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Effects of attractiveness and distinctiveness on attention and memory for faces

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Effects of Attractiveness and Distinctiveness on Attention and Memory for Faces

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Acknowledgements

Human Faces are . . .

- Important biological and socio-emotional stimuli
  - Occur frequently, well-learned
  - Associated with important outcomes throughout entire life

- Vary in facial features: race, age, emotion, or **attractiveness and distinctiveness**

Ebner, He, & Johnson, 2011; Ebner & Johnson, 2010

Effects of Attractiveness and Distinctiveness on Attention and Memory

- Attractiveness
  - Mixed evidence
  - Leads to affective arousal; with effects on pupil dilation (increased) and improved face recognition
  - Distinctiveness as explanatory factor?

- Distinctiveness
  - Robust predictor of face recognition

- Incongruity hypothesis

Wickham, & Morris, 2003; Shepherd, & Ellis, 1973; Light, Kayra-Stuart, & Hollander, 1979; Schmidt, 1991

Attractiveness and Distinctiveness From an Age by Gender Perspective

- Attractiveness
    - Mating and competition goals in young adults
    - Evolutionarily different for women and men; men more motivated to look for attractive (female) faces
- Distinctiveness
    - Recognition of less distinct faces more cognitively demanding and thus more difficult for older adults due to declining cognitive resources

Schmidt, 1991; Langlois, & Roggman, 1990; Aahron et al, 2001

Research Questions

(1) Does **facial attractiveness** and **facial distinctiveness** influence **pupil dilation** and **face recognition**? Do these effects interact with age and gender of perceiver?

(2) Does increased **pupil dilation** improve **face recognition**? Does this effect interact with age and gender of perceiver?

Study Sample

Participants	N	Range	M	SD	% Female
Younger	25	19 - 29	22.2	2.9	60.0
Older	24	63 - 92	73.9	7.8	71.0

Measures	Young Participants M / % (SD)	Older Participants M / % (SD)	Age-Group Differences
Self-Reported Health	4.4 (0.7)	4.2 (0.7)	$F(1, 48) = 0.56$, $p = .46$, $\eta_p^2 = .01$
Hearing Difficulties	0.0%	58.3%	$\chi^2(1, _{N = 49}) = 20.42$, $p < .001$
Near Vision	22.4 (5.0)	52.1 (50.4)	$F(1, 48) = 8.58$, $p < .001$, $\eta_p^2 = .15$
Contrast Sensitivity	1.7 (0.1)	1.5 (0.2)	$F(1, 48) = 18.82$, $p < .001$, $\eta_p^2 = .29$
Visual-Motor Processing Speed	67.5 (12.0)	45.5 (7.9)	$F(1, 48) = 57.50$, $p < .001$, $\eta_p^2 = .55$

Study Paradigm

Encoding: Face Viewing
(Eye Tracking)

Test: Face Recognition
(No Eye Tracking)
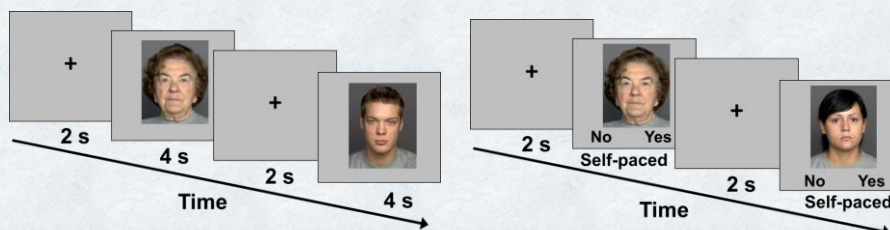
Outcome variables

- Horizontal pupil dilation (diameter in cm)
- Percent successful recognition of target faces

Applied Science Laboratories Model 504 Eye Tracker; GazeTracker Software (Eye Response Technologies, Inc.)

Independent Ratings of Facial Attractiveness and Distinctiveness

Raters	N	Range	M	SD	% Female
Younger	52	20 - 31	26.0	3.0	52.0
Older	51	70 - 81	73.6	2.8	47.0
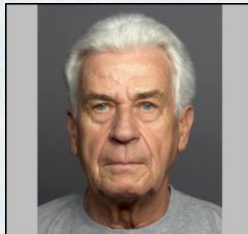
Dimension	Range	M	SD
Attractiveness	23.8 - 72.8	43.0	12.7
Distinctiveness	21.9 - 55.9	37.1	7.4

How **attractive / distinctive** is this person?

0 = not at all attractive / distinctive
100 = very attractive / distinctive

- Pearson's $r = .78$, $p < .05$
- FACES database
  Ebner, Riediger, & Lindenberger, 2010

Multilevel Random Coefficient Modeling

(1a) Effect of **attractiveness/distinctiveness** on **face recognition**

η (Hits) = β_{00} + β_{01} (Age Group) + β_{02} (Gender) + β_{03} (Age Group X Gender)
   + β_{10} (Facial Feature) + β_{11} (Age Group X Facial Feature) + β_{12} (Gender X Facial Feature)
   + β_{13} (Age Group X Gender X Facial Feature) + r_0 + r_1 (Facial Feature)

(1b) Effect of **attractiveness/distinctiveness** on **pupil dilation**

Pupil Dilation = β_{00} + β_{01} (Age Group) + β_{02} (Gender) + β_{03} (Age Group X Gender)
   + β_{10} (Facial Feature) + β_{11} (Age Group X Facial Feature) + β_{12} (Gender X Facial Feature)
   + β_{13} (Age Group X Gender X Facial Feature) + r_0 + r_1 (Facial Feature) + e

(2) Effect of **pupil dilation** on **face recognition**

η (Hits) = β_{00} + β_{01} (Age Group) + β_{02} (Gender) + β_{03} (Age Group X Gender)
   + β_{10} (Pupil Dilation) + β_{11} (Age Group X Pupil Dilation) + β_{12} (Gender X Pupil Dilation)
   + β_{13} (Age Group X Gender X Pupil Dilation) + r_0 + r_1 (Pupil Dilation)

HLM6 *Raudenbush, & Bryk, 2002; Nezlek, 2008*

Better Memory for More Attractive Faces in Younger Participants and Women; Better Memory for Less Attractive Faces in Older Participants and Men

| Variable	Hits
Fixed effects	
Intercept	2.24
Age group of participant	1.27
Gender of participant	1.14
Age group of participant X Gender of participant	0.88
Attractiveness rating of face	1.00
Age group of participant X Attractiveness rating of face	**0.96 ***
Gender of participant X Attractiveness rating of face	**1.02 ***
Age group of participant X Gender of participant X Attractiveness rating of face	1.01
Random Effects	
Attractiveness rating of face	0.00
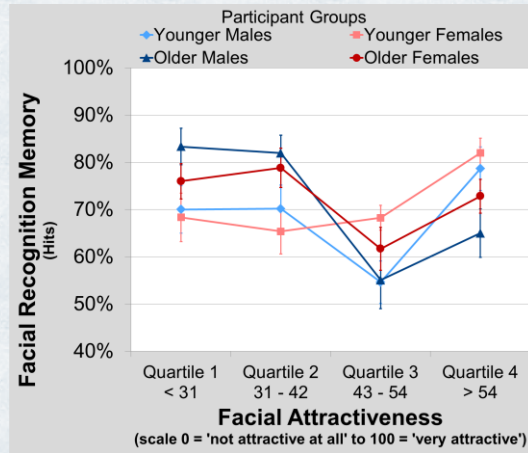
Comparable Pattern of Results for Facial Distinctiveness

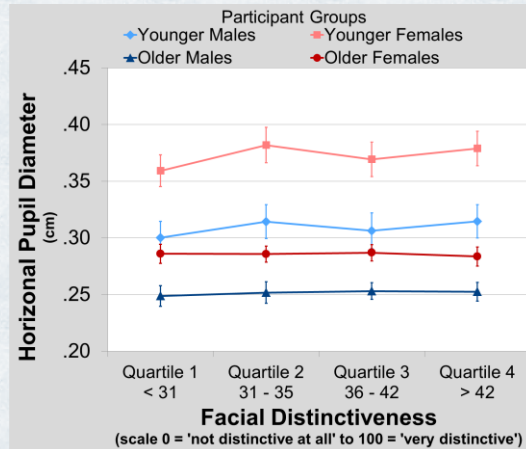| Variable	Hits
Fixed effects	
Intercept	2.26
Age group of participant	1.23
Gender of participant	1.16
Age group of participant X Gender of participant	0.88
Distinctiveness rating of face	**1.02 ***
Age group of participant X Distinctiveness rating of face	**0.93 ***
Gender of participant X Distinctiveness rating of face	**1.04 ***
Age group of participant X Gender of participant X Distinctiveness rating of face	1.03
Random Effects	
Distinctiveness rating of face	0.00

6
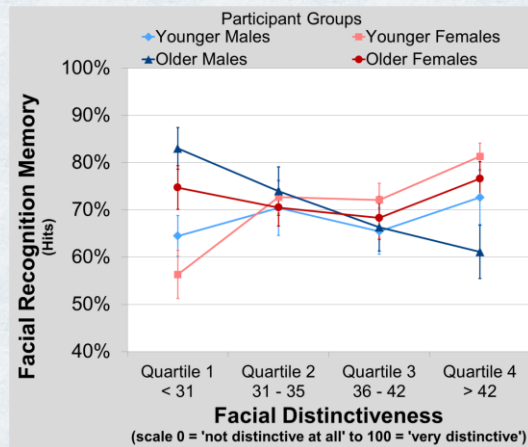
Younger Participants and Women Have Greater Pupil Dilation; No Effects for Facial Attractiveness

| Variable	Pupil Diameter
Fixed effects	
Intercept	30.75
Age group of participant	**-5.60 ***
Gender of participant	**6.45 ***
Age group of participant X Gender of participant	-3.07
Attractiveness rating of face	0.01
Age group of participant X Attractiveness rating of face	**-0.01 ***
Gender of participant X Attractiveness rating of face	0.01
Age group of participant X Gender of participant X Attractiveness rating of face	-0.01
Random Effects	
Intercept	35.97
Attractiveness rating of face	0.00
Residual	3.33
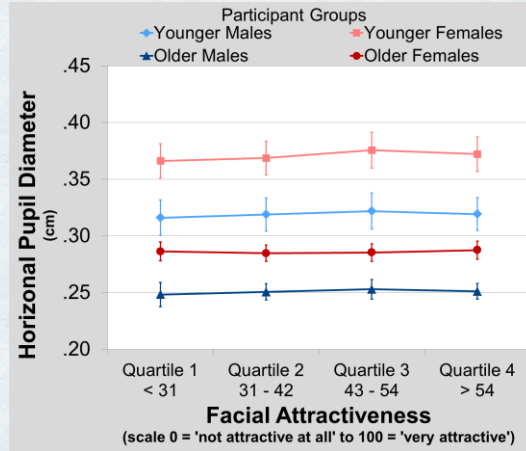
Comparable Pattern of Results for Facial Distinctiveness

Variable	Pupil Diameter
Fixed effects	
Intercept	30.76
Age group of participant	**-5.61 ***
Gender of participant	**6.45 ***
Age group of participant X Gender of participant	-3.07
Distinctiveness rating of face	**0.02 ***
Age group of participant X Distinctiveness rating of face	-0.01
Gender of participant X Distinctiveness rating of face	0.00
Age group of participant X Gender of participant X Distinctiveness rating of face	-0.02
Random Effects	
Intercept	35.94
Distinctiveness rating of face	0.00
Residual	3.34

Greater Pupil Dilation Related to Better Face Memory for Women but Worse Face Memory for Men; Effect More Pronounced in Older Participants

Variable	Hits
Fixed effects	
Intercept	1.72
Age group of participant	2.94
Gender of participant	1.35
Age group of participant X Gender of participant	0.39
Pupil diameter of participant	**0.93** [+]
Age group of participant X Pupil diameter of participant	**1.21** [*]
Gender of participant X Pupil diameter of participant	**1.09** [+]
Age group of participant X Gender of participant X Pupil diameter of participant	**0.80** [*]
Random Effects	
Pupil diameter of participant	0.00
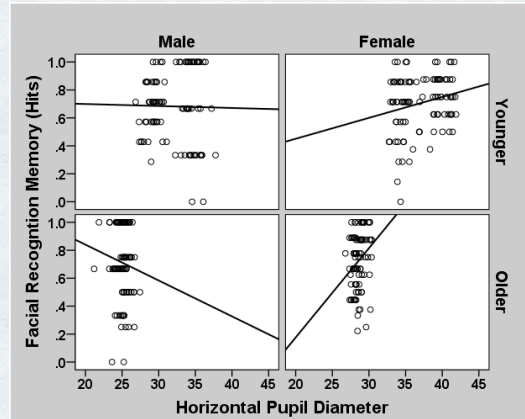
Discussion

- Better memory for more attractive and more distinctive faces in younger participants and women
  - Competition and mate selection goals
  - Pupil dilation representative of arousal
  - Appearance possibly less salient/relevant for older adults
- Better memory for less attractive and less distinctive faces in older participants and men
  - Particularly disadvantaged when viewing congruent stimuli
  - Pupil dilation representative of cognitive effort
- Greater pupil dilation in younger participants and women

Where to Go from Here

- Additional Analysis in Current Data Set
  - Pupil dilation change scores
  - Areas of interest analysis (e.g., focus on the eyes)
  - Consider age and gender of face (in main analysis as well as in face ratings)
- Follow-up studies
  - Targeted approach to identify underlying mechanisms (e.g., neural processes, motivational factors)
  - Manipulation of orienting task (implicit vs. explicit encoding; mate/friend choice task)
  - Transfer of effects to other memory components (e.g., name recall and recognition)?

Facial Distinctiveness & Gaze Time