INF1-CG 2015
Lecture 27

Face recognition: experiments, computation and the phenomenology of prosopagnosia

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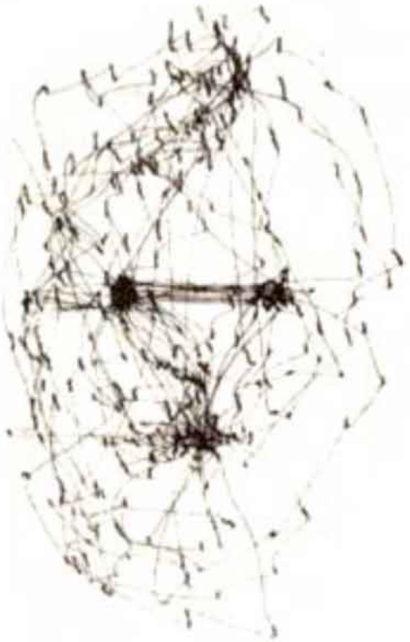
Today's goals



To look briefly at some experimental approaches to facial processing. To explore the phenomenology of prosopagnosia.

Today's reading

Rezlescu, C., Barton, J.J.S., Pitcher, D. & Duchaine, B. (2014). Normal acquisition of expertise with greebles in two cases of acquired prosopagnosia. Published online before print March 24, 2014, doi: 10.1073/pnas.1317125111 PNAS March 24, 2014

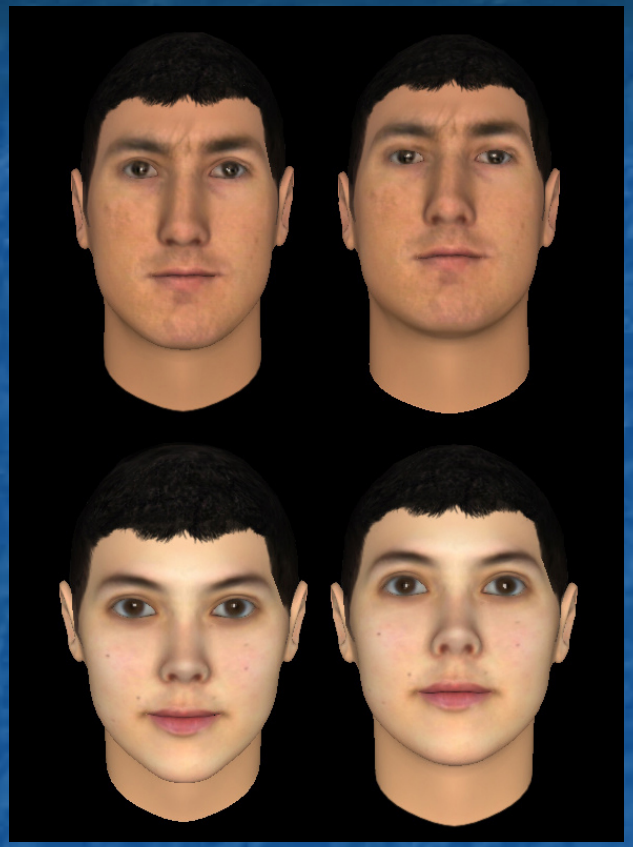
Kanwisher, N. (2000). Domain specificity in face perception. *Nature Neuroscience*, *3*, 759-763.

The problem of face recognition

Expressions differ.

Lighting effect differences can be greater than differences between individuals.

The problem of face recognition

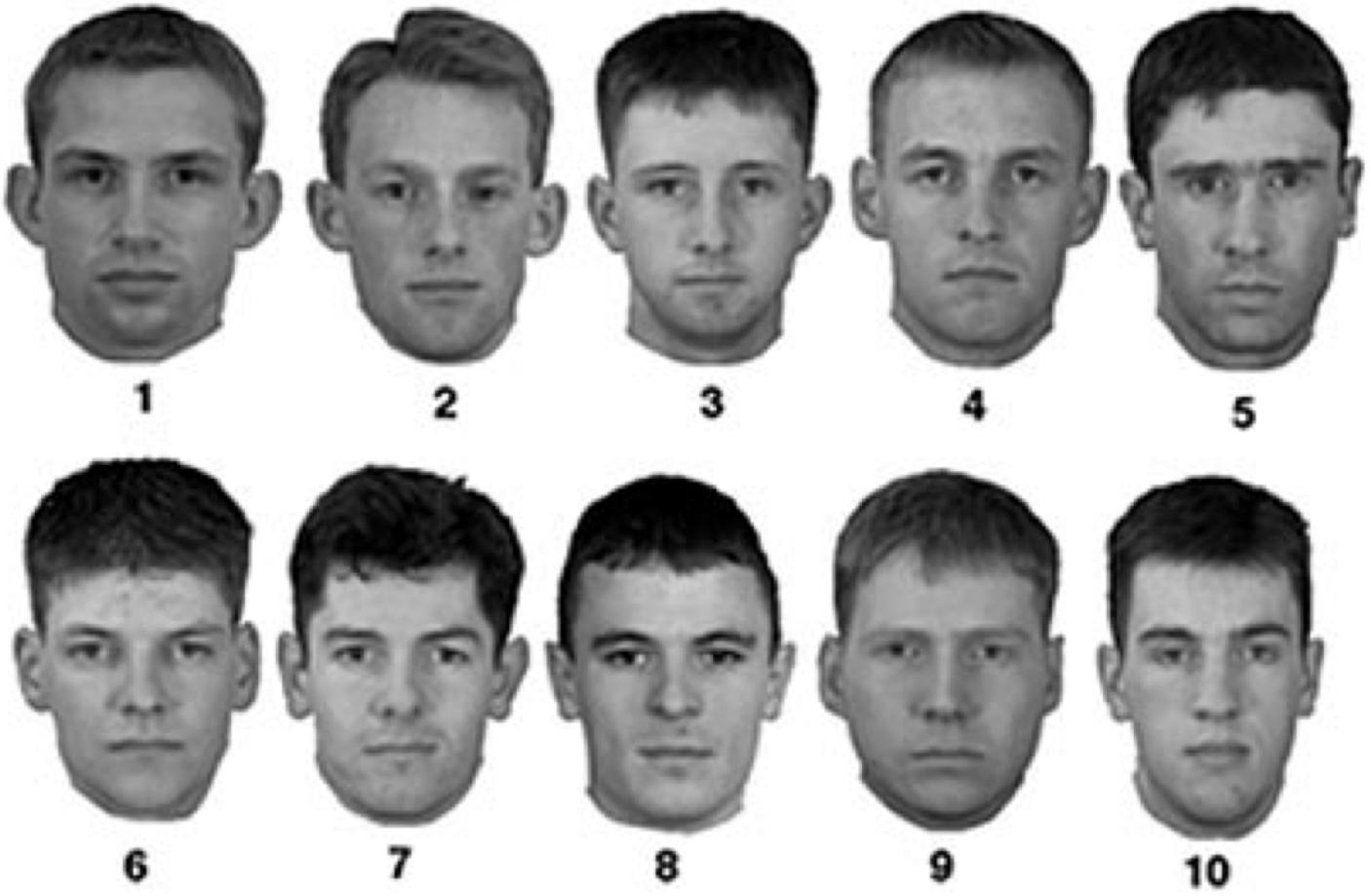


Simple tilt causes substantial differences.

Face recognition has attracted psychological and technological interest.

Recognizing unfamiliar faces

Bruce et al. (1999)



People are extremely poor at recognizing unknown faces again.

The Thatcher Illusion

Thompson (1980)

Inverting the face disrupts the configural processing that we typically carry out on normally presented faces.

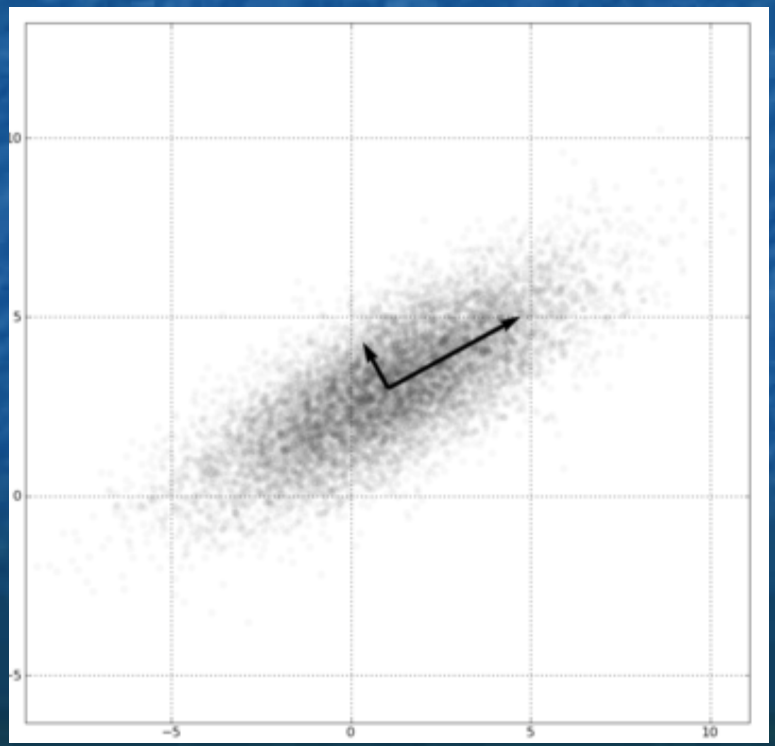
Farah (1998) shows this is a perceptual level phenomenon too.

PCA analysis and "eigenfaces"

e.g. Turk et al. (1991); Hancock et al. (2000)

Faces are complex things, complex "sets of data".

Principal components analysis (PCA) is a standard statistical technique for reducing large volumes of data to orthogonal components.



PCA analysis and "eigenfaces"

e.g. Turk et al. (1991); Hancock et al. (2000)

We can use PCA with faces.

First, mark key features (eyes, nostrils, mouth).

Second, morph the face to normalize it, so that the key features all appear in the same position.

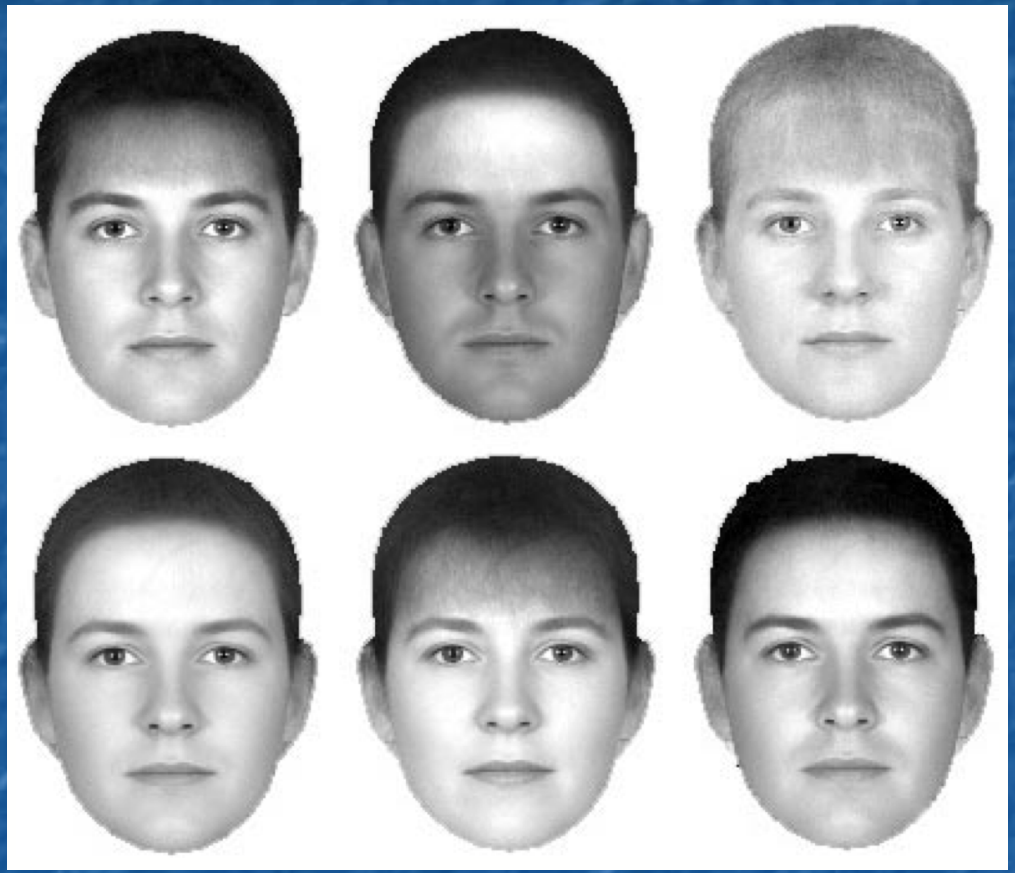
Third, calculate "eigenfaces", which are orthogonal variations from the average face.

These eigenfaces mean we can define a face with 50 or so numbers.

They give us an idea of features that are useful for recognition.

PCA analysis and "eigenfaces"

e.g. Turk et al. (1991); Hancock et al. (2000)



The effects of adding or subtracting the first three components (from left to right) from the average face. The second one codes fo gender.

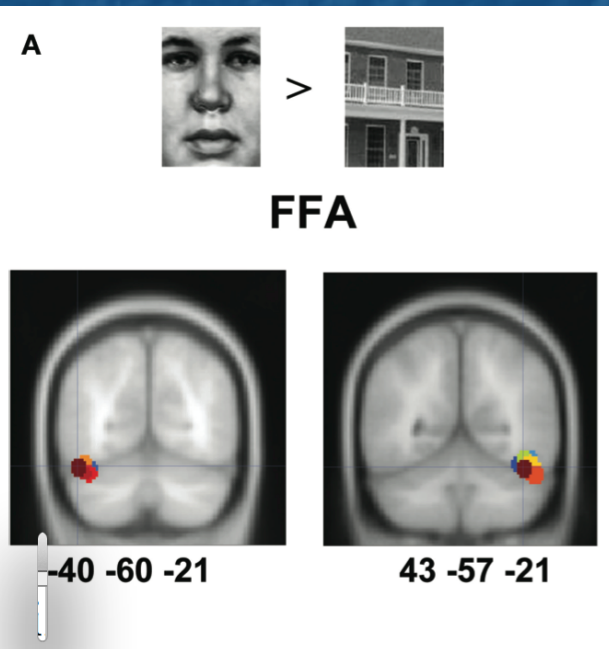
PCA analysis and "eigenfaces"

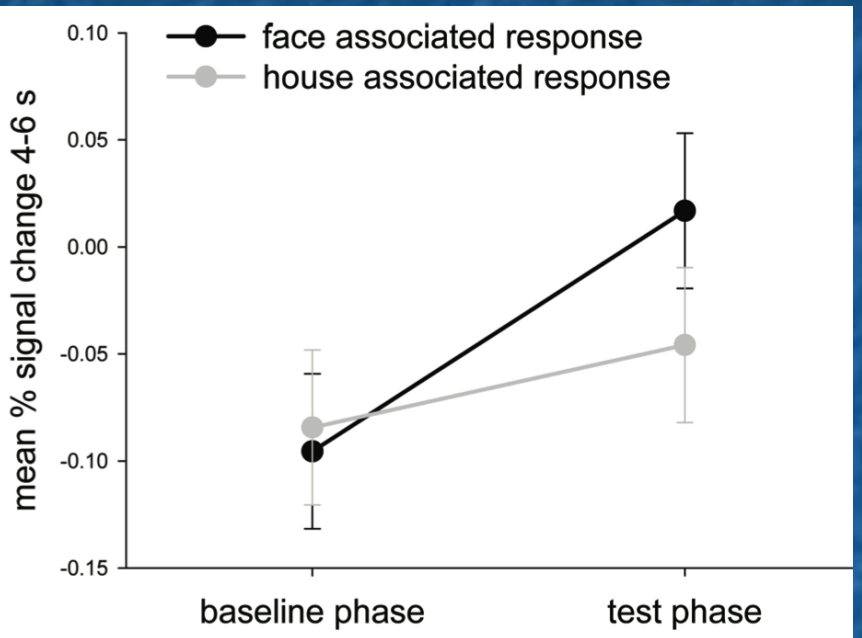
Hancock et al. (2000)

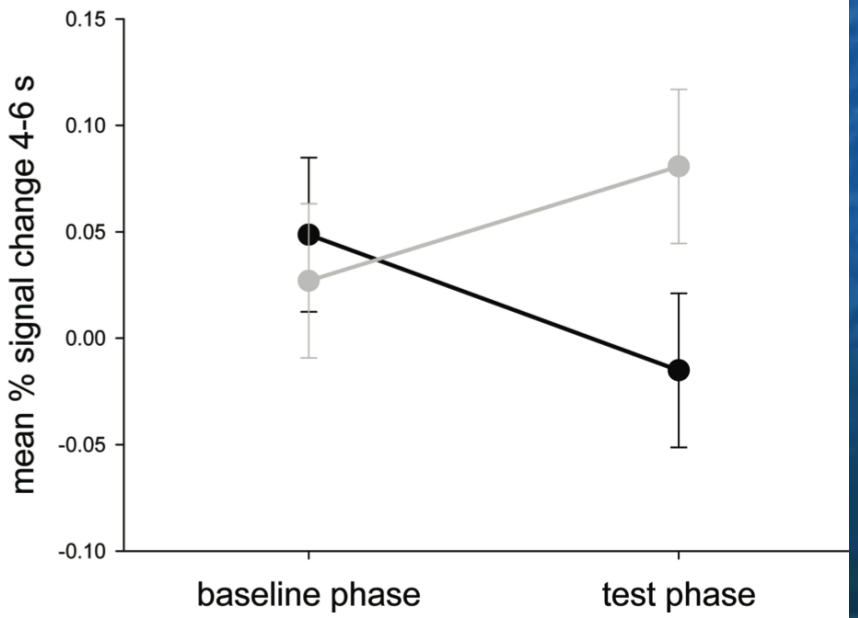
These components code for face shape.

The Fusiform Face Area

Kuhn *et al.* (2010)







People acting to obtain a face or a house picture activate the FFA for faces.

Challenges

Think about the relationship between face recognition by machines and by humans. Do the same criteria apply?

How much does it make sense for us to be hard-wired for face recognition?

What is the relationship between dedicated expertise and generic/learnable expertise?

References

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Hancock, P. J., Bruce, V., & Burton, A. M. (2000). Recognition of unfamiliar faces. *Trends in Cognitive Sciences, 4*(9), 330-337.

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Bruce, V., Henderson, Z., Greenwood, K., Hancock, P. J., Burton, A. M., & Miller, P. (1999). Verification of face identities from images captured on video. *Journal of Experimental Psychology: Applied, 5*(4), 339.

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