



# Investigating categorical perception of gender with 3-D morphs of familiar faces



Isabelle Bühlhoff Fiona. N. Newell

Max-Planck-Institute for Biological Cybernetics, Tübingen, Germany  
Trinity College, Dublin, Ireland  
isabelle.buelthoff@tuebingen.mpg.de Fiona.Newell@tcd.ie

## 1 INTRODUCTION

In a recent study (ECVP98) we reported no evidence for perceptual categorisation of gender using unfamiliar faces. Here, we investigated whether familiarizing participants with the stimuli prior to test would provoke categorical perception as was previously reported for face identity (Beale and Keil, 1995, Levin and Beale, 2000). We also tested whether using "averaged" faces instead of individual faces, as stimuli might reduce the facial variations related to identity and thereby favor categorical perception of gender.

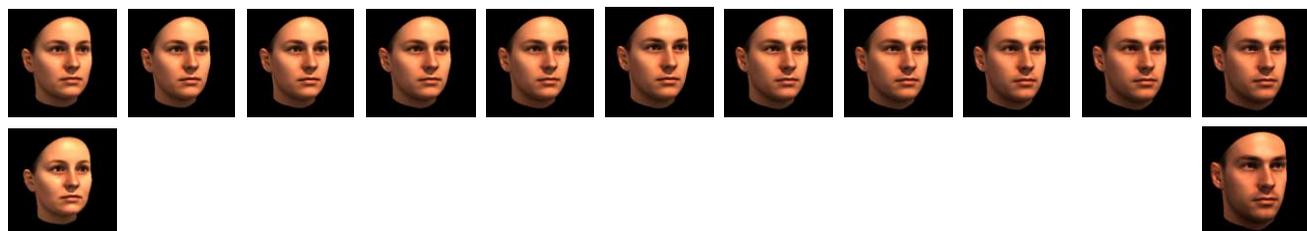
## 2 STIMULI AND PROCEDURE

For the first experiment we used 6 males and 6 female 3D heads (hair removed) obtained with a 3D head-scanner (Cyberware). 3D-Morphs were created between male and female faces using an algorithm which automatically finds corresponding pixels between 3D-images of faces (Vetter and Poggio, 1997). In the familiarization experiment, the participants were familiarized with the 6 male and 6 female original faces prior testing. For the second experiment, we used the same method to generate an average face from 100 male and 100 female faces. From this face we created morphs between an average female and an average male face.

### 20 deg view: individual faces



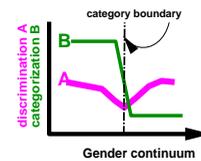
### 20 deg view: average faces



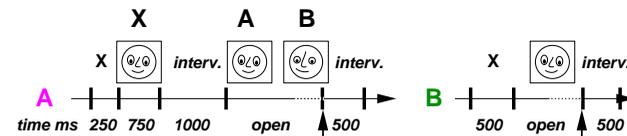
## 3 HYPOTHESES

**A.** In the **discrimination** task, pairs of faces are discriminated more accurately when they straddle the category boundary than when both faces belong to the same category.

**B.** In the **categorization** task, all faces are perceived as either male or female, with a sharp change around the gender boundary although the presented faces are evenly distributed along the artificial gender continuum.



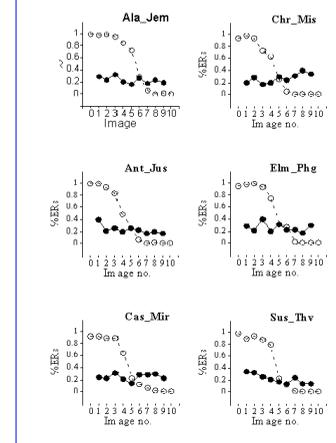
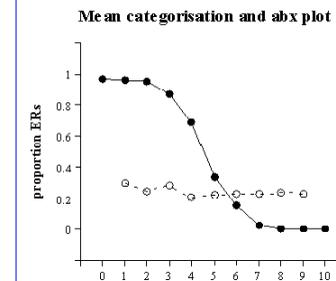
**A. Discrimination task.** XAB Participants were asked which of a pair of images matched the first face presented in the trial. AB Participants were asked which image of the pair was more feminine.  
**B. Categorization task.** Participants had to categorize each face image as male or female.



## 4 RESULTS

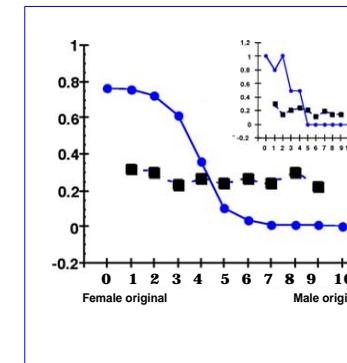
### familiar faces

20 Ss



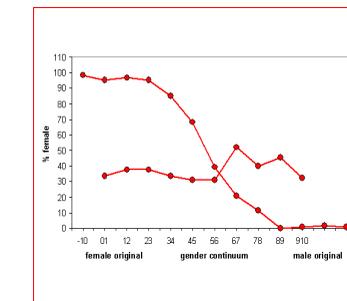
### unfamiliar faces

15 Ss



### "averaged" faces

15 Ss



## 5 RESULTS SUMMARY

In both experiments the participants could categorize all faces by their gender in the categorization task (characteristic step function). Prior familiarization with the endpoint faces or the use of averaged faces lacking individual features did not induce a visible categorical effect for the perception of gender; participants did not discriminate more easily between face images straddling the category boundary.

## 6 GENERAL DISCUSSION

The results suggest that we do not perceive the gender of a face categorically. We might use other cues (like hair line, hairdo, make-up, and expression) when facial features do not provide sufficient information about the gender of a person.

## 7 REFERENCES

- Beale J.M. and Keil F.C. (1995). Categorical effects in the perception of faces. *Cognition*, 57, 217-239.
- Bühlhoff I., Newell F.N., Vetter T. and Bühlhoff H.H. (1998) Is the gender of a face categorically perceived? *IOVS*, 39, S171.
- Levin D.T. and Beale J.M. (2000). Categorical perception occurs in newly learned faces, other-race faces, and inverted faces. *Perception and Psychophysics*, 62, 386-401.
- Vetter T. and Poggio T. (1997). Linear Object Classes and Image Synthesis from a Single Example Image. *IEEE Transactions on Pattern Analysis and Machine Intelligence (PAMI)*, 19:7, 733-742.

**ECVP 2000 Groningen**