

# Effects of Attractiveness and Distinctiveness on Attention and Memory for Faces

Carla M. Strickland-Hughes<sup>1</sup>, Marcia K. Johnson<sup>2</sup>, & Natalie C. Ebner<sup>1</sup>

<sup>1</sup>University of Florida, <sup>2</sup>Yale University

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## 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?

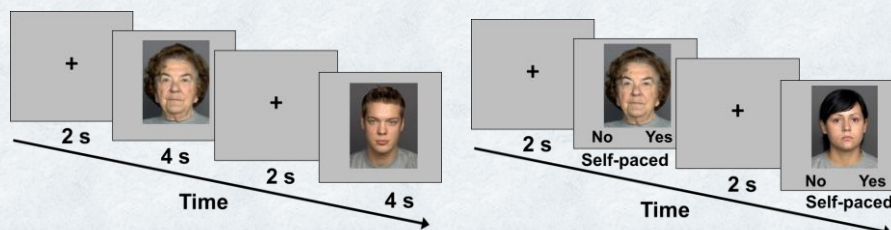
## Study Sample

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

Measures	Young Participants <i>M</i> / % ( <i>SD</i> )	Older Participants <i>M</i> / % ( <i>SD</i> )	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)**



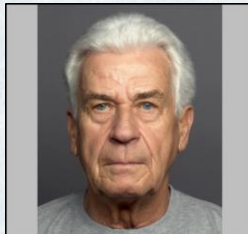
### Outcome variables

- 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

$$\eta \text{ (Hits)} = \beta_{00} + \beta_{01} \text{ (Age Group)} + \beta_{02} \text{ (Gender)} + \beta_{03} \text{ (Age Group X Gender)} \\ + \beta_{10} \text{ (Facial Feature)} + \beta_{11} \text{ (Age Group X Facial Feature)} + \beta_{12} \text{ (Gender X Facial Feature)} \\ + \beta_{13} \text{ (Age Group X Gender X Facial Feature)} + r_0 + r_1 \text{ (Facial Feature)}$$

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

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

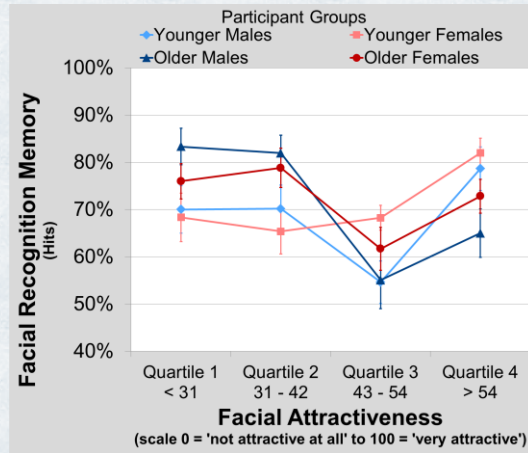
### (2) Effect of pupil dilation on face recognition

$$\eta \text{ (Hits)} = \beta_{00} + \beta_{01} \text{ (Age Group)} + \beta_{02} \text{ (Gender)} + \beta_{03} \text{ (Age Group X Gender)} \\ + \beta_{10} \text{ (Pupil Dilation)} + \beta_{11} \text{ (Age Group X Pupil Dilation)} + \beta_{12} \text{ (Gender X Pupil Dilation)} \\ + \beta_{13} \text{ (Age Group X Gender X Pupil Dilation)} + r_0 + r_1 \text{ (Pupil Dilation)}$$

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

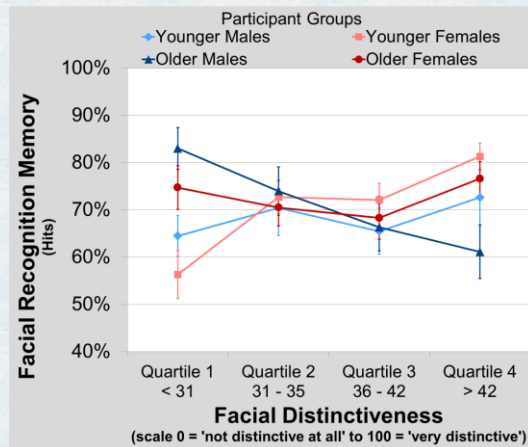
## Better Memory for More Attractive Faces in Younger Participants and Women; Better Memory for Less Attractive Faces in Older Participants and Men

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
<b>Age group of participant X Attractiveness rating of face</b>	<b>0.96 *</b>
<b>Gender of participant X Attractiveness rating of face</b>	<b>1.02 *</b>
Age group of participant X Gender of participant X Attractiveness rating of face	1.01
Random Effects	
Attractiveness rating of face	0.00



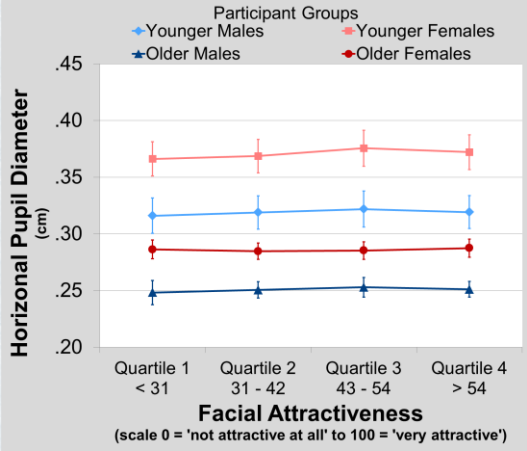
## Comparable Pattern of Results for Facial Distinctiveness

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
<b>Distinctiveness rating of face</b>	<b>1.02 *</b>
<b>Age group of participant X Distinctiveness rating of face</b>	<b>0.93 *</b>
<b>Gender of participant X Distinctiveness rating of face</b>	<b>1.04 *</b>
Age group of participant X Gender of participant X Distinctiveness rating of face	1.03
Random Effects	
Distinctiveness rating of face	0.00



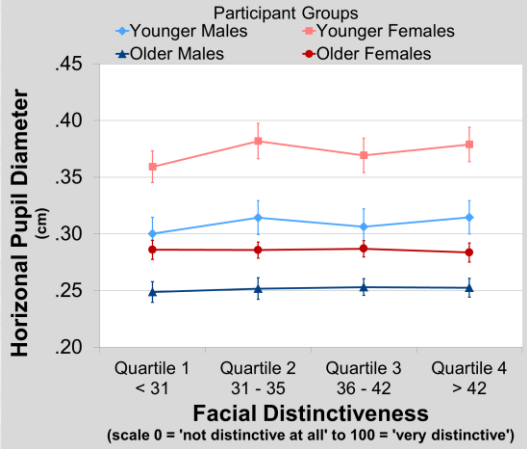
## Younger Participants and Women Have Greater Pupil Dilation; No Effects for Facial Attractiveness

Variable	Pupil Diameter
<b>Fixed effects</b>	
Intercept	30.75
<b>Age group of participant</b>	<b>-5.60 *</b>
<b>Gender of participant</b>	<b>6.45 *</b>
Age group of participant X Gender of participant	-3.07
Attractiveness rating of face	0.01
<b>Age group of participant X Attractiveness rating of face</b>	<b>-0.01 *</b>
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
<b>Random Effects</b>	
Intercept	35.97
Attractiveness rating of face	0.00
Residual	3.33



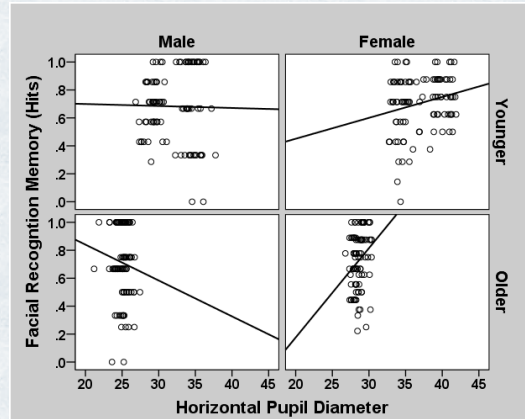
## Comparable Pattern of Results for Facial Distinctiveness

Variable	Pupil Diameter
<b>Fixed effects</b>	
Intercept	30.76
<b>Age group of participant</b>	<b>-5.61 *</b>
<b>Gender of participant</b>	<b>6.45 *</b>
Age group of participant X Gender of participant	-3.07
<b>Distinctiveness rating of face</b>	<b>0.02 *</b>
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
<b>Random Effects</b>	
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
<b>Pupil diameter of participant</b>	<b>0.93 *</b>
<b>Age group of participant X Pupil diameter of participant</b>	<b>1.21 *</b>
<b>Gender of participant X Pupil diameter of participant</b>	<b>1.09 *</b>
<b>Age group of participant X Gender of participant X Pupil diameter of participant</b>	<b>0.80 *</b>
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

Variable	Face Looking Time (Gaze Time)
<b>Fixed effects</b>	
Intercept	3.73
Age group of participant	-0.41 *
Gender of participant	0.02
Age group of participant X Gender of participant	0.48 *
Distinctiveness rating of face	0.00
Age group of participant X Distinctiveness rating of face	0.00
Gender of participant X Distinctiveness rating of face	0.00
Age group of participant X Gender of participant X Distinctiveness rating of face	0.00
<b>Random Effects</b>	
Intercept	35.94
Distinctiveness rating of face	0.00
Residual	3.34

