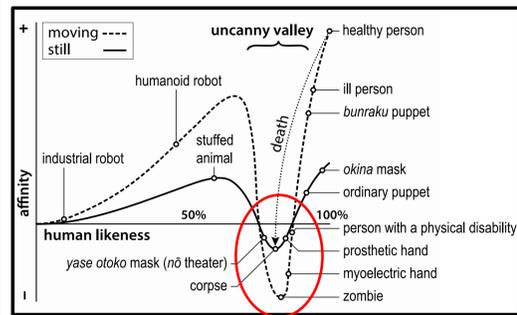


Familiarity, deviation, and uncanniness in faces and non-faces

The uncanny valley...



- Uncanny valley**
- Negative appraisal of **near humanlike entities** (Mori, 2012)
 - Eerie, creepy, uncanny, strange, weird, cold... (Diel, Weigelt, & MacDorman, 2021)
 - Observed for **animal-like stimuli** (Löffler, Dörrenbächer, & Hassenzahl, 2020)
 - Not specific, but more sensitive to humans (Diel & MacDorman, 2021)
 - Sensitivity to facial distortions **increases with realism** (Mäkäräinen et al., 2014)
 - The more face-like, the more "off" are deviations

Uncanny valley and face-related processing?



... And face processing

Face space and face familiarity

- Face-space:** multidimensional system for storing face identity based on individual structural variability (Valentine, 1991; Valentine, Lewis, & Hills, 2016)
 - Faces close to the **centre** are more **attractive** (Potter & Cornille, 2008)
 - Because of **evolutionary fertility markers** (DeBruine, Jones, Unger, Little, & Feinberg, 2007) or **cognitive fluency of prototypicality** (Halberstadt & Rhodes, 2000; 2003)?
 - Deviating/distorted "uncanny" faces: more distant from centre or "acceptable range"
- Familiar faces transcend **within-person variability** (Kramer, Young, & Burton, 2018; Sandford & Rego, 2019)
 - Familiar faces may have their own range of "acceptable" variations (within-person variability) and "unacceptable" deviations (Carr et al., 2017)

Face processing

- Faces are detected and recognized quickly and accurately
 - Configural processing (Rhodes, Braker, Taylor, & Tan, 1989)
- Inversion disturbs** face processing (Carbon & Leder, 2006; Maurer, Le Grand, & Mondloch, 2002)
- Inversion reduces** variance of **aesthetic judgments** of faces (Bäumli, 1994; Leder, Goller, Forster, Schlageter, & Paul, 2017)
 - Ability to detect aesthetically (un-)pleasing features enhanced by face-typical processing?
- (Face) **expertise** may enhance ability to **detect deviations** (Chattopadhyay & MacDorman, 2016)
- Expertise for **non-face stimuli**, e.g., **greebles** (Gauthier & Tarr, 1997; Ashworth, Vuong, Rossion, & Tarr, 2008)
 - Does expertise drive uncanniness of deviations?

Does face familiarity (and upright orientation) increase sensitivity to facial deviations?

Does expertise elicit uncanniness of distorted greebles?

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Famous Face Familiarity Increases, and Inversion Reduces Distortion Sensitivity for Uncanniness Ratings and Detection of Facial Distortions

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Presented at the EPS conference (online), 8th July 2021

Familiarity and inversion: distortion sensitivity and uncanniness

Hypotheses:

2. **Familiar** and **upright** faces show a stronger increase of **uncanniness** with increasing **distortion** levels than unfamiliar and inverted faces
- Familiar** and **upright** faces show a higher **distortion sensitivity** than unfamiliar and inverted faces
- Distortion sensitivity** predicts the effects of familiarity, orientation and distortion on **uncanniness**

Methods

- 66 participants: 33 British, 33 German (online)
- Stimuli: **five famous British** faces, **five famous German** faces; exclusively famous to nation (preliminary study)
- Stimuli were **incrementally distorted** and either **upright** or **inverted**
 - 100 stimuli: 2 orientation x 5 distortion x 10 faces
 - Distortion: increase interocular distance, move mouth caudally



Task 1: Face rating

- Four scales: eerie, creepy, strange, repulsive (0 to 100); all 100 faces

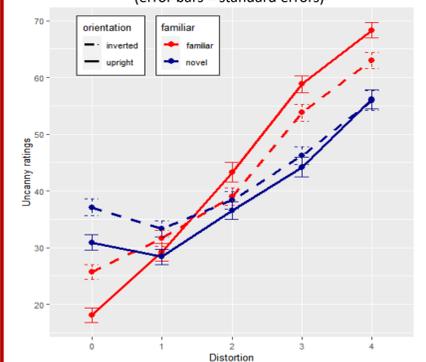
Task 2: Delayed matching to sample

- Matching a **target face** to a **cue face**, 2-back (identical, different)
- Target either identical or a variant
- Distractor: famous faces (not test stimuli)

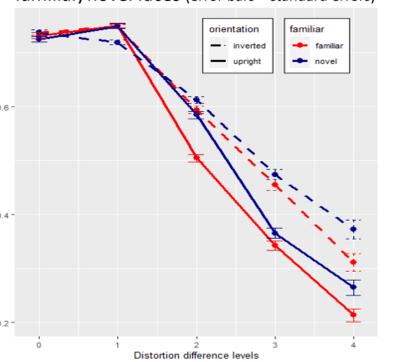


Results

Uncanniness ratings across distortion levels for upright/inverted, familiar/novel faces (error bars = standard errors)



"Identical" response rates across distortion difference levels for upright/inverted, familiar/novel faces (error bars = standard errors)



- Uncanniness increase across distortion levels is stronger for familiar (vs novel) and upright (vs inverted) faces
- Ability to detect distortions increased for familiar (vs novel) and upright (vs inverted) faces
- "Identical" response rate can predict uncanniness as well as familiarity, inversion, and distortion

The deviation-from-familiarity effect: Expertise increases uncanniness of deviating greebles

Hypotheses:

- Without expertise**, normal and distorted greebles are **equally uncanny**. With **expertise**, **distorted** greebles are **more uncanny** than normal greebles, and more uncanny than without training.
- Without expertise**, normal and averaged greebles are **equally attractive**. With **expertise**, **averaged** greebles are **more attractive** than normal greebles.

Methods

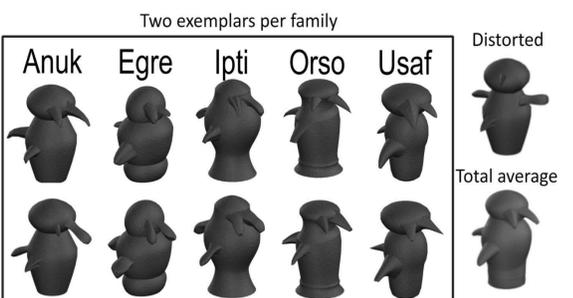
- 45 participants: 21 expertise, 24 control
- Stimuli: 30 asymmetrical greeble stimuli
 - Six individual greebles per five families
 - Families: different body shapes
 - Individuals: same body shapes, different body part shapes
 - Each family and individual had a corresponding label
- + 10 **distorted** greebles
 - Same distortion for all
- + 6 **averaged** greebles
 - 5 per family, one total average (morphed)

Expertise training:

- 5-day training (1 hour per day) on learning greebles by individual and family labels
- Expertise condition: Based on previous greeble expertise research (Ashworth et al., 2008)

Rating task:

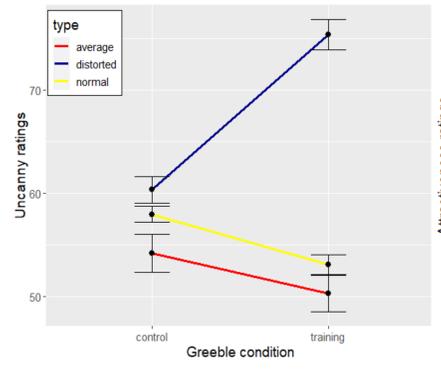
- all greebles, seven scales: eerie, creepy, strange, weird, pleasant, attractive, appealing (0-100).
- Both conditions



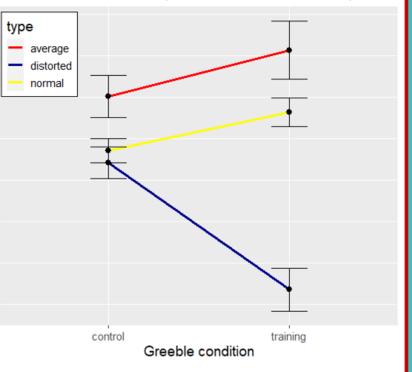
Courtesy of Michael J. Tarr, Carnegie Mellon University, <http://www.tarrlab.org/>

Results

Uncanniness ratings across greeble types and conditions. (error bars = standard errors)



Attractiveness ratings across greeble types and conditions. (error bars = standard errors)



- Distorted greebles are more uncanny than normal greebles only after expertise training
- Distorted greebles are more uncanny after expertise training than distorted greebles without expertise training
- Averaged greebles are more attractive than normal greebles regardless of expertise

CONCLUSIONS

- Uncanniness is elicited by **deviations from familiarized categories**
- Degree of **expertise with the category (familiar/upright face, post-training greeble)** **enhances sensitivity to deviations**
- Uncanniness is not explained by human- or animal-specific theories, but by a **general deviation detection mechanism highly sensitive for human/animal stimuli: possibly also uncanny valley**