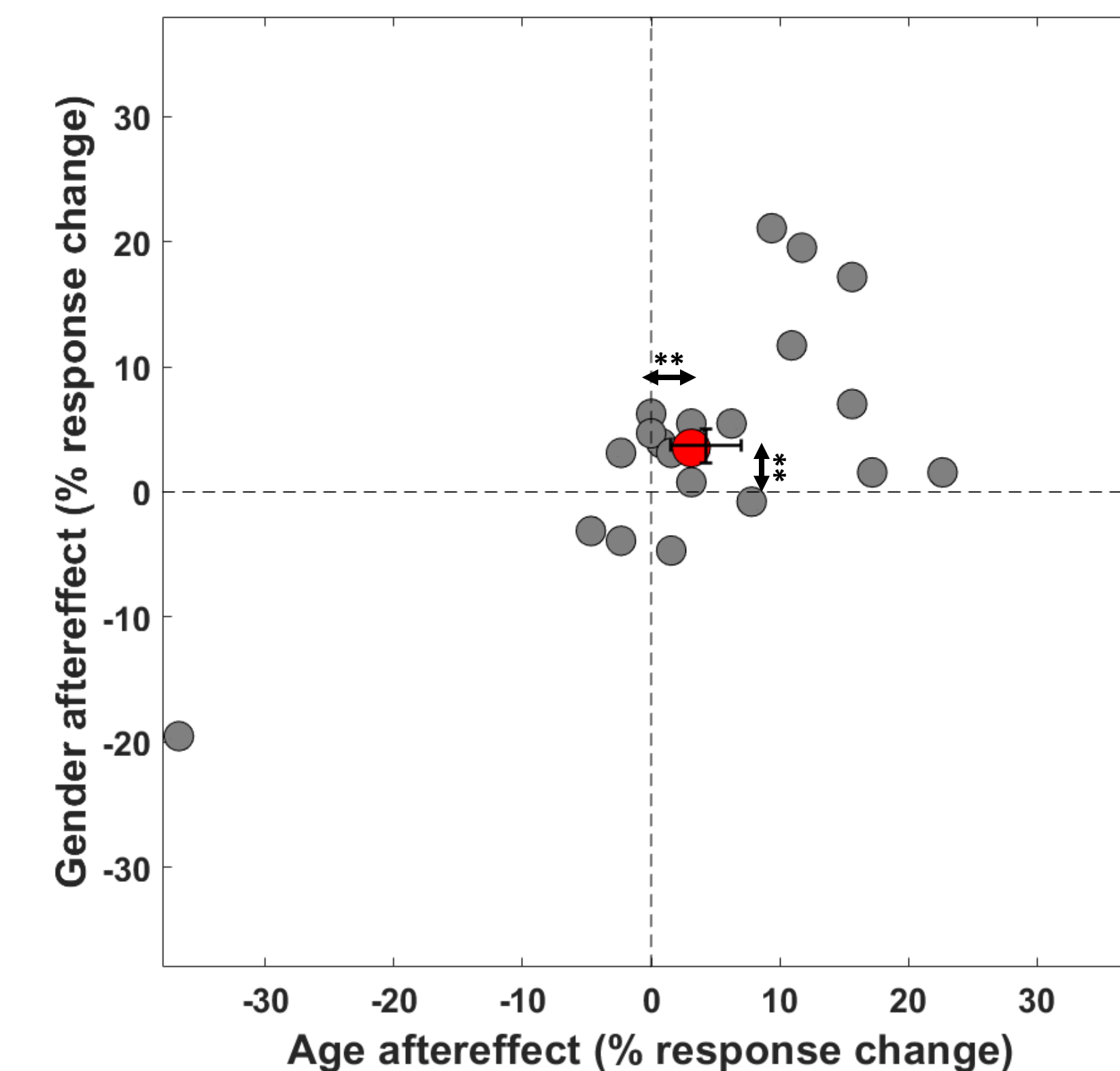
Four Randomly Intermixed Tests:

Gender Task	Age Task
Male (1) or Female (2)? Young Androgynous Morphs	Younger (1) or Older (2) than [MF mean]? Middle-Age Female Morphs
Male (1) or Female (2)? Old Androgynous Morphs	Younger (1) or Older (2) than [MM mean]? Middle-Age Male Morphs

Analysis (computed using percentage of responses):

	Age aftereffect:				Gender Aftereffect:			
Adapter type	(YMOF - YFOM)+(YFOM - YMOF)				(YMOF - YFOM)+(YFOM - YMOF)			
Stimulus type	MM	MM	MF	MF	YA	YA	OA	OA
Reference Response	O			O	F			F

RESULTS



Significant aftereffects in the expected direction.

- Datapoints: individual participants
- Red: median aftereffects
- Error bars: 68% bootstrapped CIs

CONCLUSIONS

- Repulsive age-contingent gender and gender-contingent age aftereffects
- If coded separately (some neurons tuned for age, others for gender) in a normalization network, results are predicted by Hebbian normalization.

ACKNOWLEDGMENTS

1. Westrick et al., *J Neurosci*, 2016.
2. Aschner et al., *J Neurosci*, 2018.
3. Gibson & Radner, *J Exp Psych*, 1937.
4. Yiltiz et al., *Vision Res*, 2020.



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