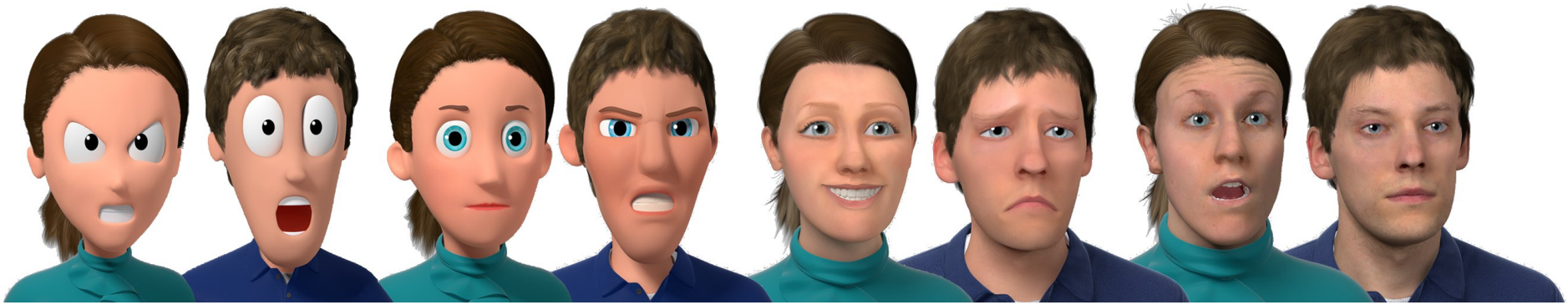
To Stylize or not to Stylize?
The Effect of Shape and Material Stylization on the Perception of Computer-Generated Faces

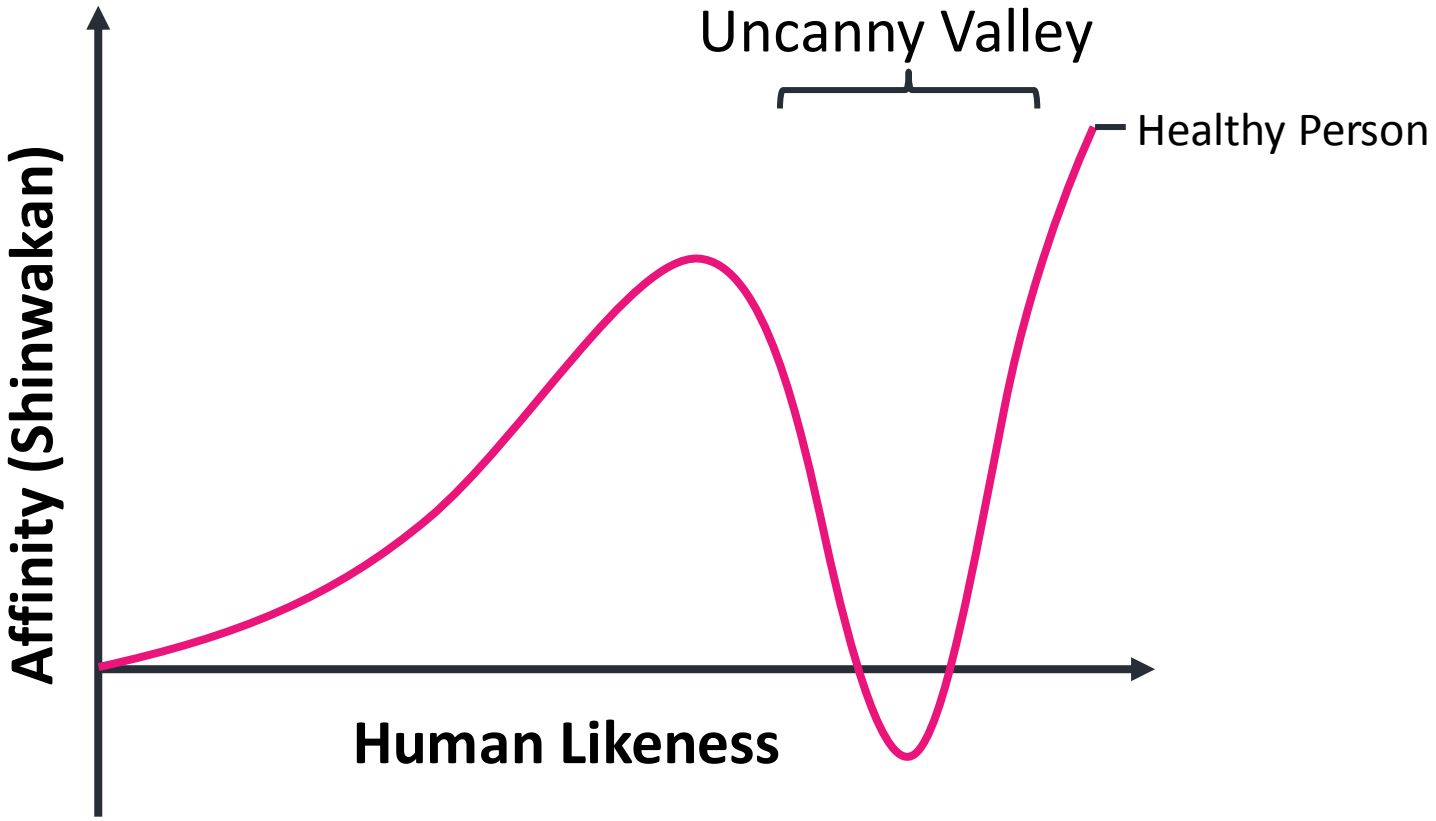


Eduard Zell, Carlos Aliaga, Adrian Jarabo, Katja Zibrek,
Diego Gutierrez, Rachel McDonnell, Mario Botsch

Universität Bielefeld

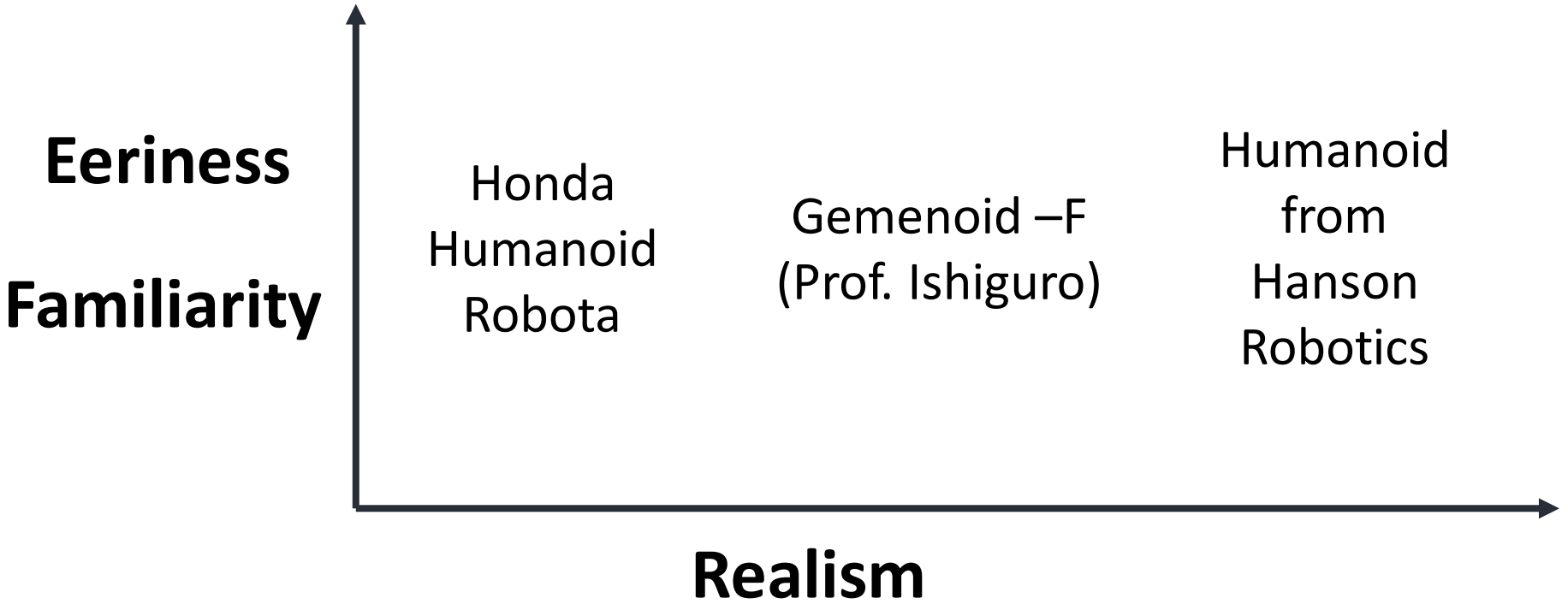
Trinity College Dublin
Coláiste na Tríonóide, Baile Átha Cliath
The University of Dublin

1542 Universidad Zaragoza



RELATED WORK

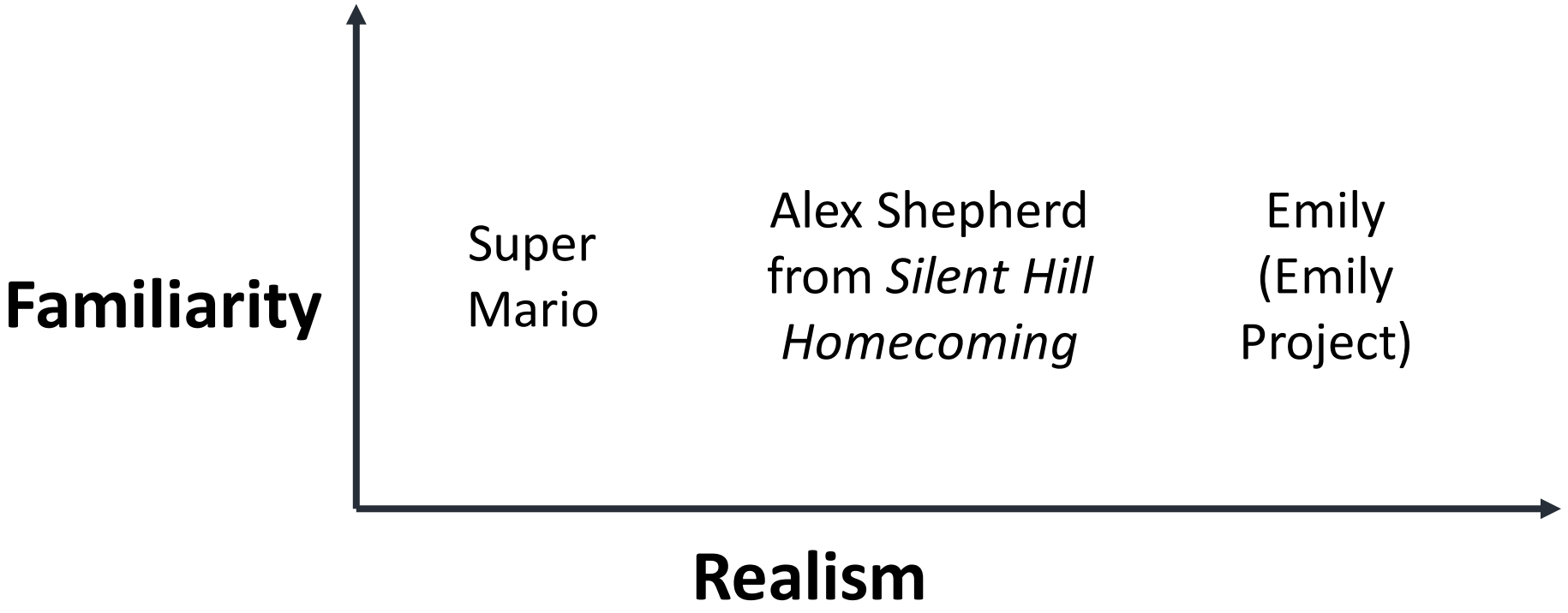
Uncanny Valley – Empirical Research



[MacDorman et al. 2006]

— **different characters**

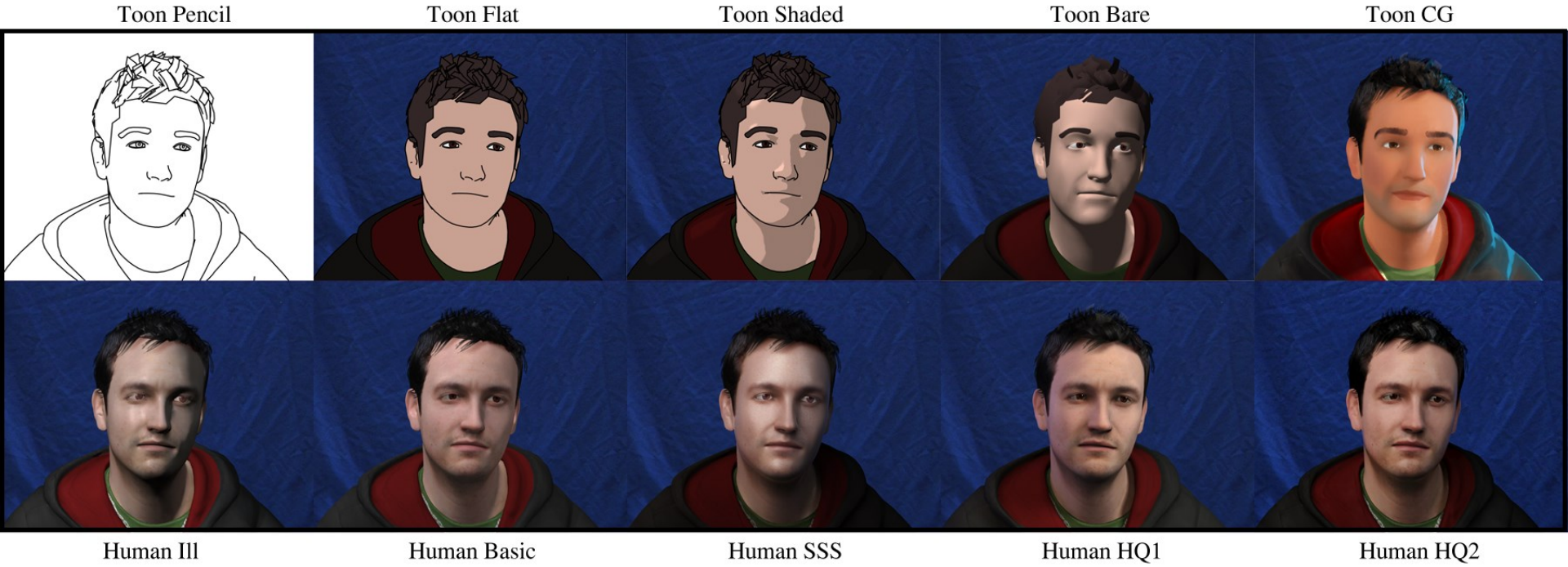
Uncanny Valley – Empirical Research



[Tinwell et al. 2011b]

— **different characters**

Related Work – Render me Real? …



[McDonnell et al. 2012]

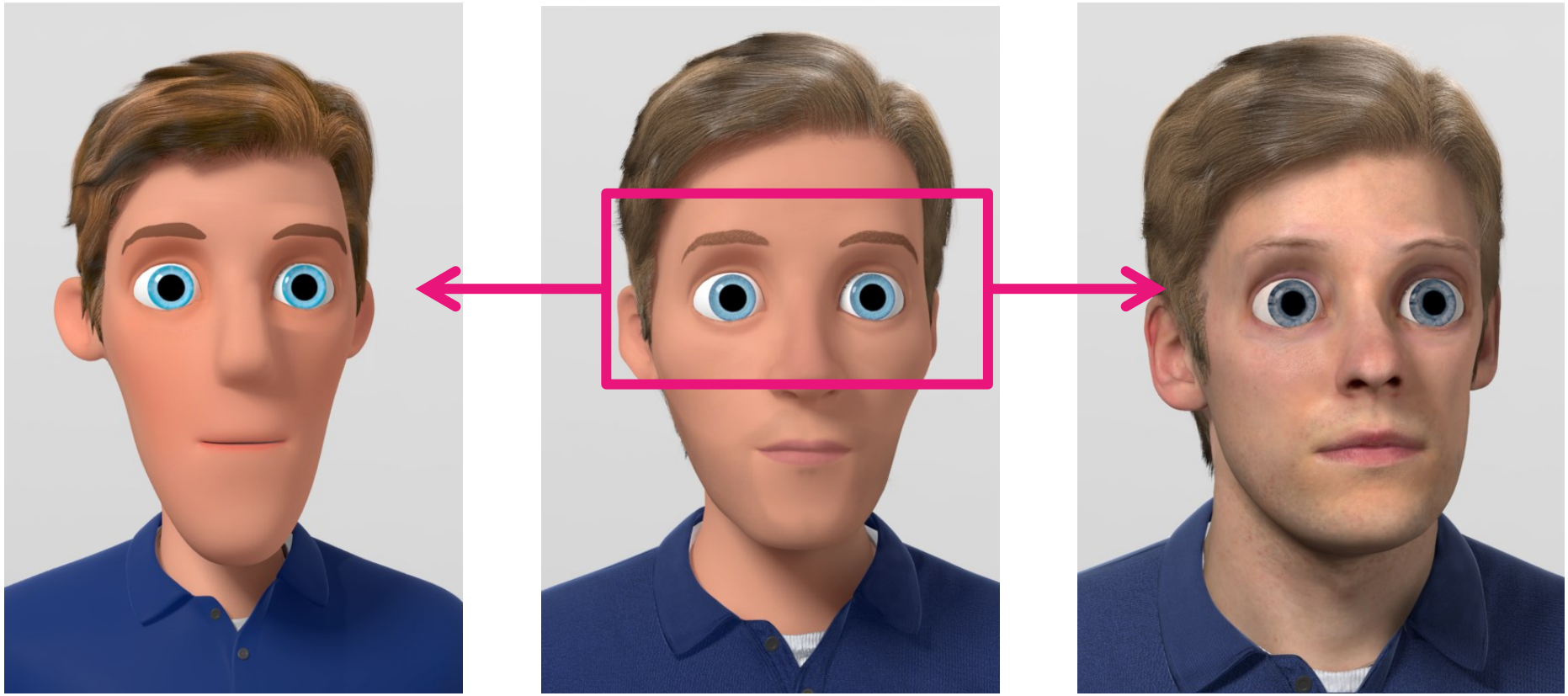
– **no shape variation**

Why bother?

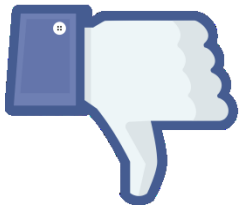
- Entertainment
  - VFX and Computer Animation
  - Games

- Future Markets
  - Robotics in Healthcare
  - Personal Virtual Assistant

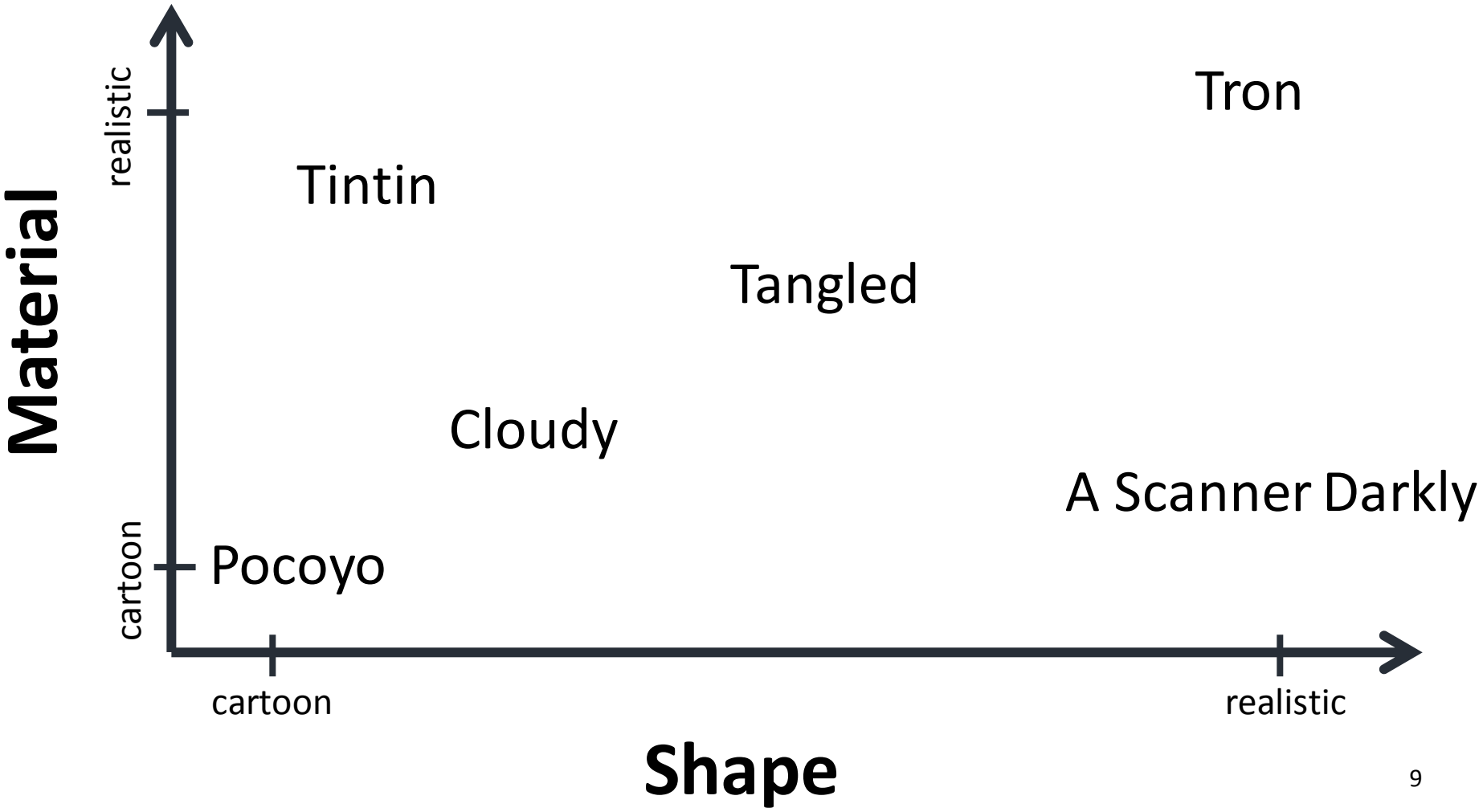
Anthropomorphism

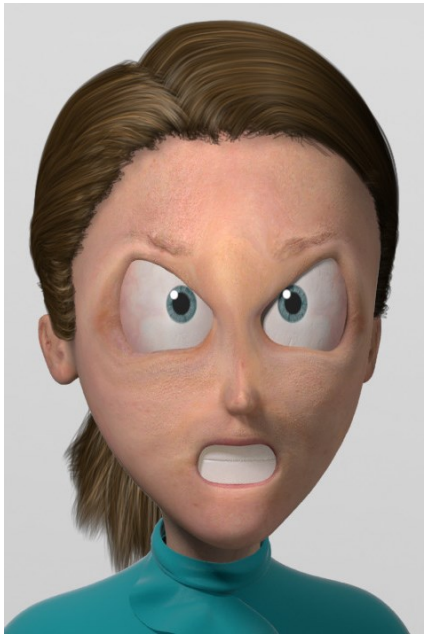


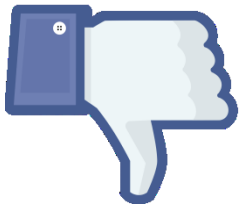
[Seyama and Nagayama 2007; Burleigh et al. 2013].



One single stylization dimension?







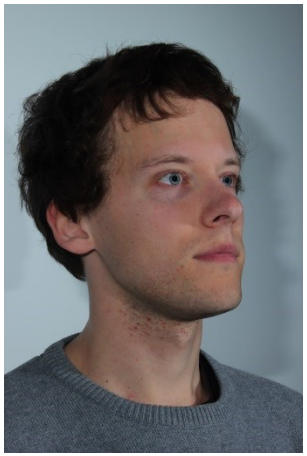
Overview of Experiments

1. Looking for Important Scales
   a) Shape and Material
   b) Lighting and Shading
   c) Texture
2. Check for Generalization
3. Importance of Expression

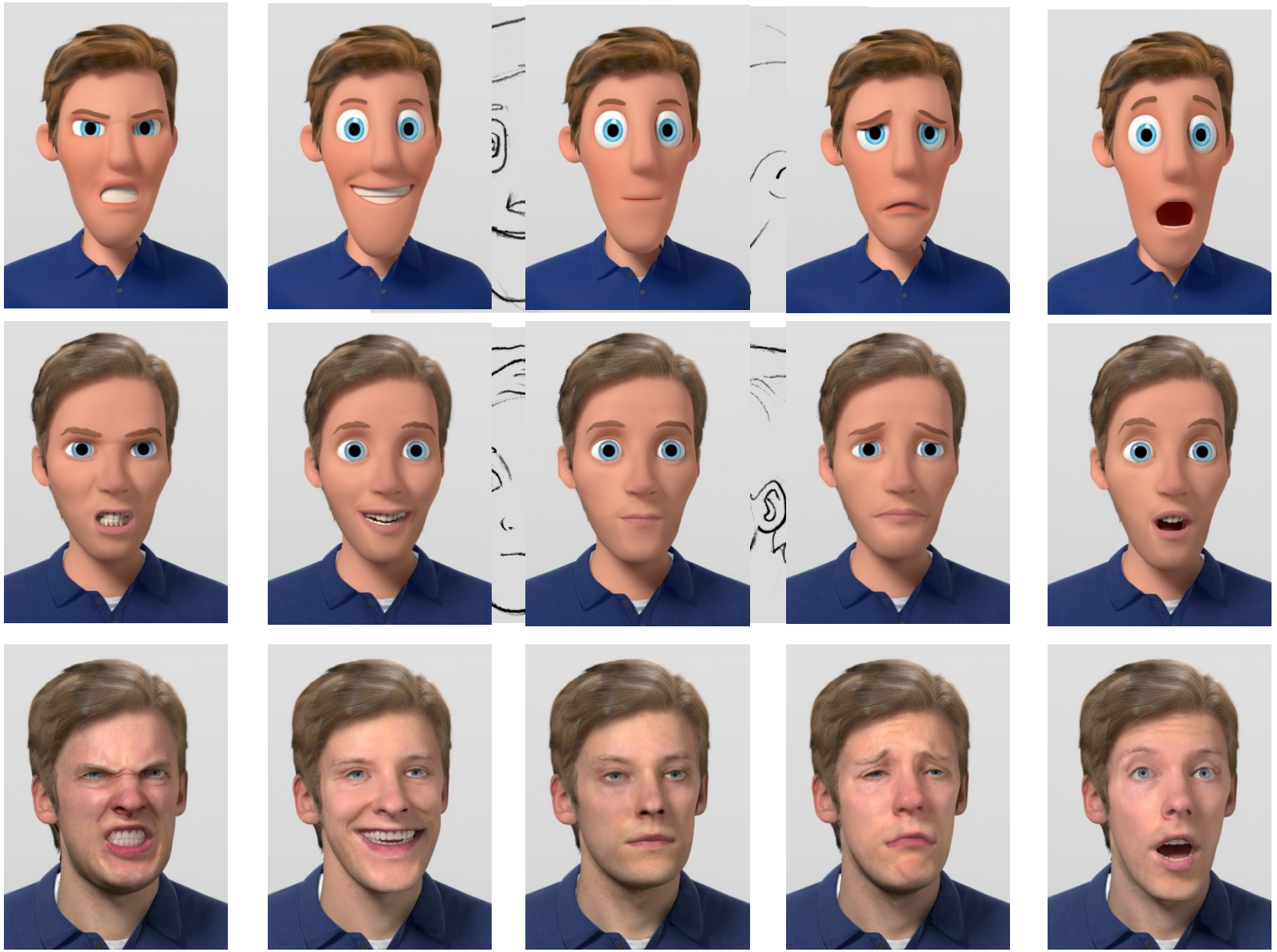
Experiment Design

- 20 or more participants/experiment
- university students (avg. age 24)
- all variations rated by each participant
- seven-point Likert scales

- Analysis
  - Repeated measure ANOVA
  - Tukey HSD for post-hoc



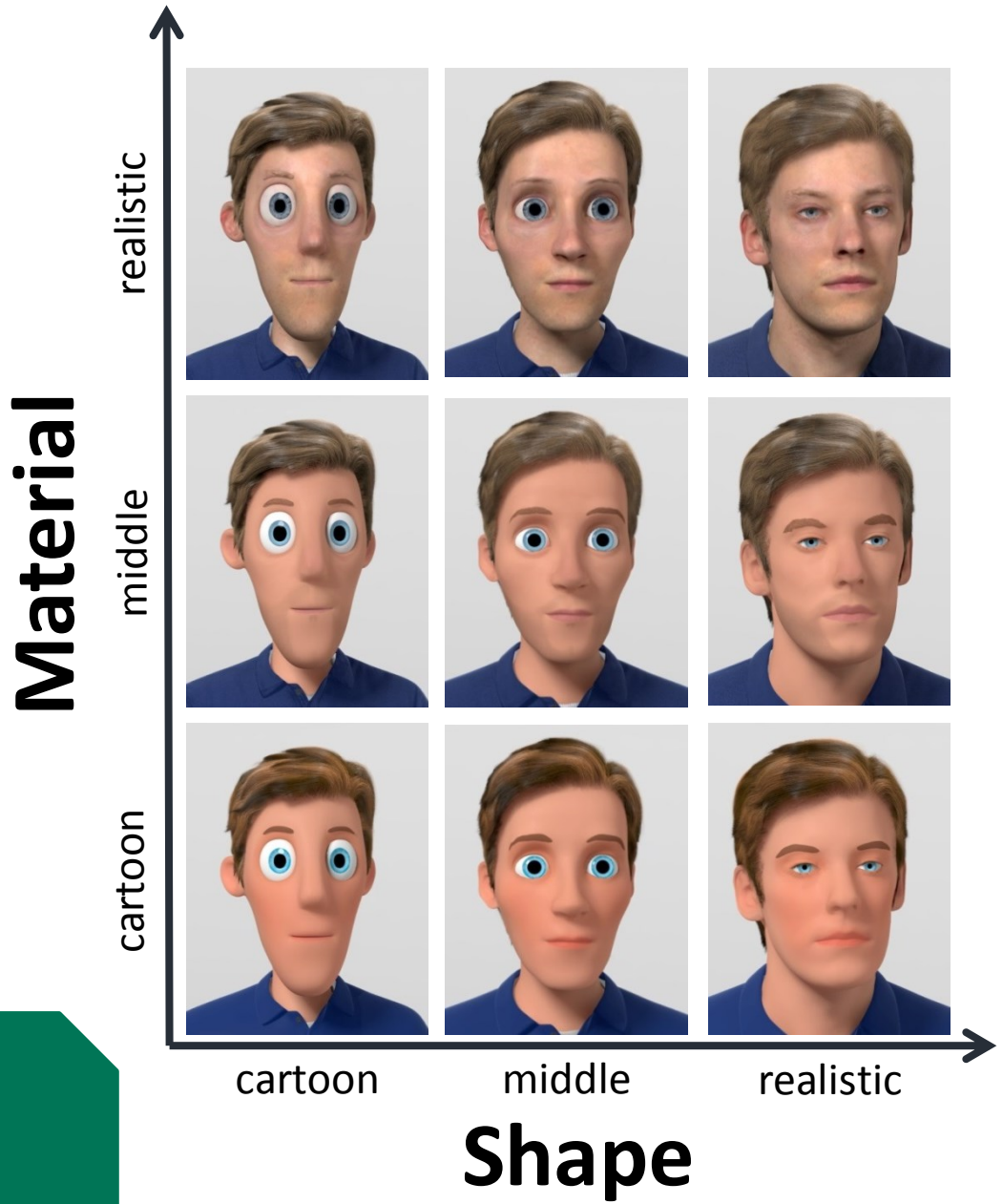
STIMULI CREATION


angry
happy
neutral
sad
surprised

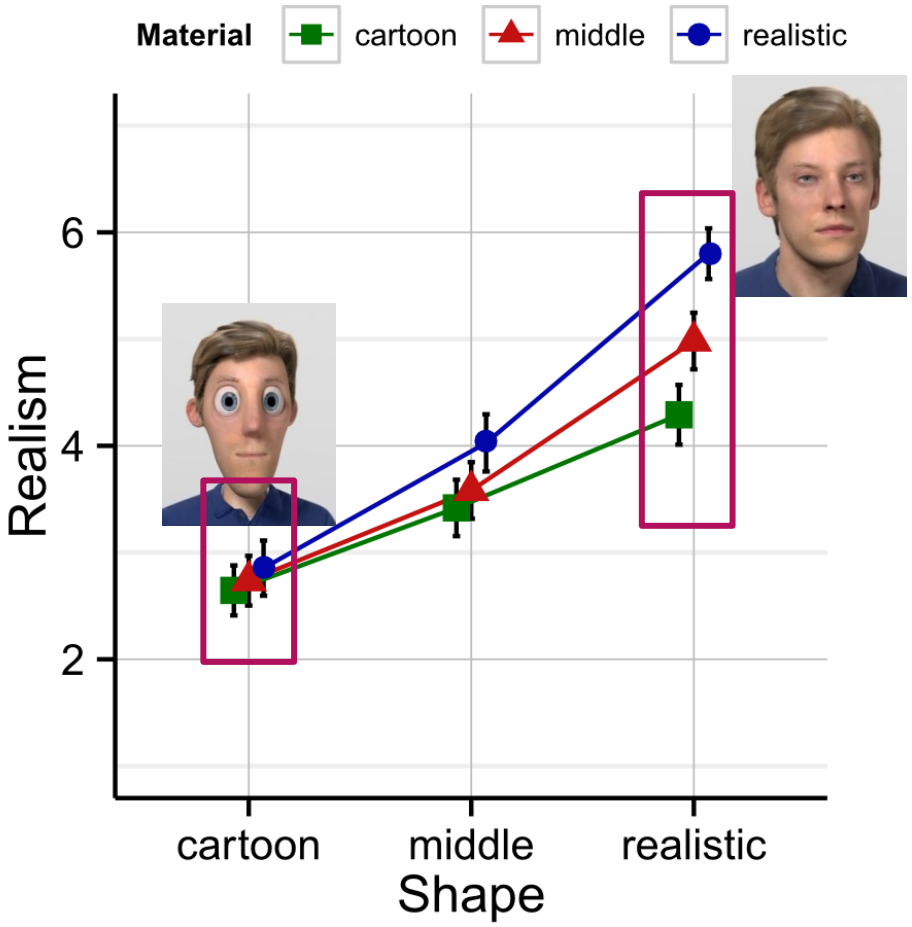
ca. 400 stimuli in total

Experiment 1a

SHAPE AND MATERIAL

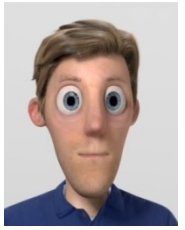


Results - Realism



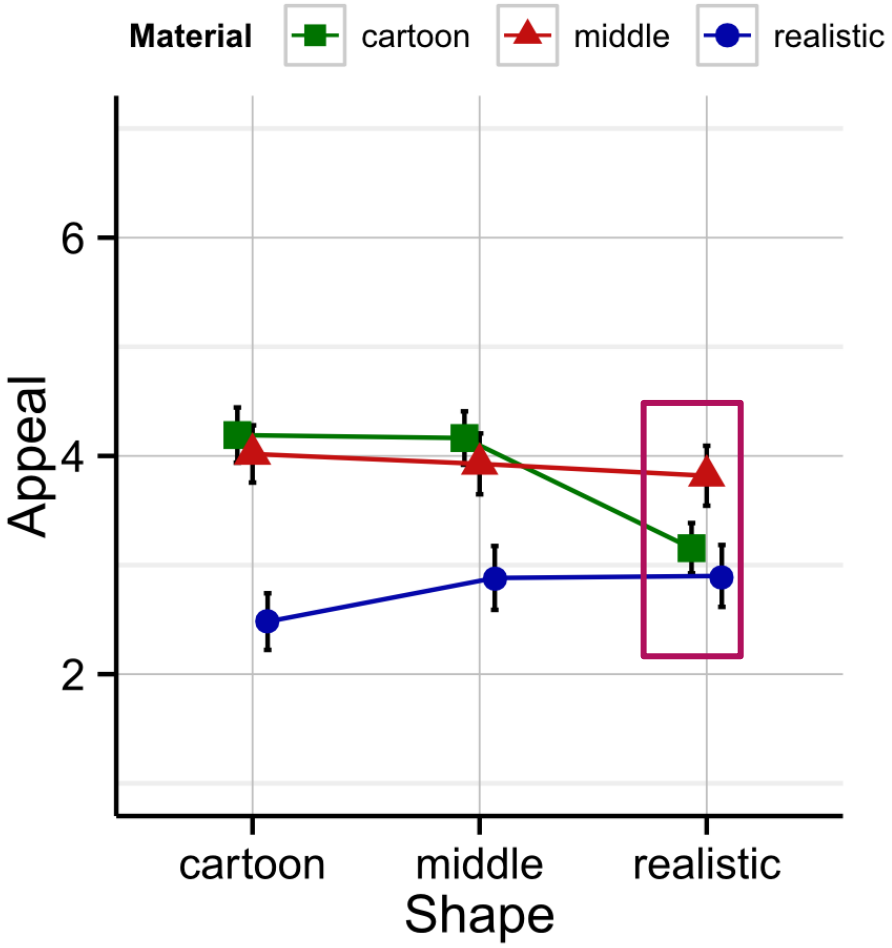
- mainly affected by shape

realistic materials for realistic shapes

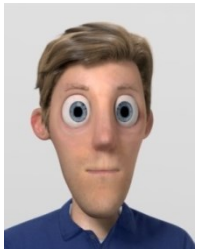


realistic materials for stylized shapes

Results - Appeal

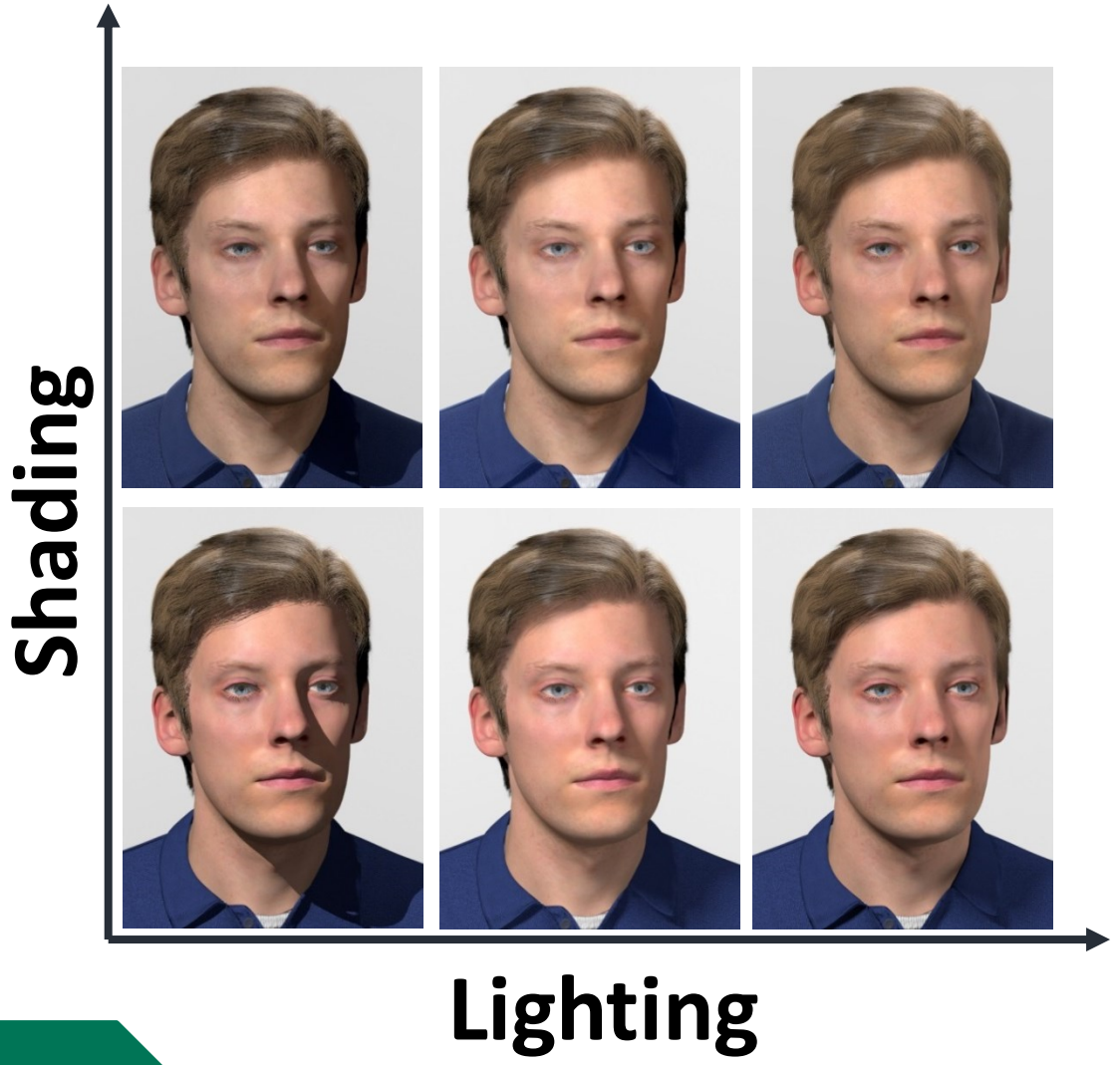


- realistic materials



- strong mismatches in stylization

- similar to familiarity and reassurance scales

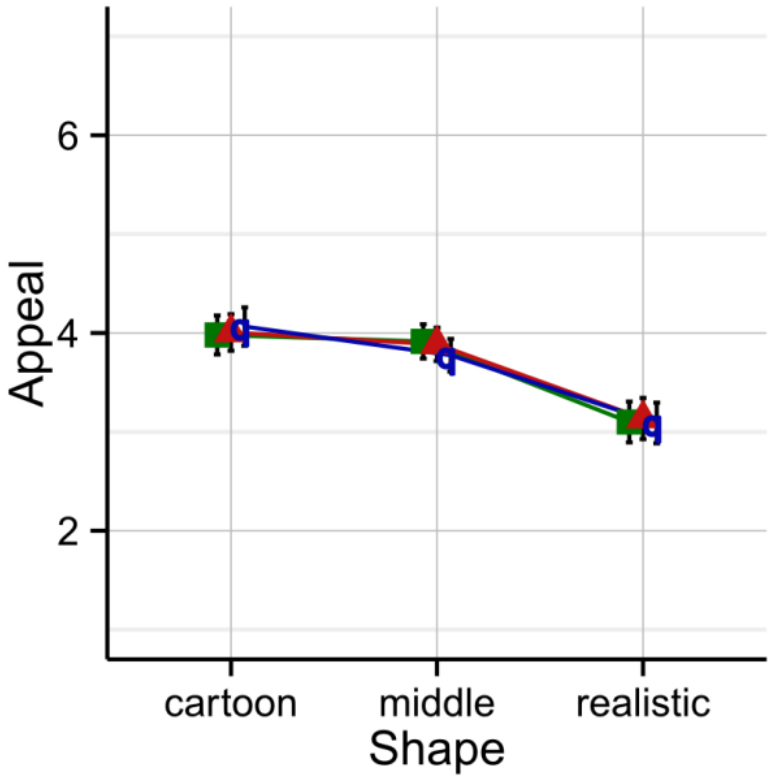


Experiment 1b

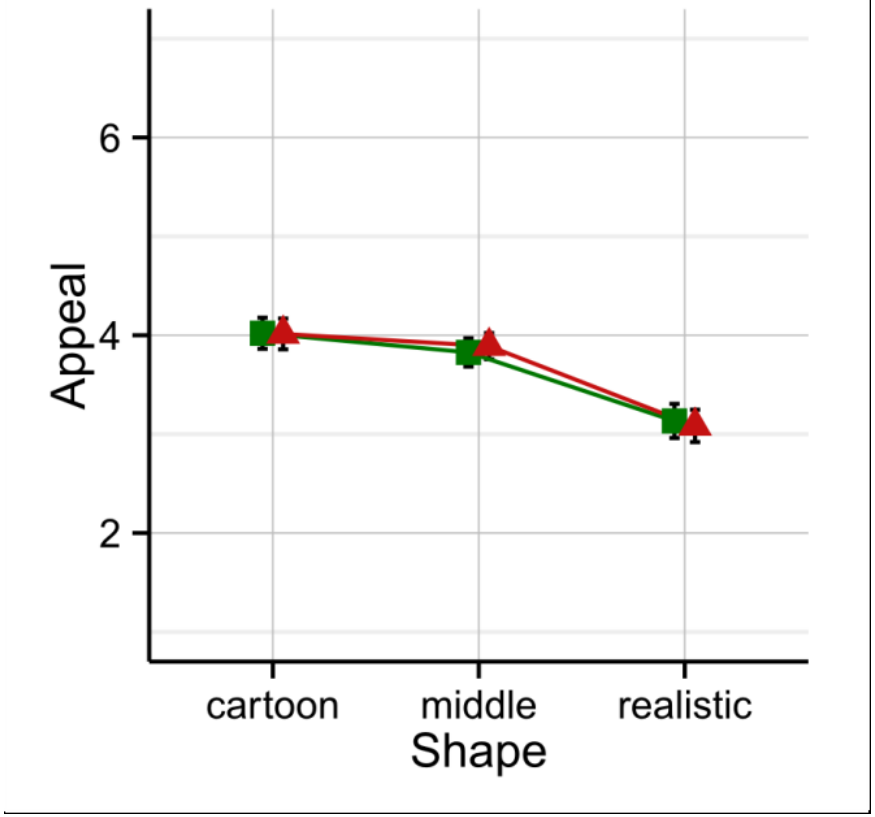
SHADING AND LIGHTING

Results - Appeal

[redacted]



[redacted]



• • •

middle

realistic

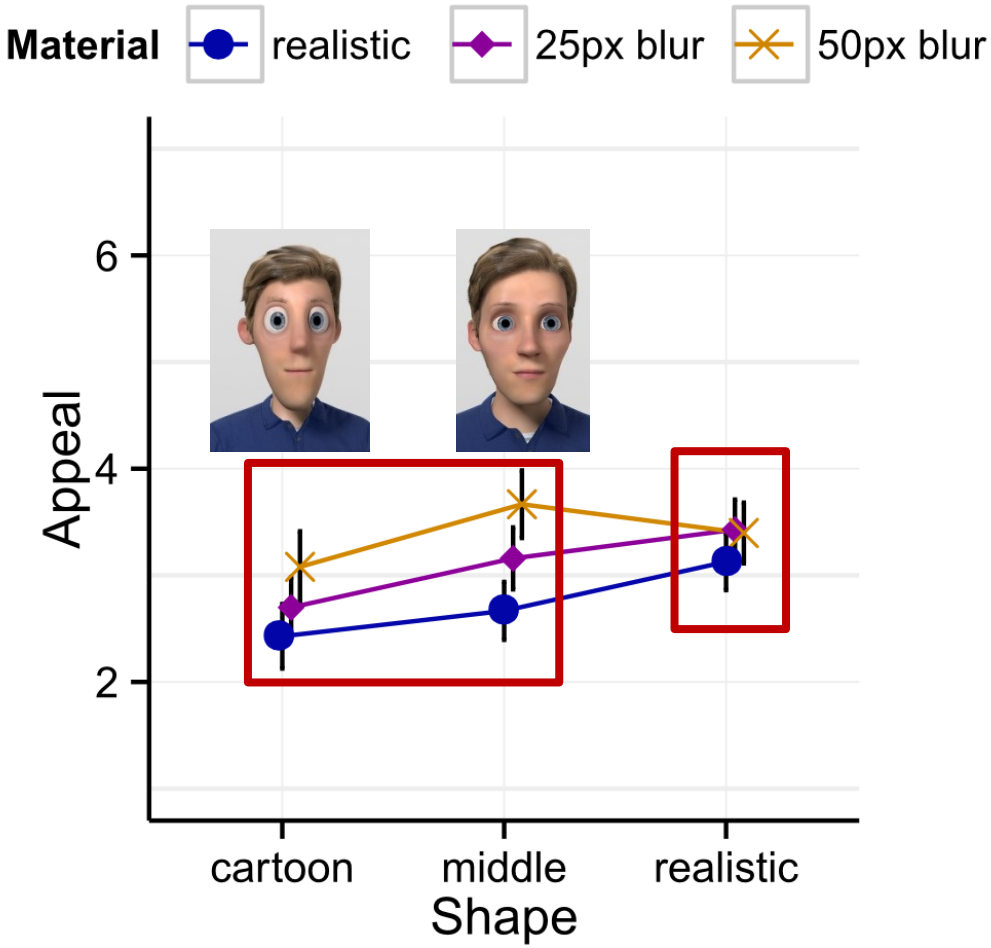
blur 25px

blur 50px

Experiment 1c

TEXTURE

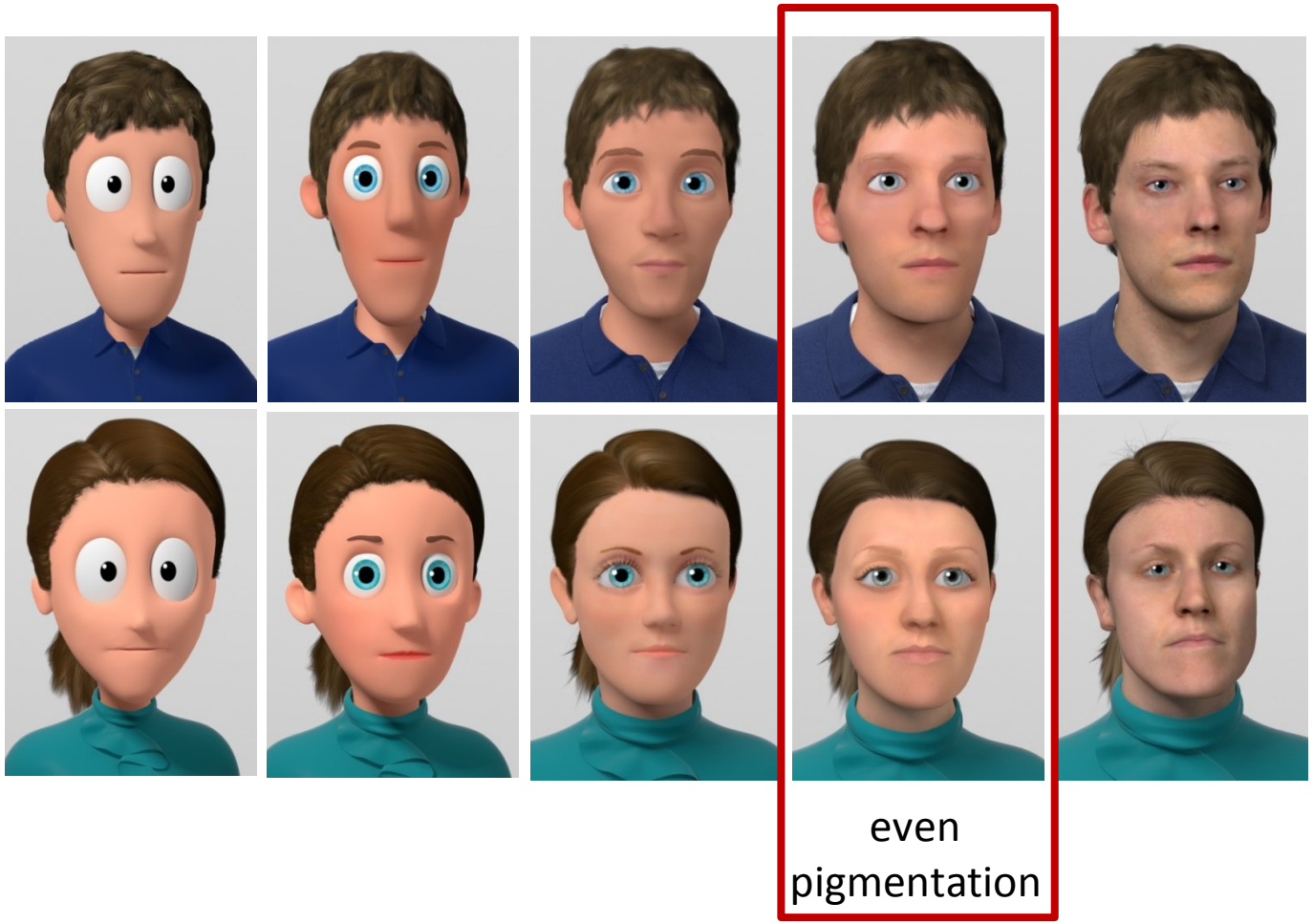
Results



- realism non-significantly affected

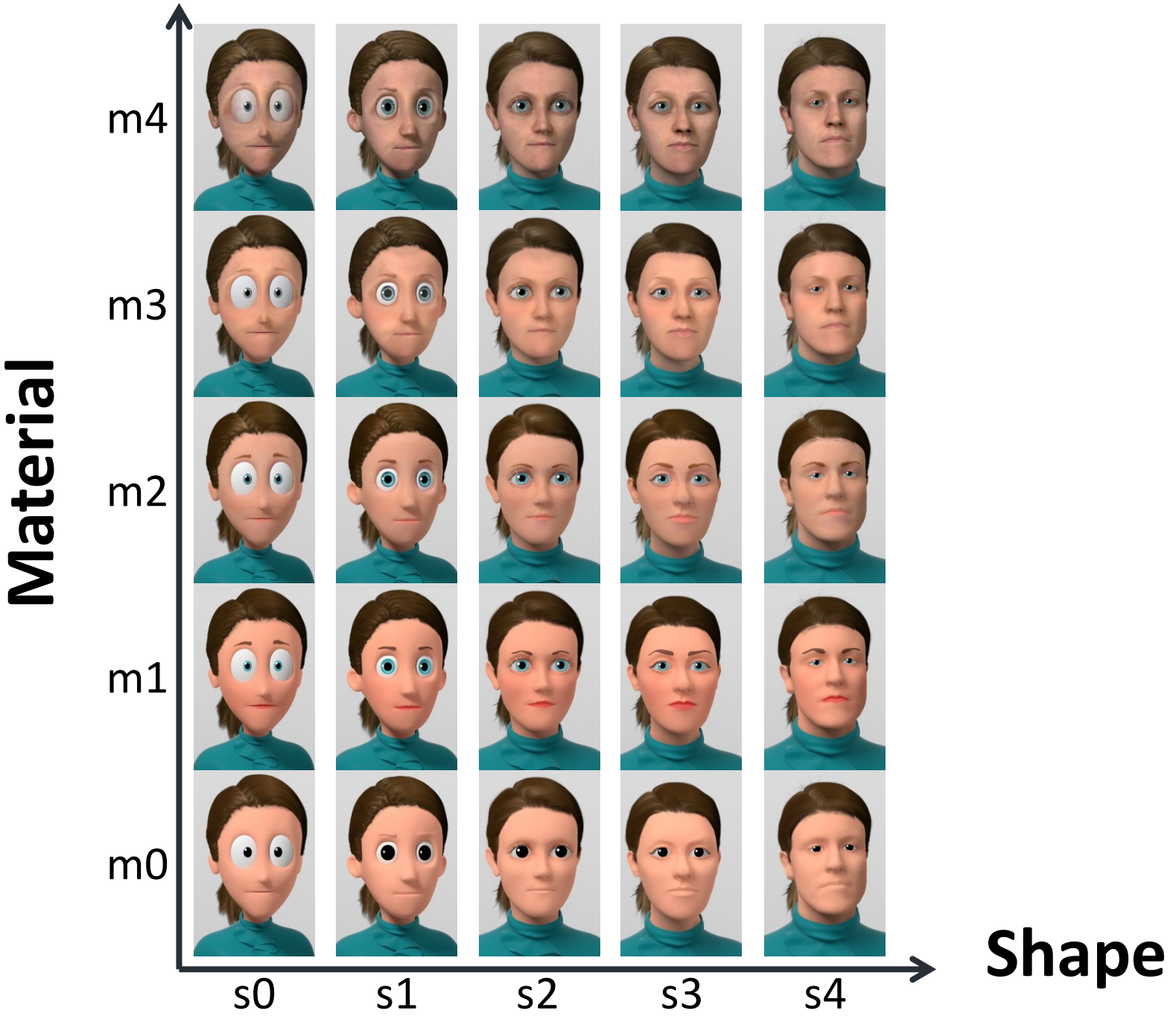
- blurred textures

- for realistic shapes not significant, but widely accepted in research [Fink and Matts 2008]

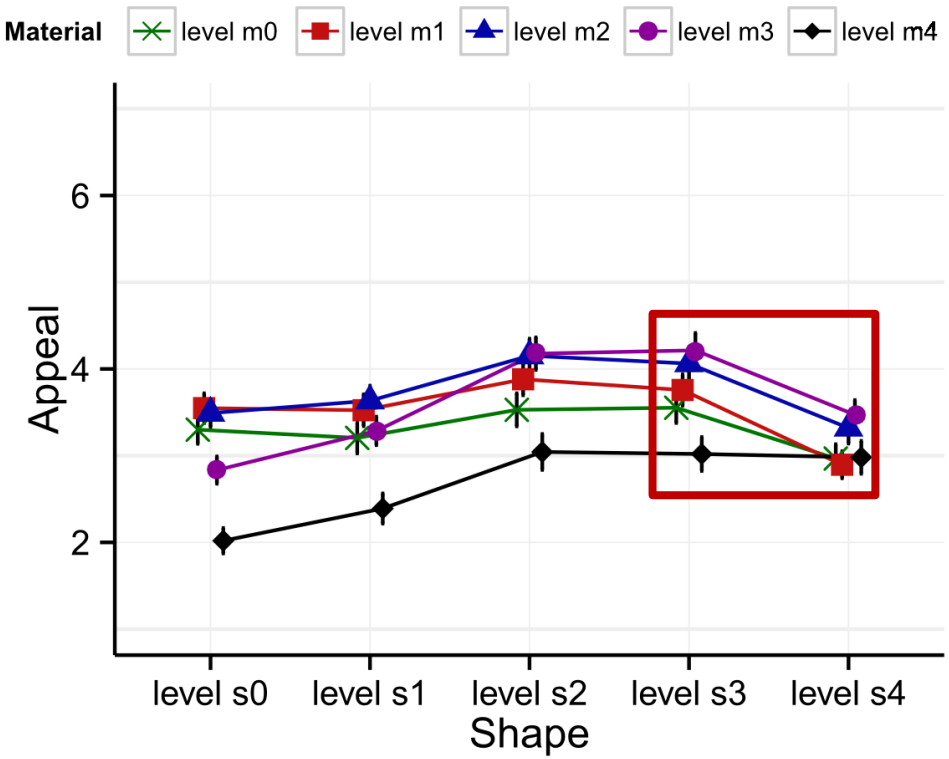


Experiment 2

SHAPE AND MATERIAL


Material
m4
m3
m2
m1
m0
s0
s1
s2
s3
s4
Shape

Results

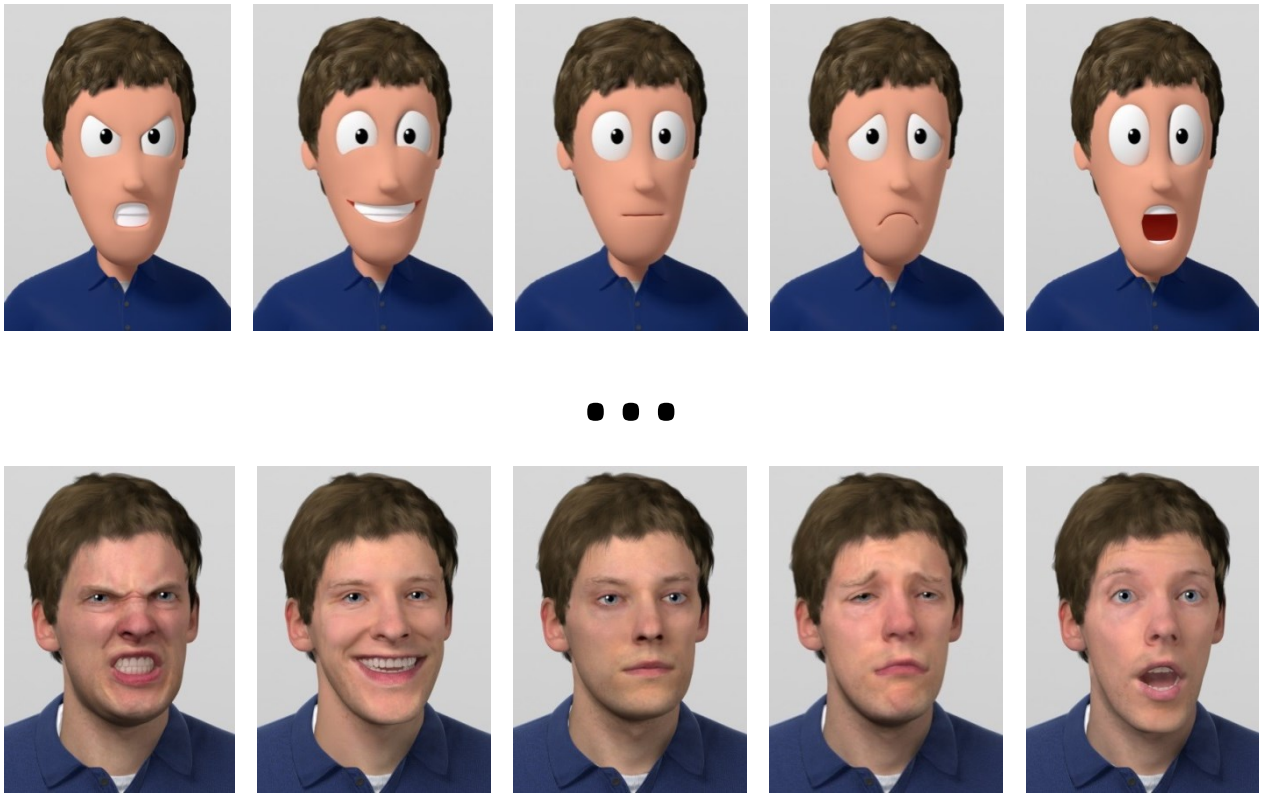


✓ realism results confirmed

👍 even skin pigmentation

👎 realistic materials

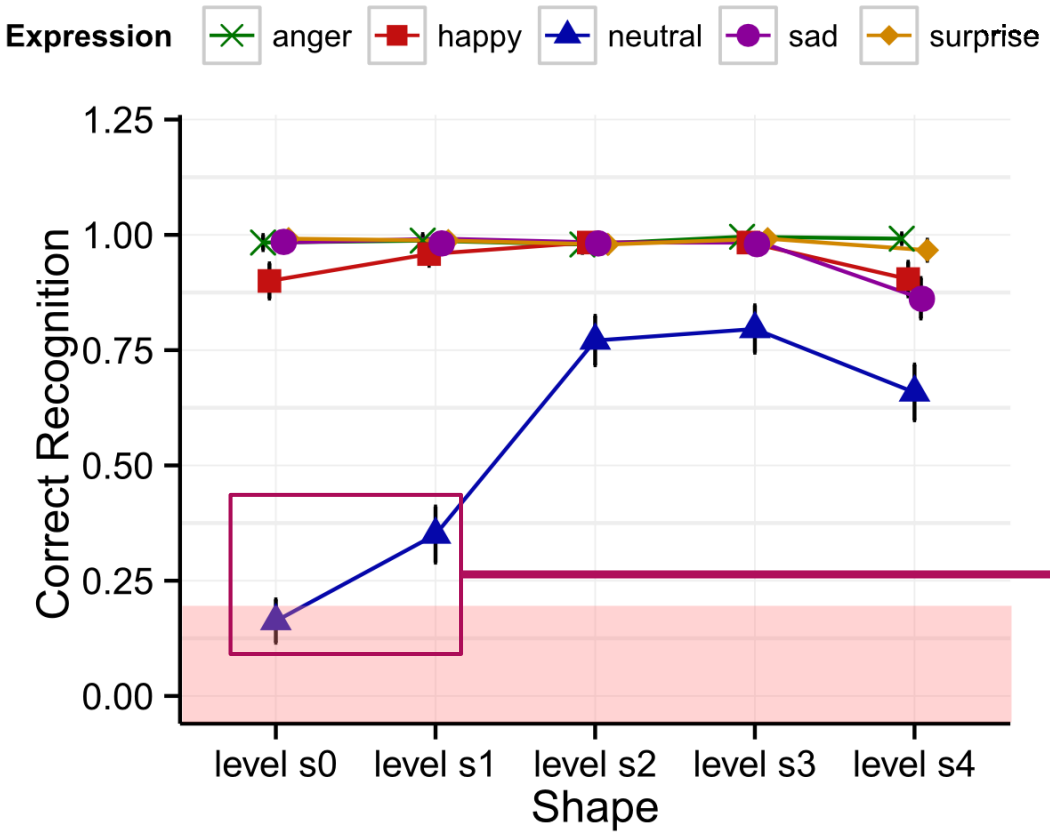
👎 strong mismatches in stylization



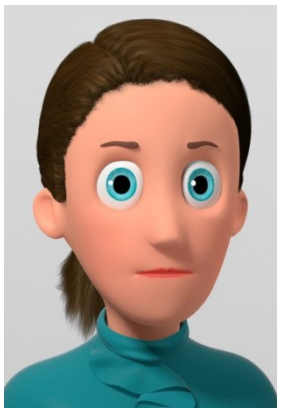
Experiment 3

EXPRESSION

Expression Recognition

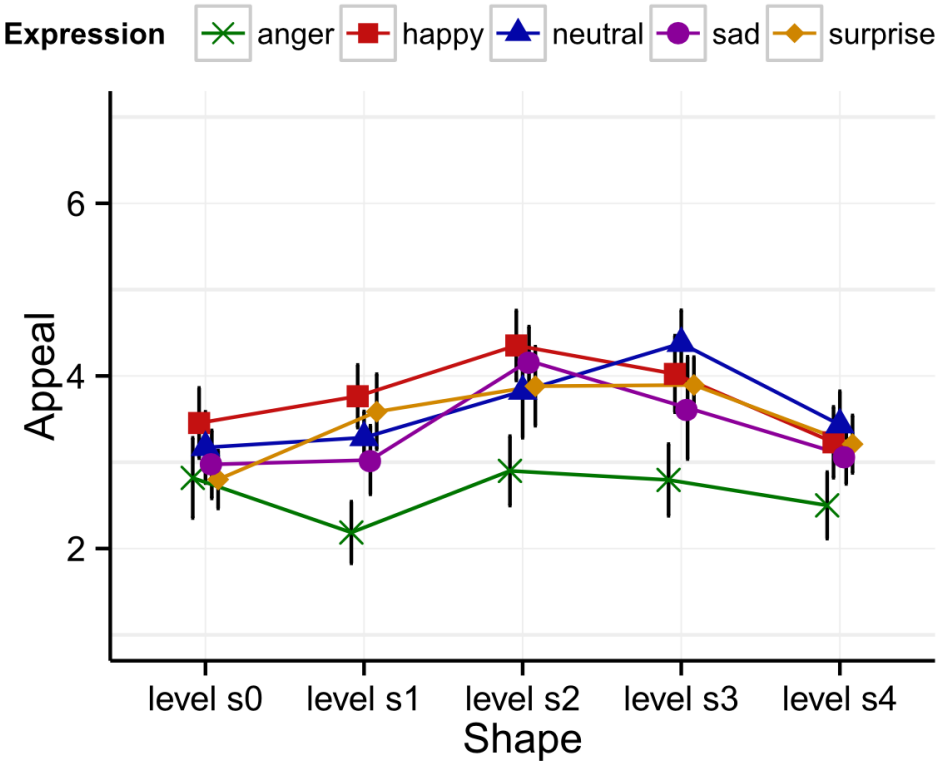


- mostly outstanding recognition (20% random pick)



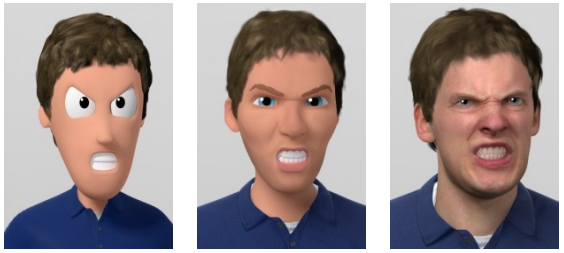
Mixed with weak surprise

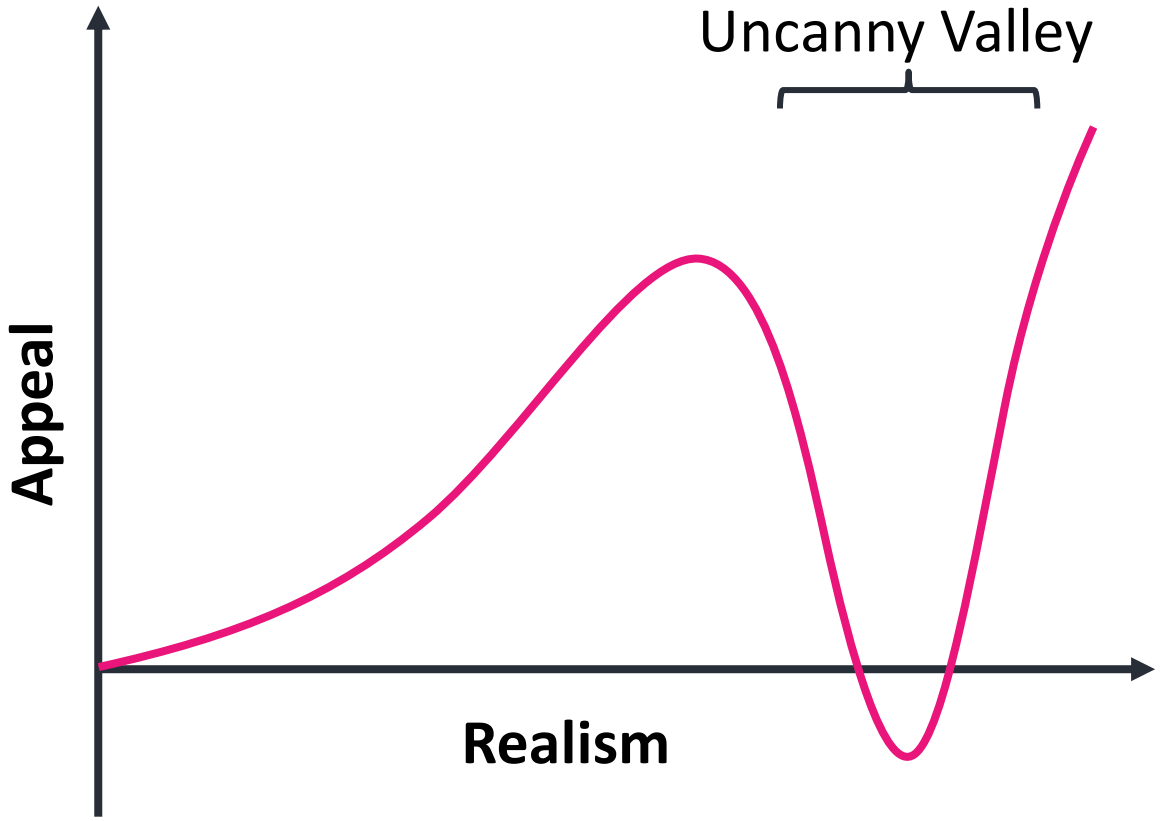
Expression - Appeal



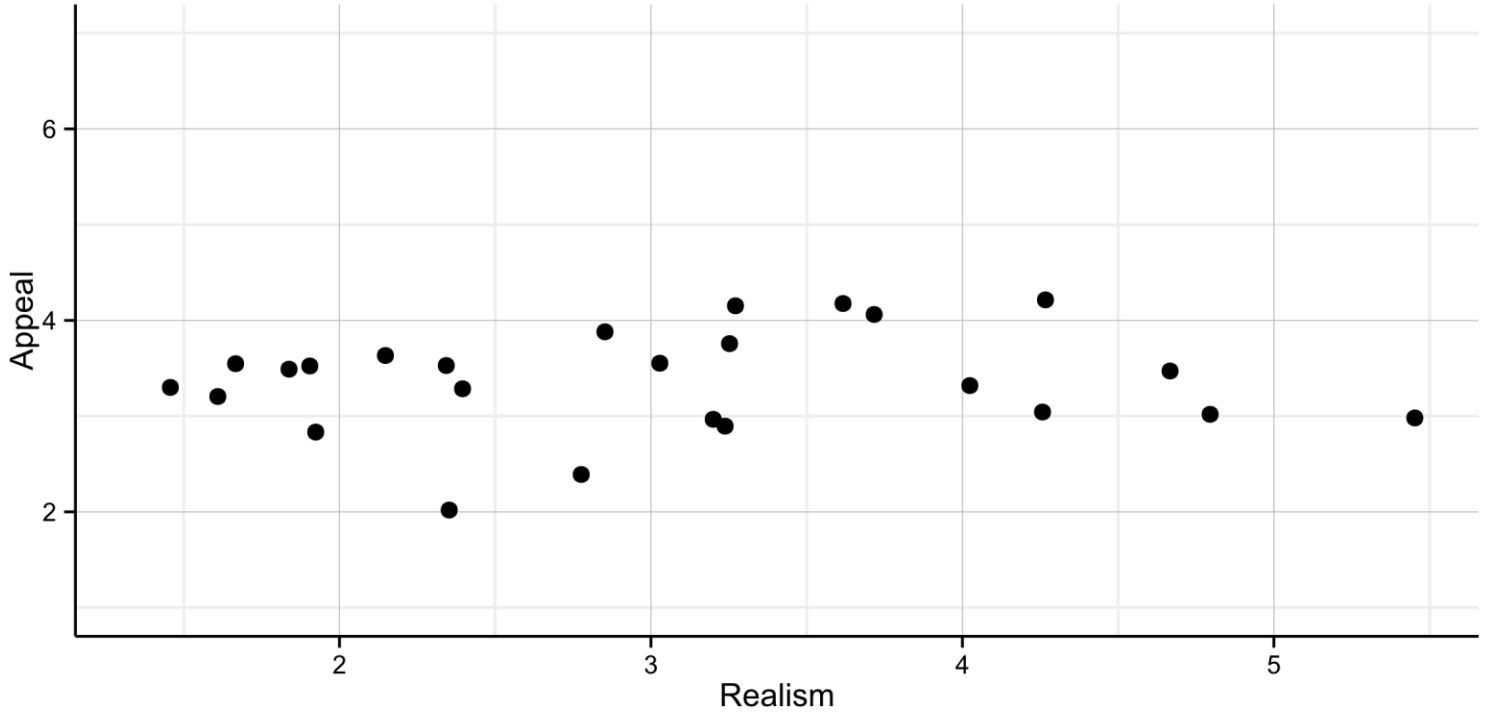
- expressions vary

anger
(negative expression)

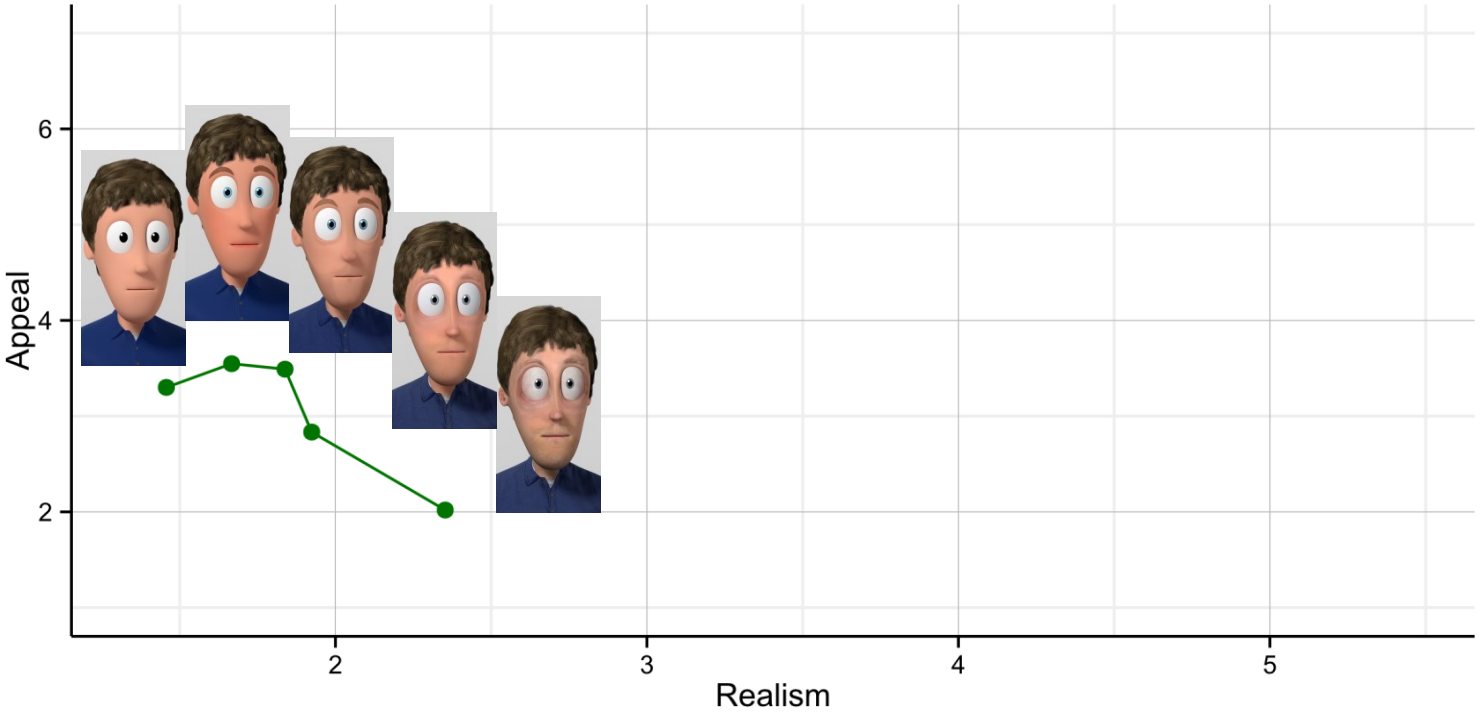




CONCLUSION

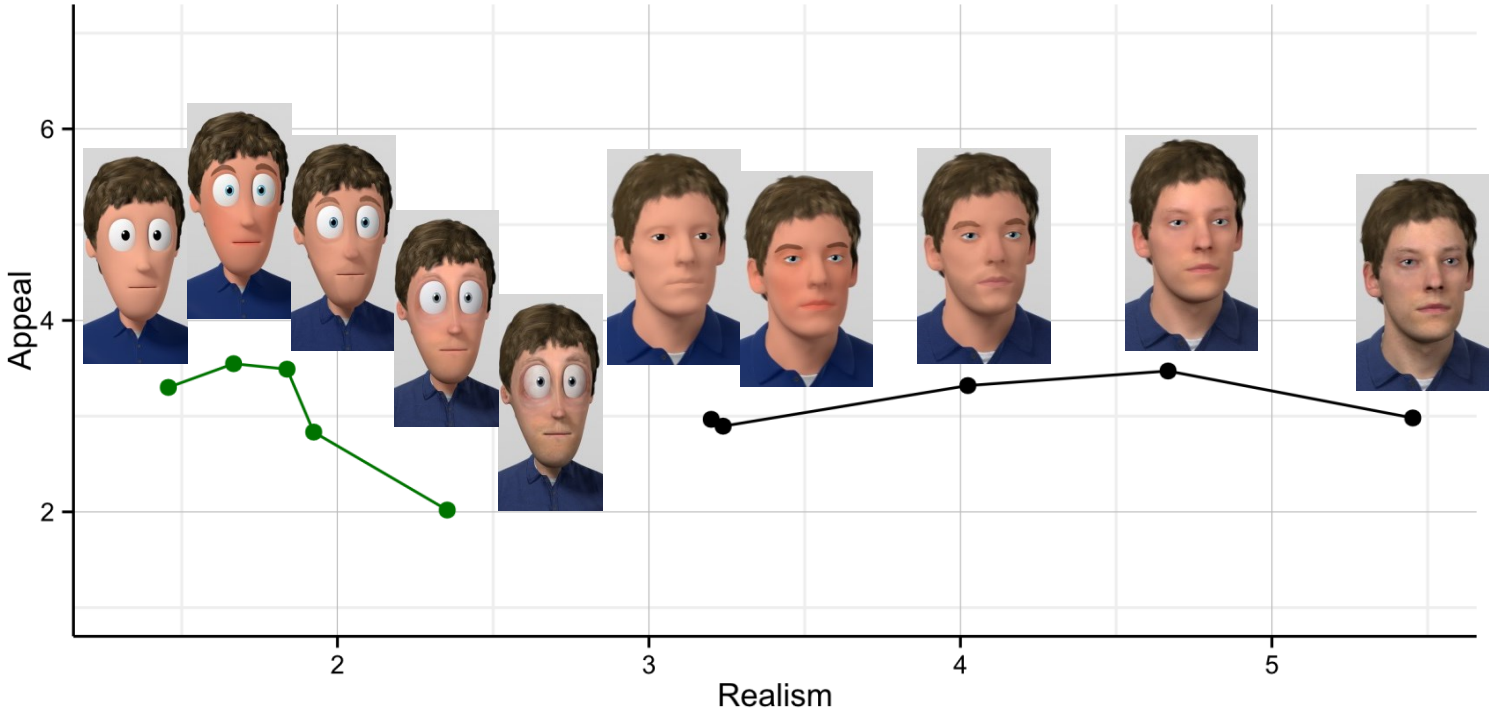

Appeal
6
4
2
2
3
4
5
Realism

Conclusion



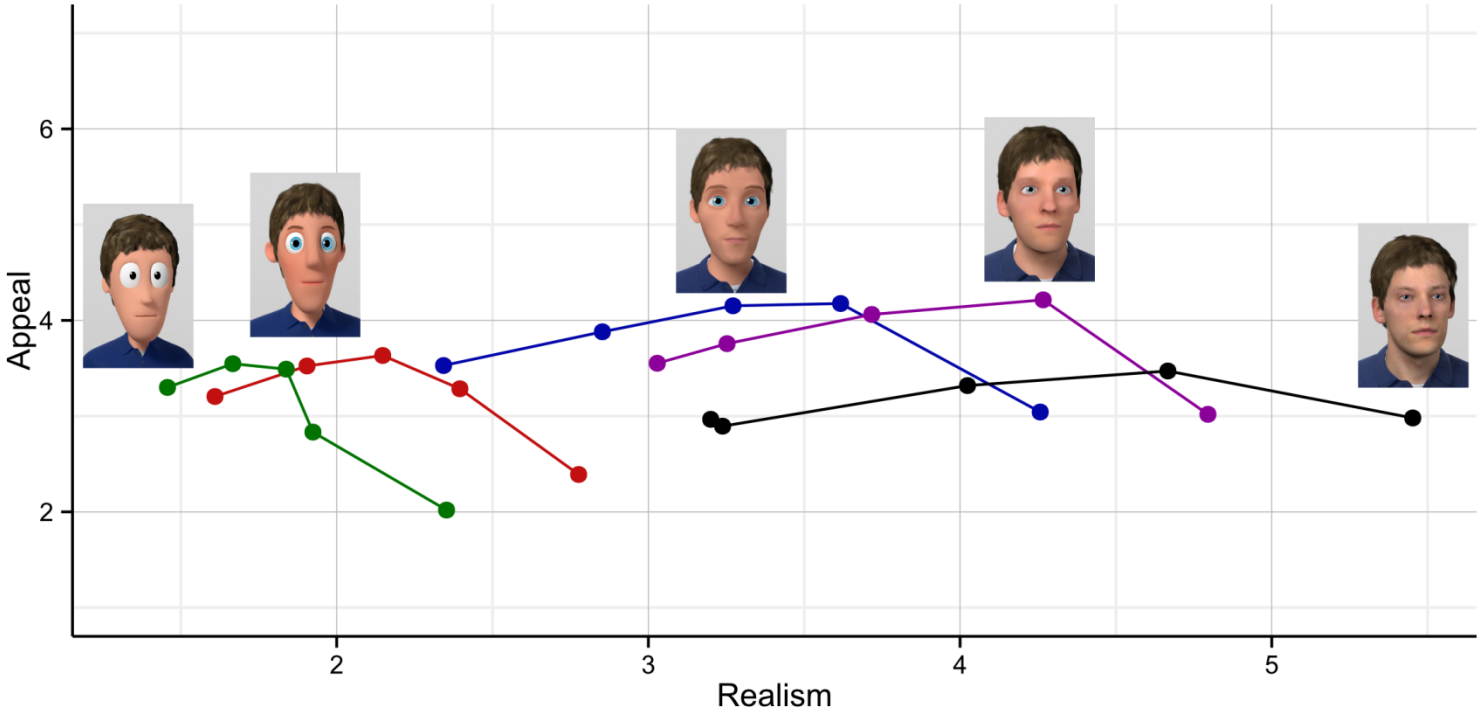
- material (texture) influences appeal

Conclusion

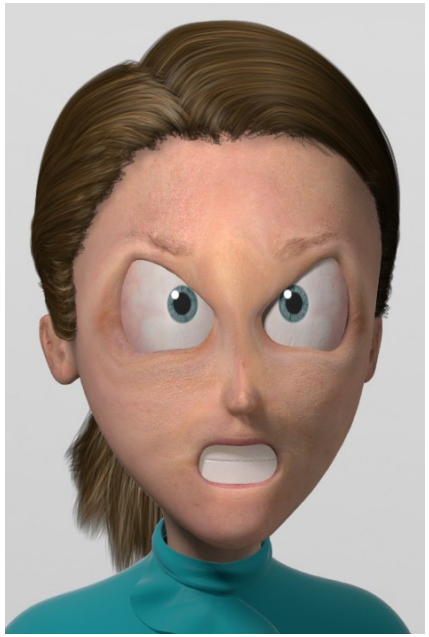


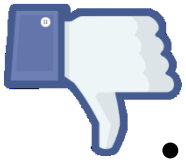
realistic Material < **realistic Shape** < **realistic Shape & Material**

Conclusion



- differentiation between shape and material crucial
- peak at material style ≈ shape style

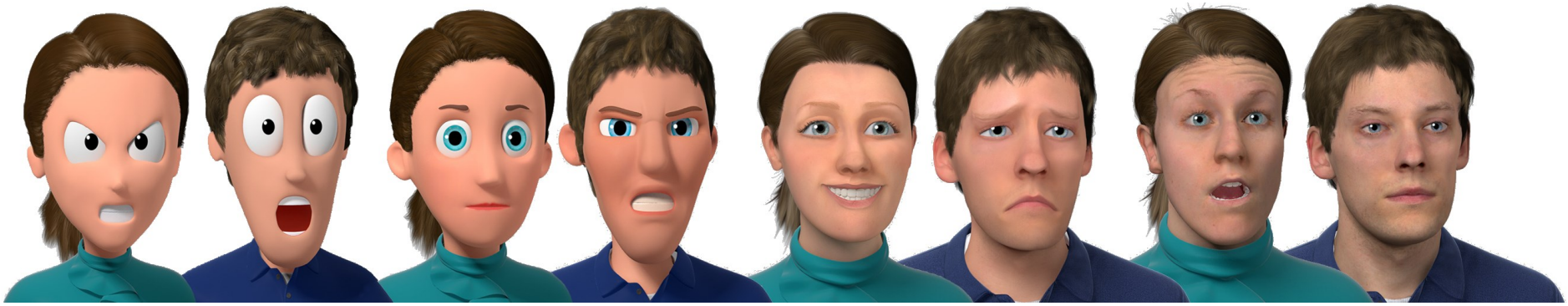




- realistic albedo with uneven pigmentation
- non-matching material and shape stylization
- angry expression

- smooth skin
- matching material and shape stylization
- neutral/positive expression
- read paper!

To Stylize or not to Stylize?
The Effect of Shape and Material Stylization on the Perception of Computer-Generated Faces



http://graphics.uni-bielefeld.de/publications/sigasia2015

funded by

CITEC Cognitive Interaction Technology Center of Excellence Bielefeld University

SFI Science Foundation Ireland

MINISTERIO DE CIENCIA Y TECNOLOGÍA

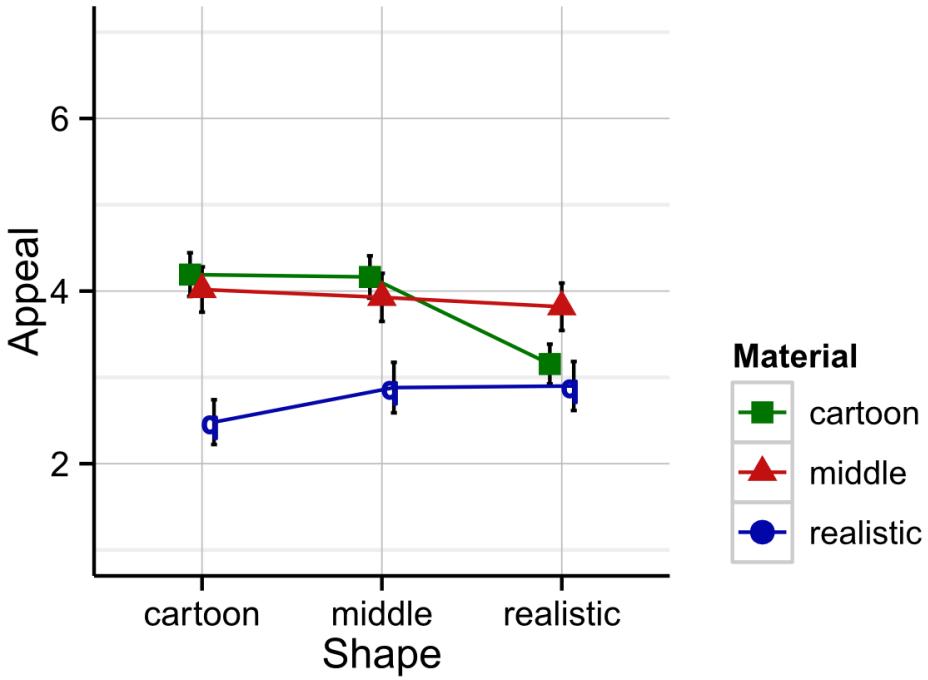
Google Faculty Research Awards

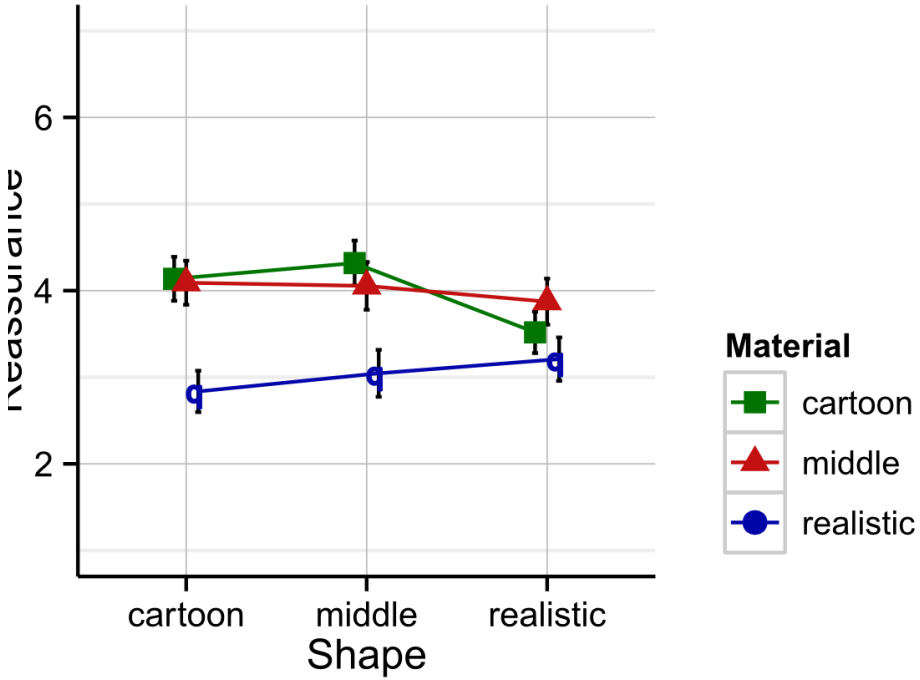
DFG Deutsche Forschungsgemeinschaft

GOBIERNO DE ARAGON

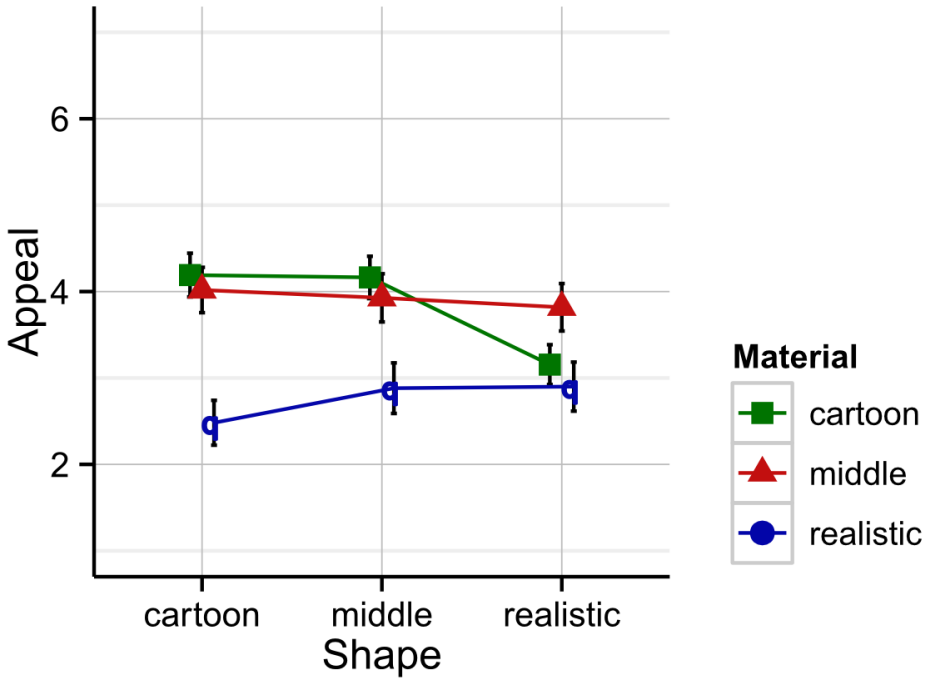
Fundación BBVA

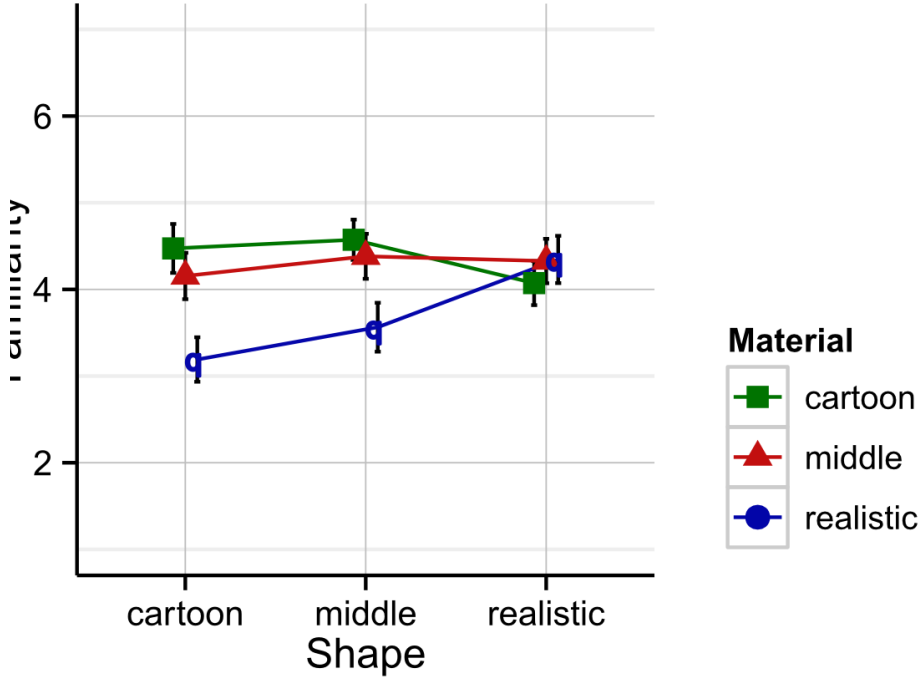
Exp.1a:Results - Reassurance



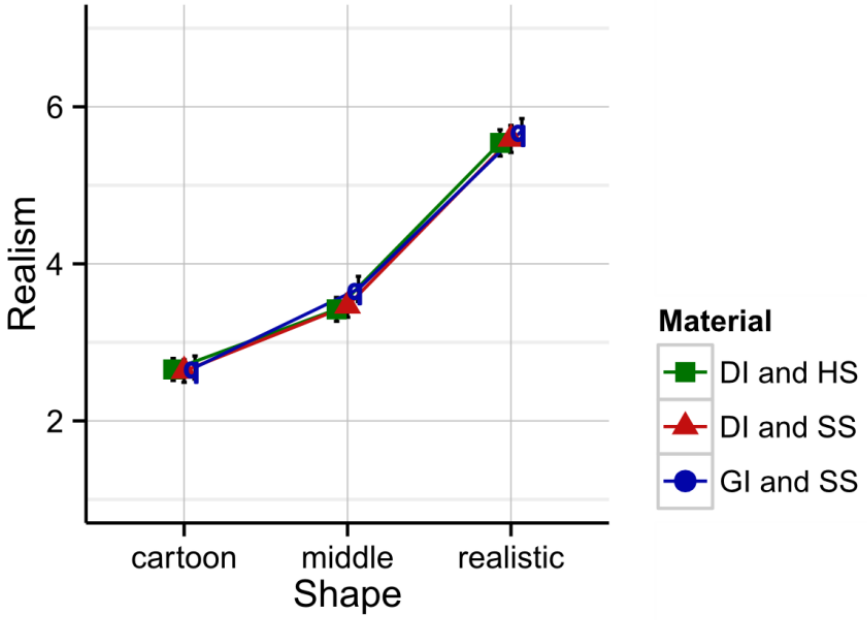


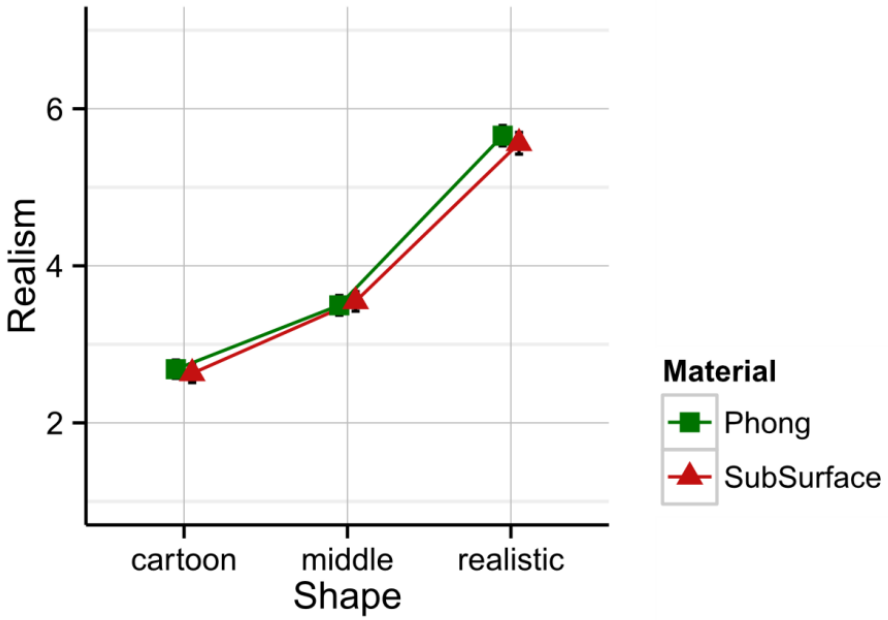
Exp.1a:Results - Familiarity



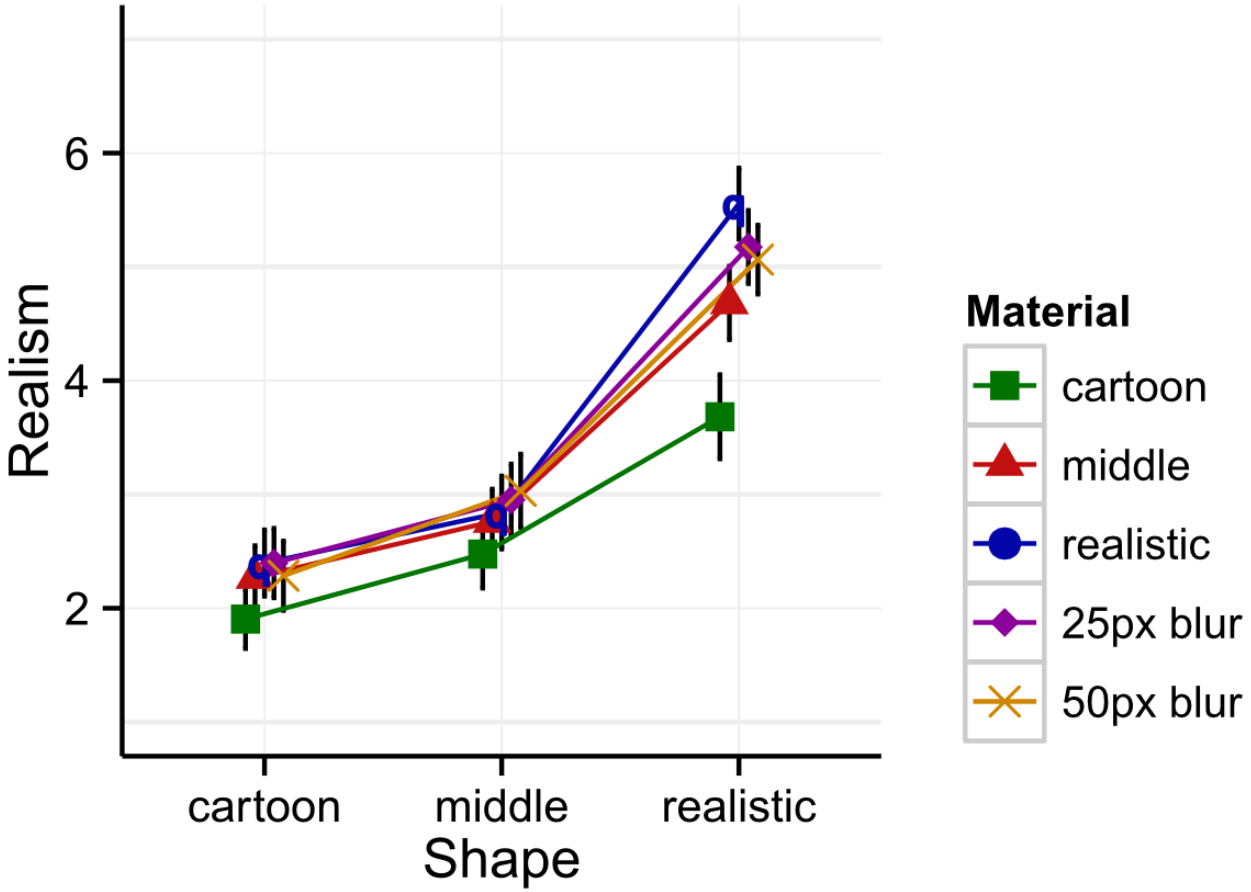


Exp.1b:Results-Realism

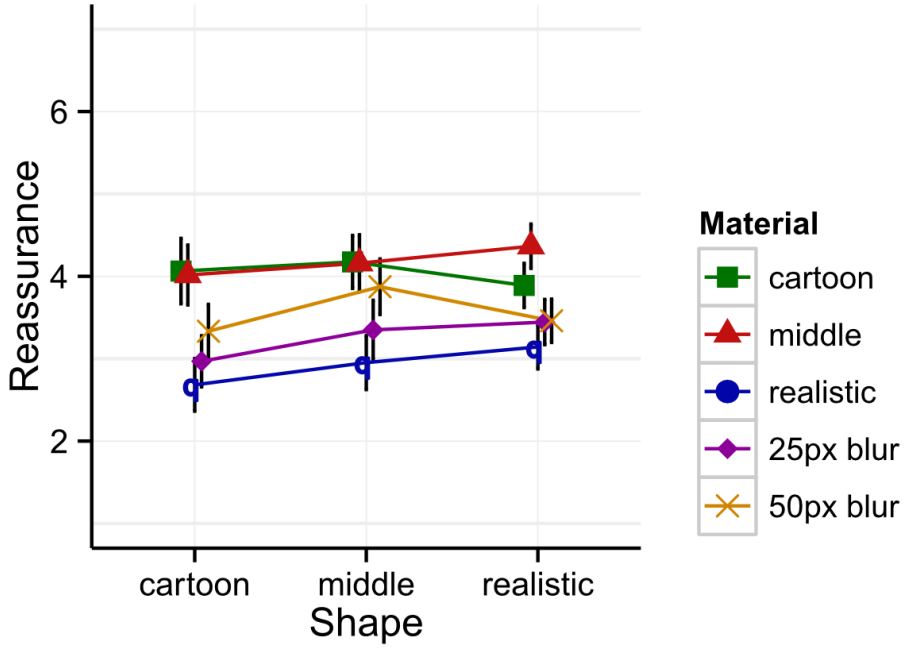


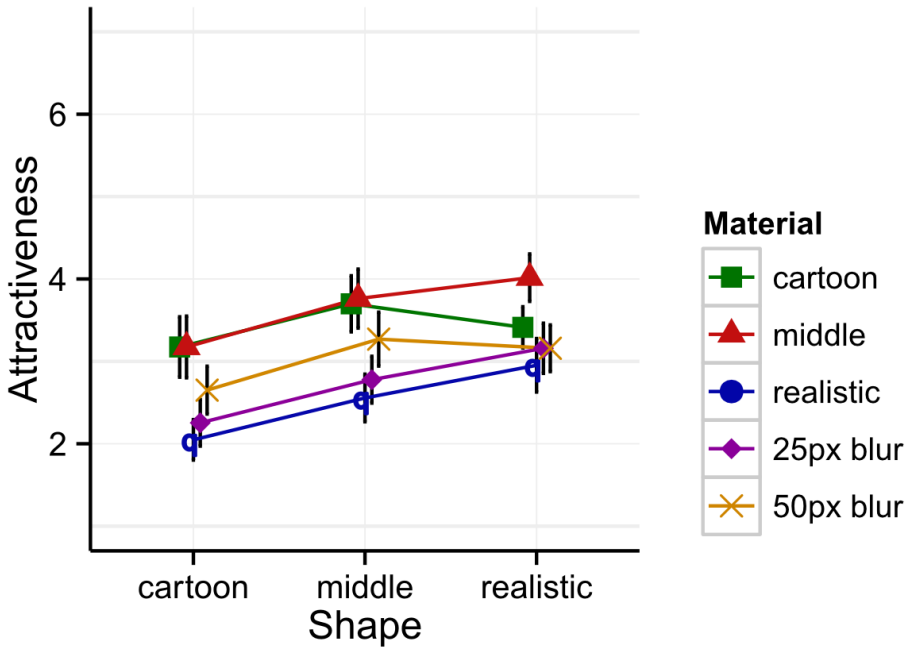


Exp.1c:Results - Realism



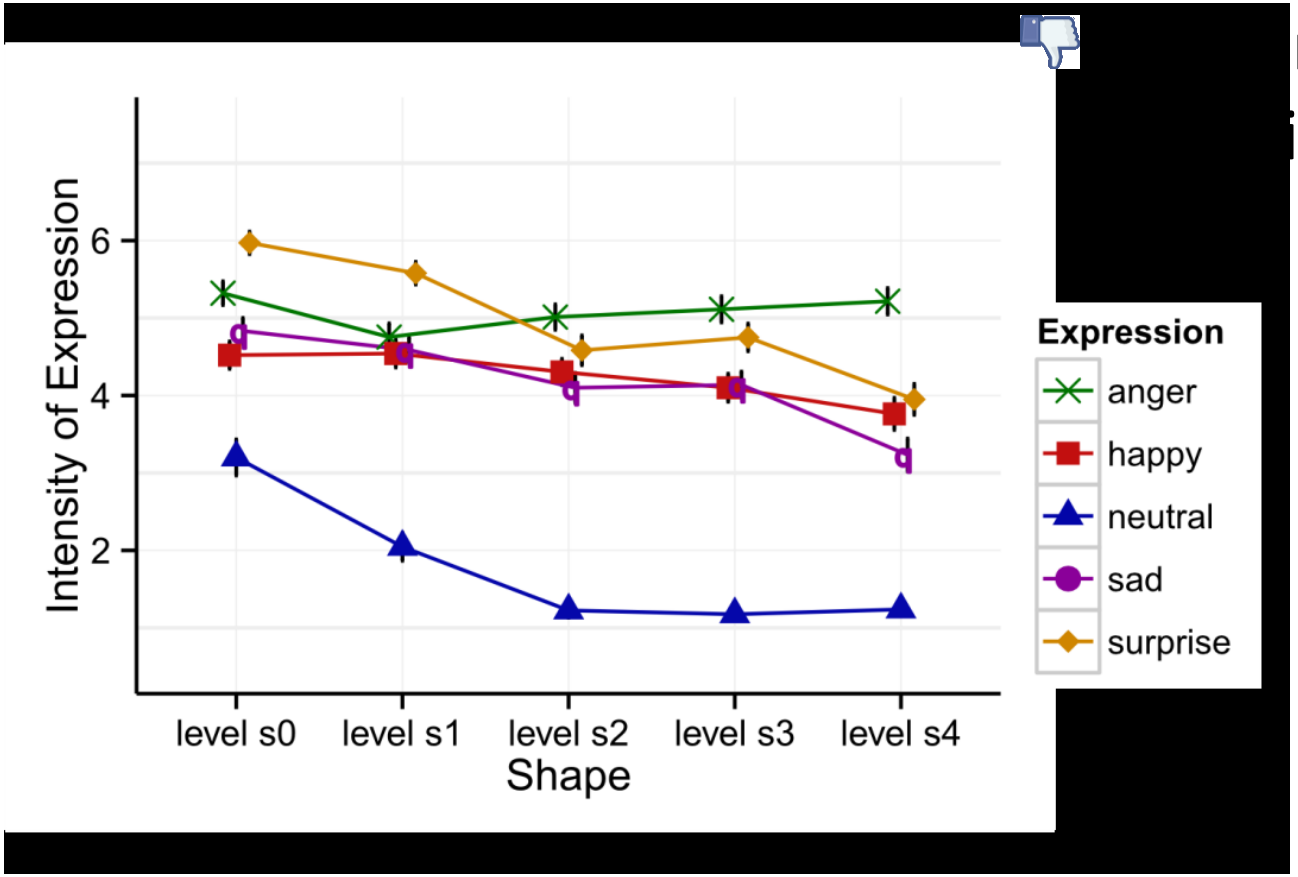
Exp.1c:Results – Reassurance and Attractiveness





Expression - Intensity

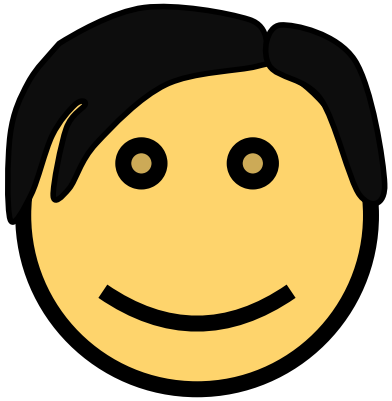
- constant across material stylizations
- realism decreases ity

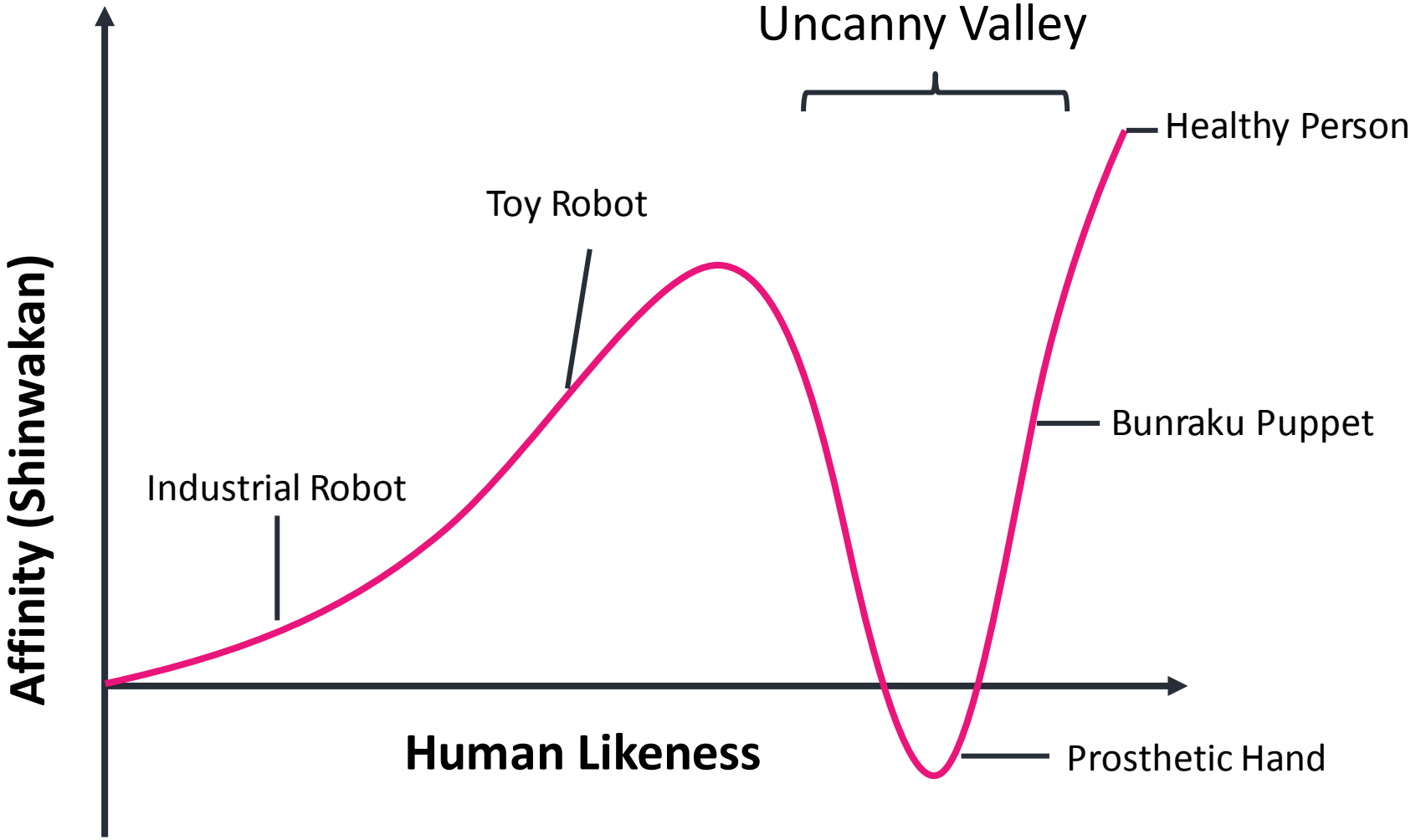


One single stylization dimension?

artistic

iconic




Uncanny Valley
Healthy Person
Toy Robot
Bunraku Puppet
Industrial Robot
Affinity (Shinwakan)
Human Likeness
Prosthetic Hand