Published in final edited form as:
Perception. 2012 ; 41(3): 361–364.

You can take the eyes out of the doll, but...

Benjamin Balas¹ and Joseph Horski²

¹Department of Psychology, North Dakota State University

²North Dakota Governor's School

Abstract

The perceived animacy of a face is well-predicted by the perceived animacy of the eyes presented in isolation. This is not true for other facial features (e.g. having a highly life-like nose does not appear to be crucial) suggesting that the eyes are a critical feature for perceiving life in a face. Here, we asked whether it was therefore possible to “transplant” animacy into a face by transplanting the eyes into a face image. We conducted digital eye surgery on a series of morphed human/doll faces and found that while doll eyes make a morphed face look less alive, human eyes do not make you look more so. Thus, we cannot so easily transplant animacy into a face, but we can take it away.

“They have lifeless eyes – like a doll’s eyes” Quint, JAWS 1975

A statue or doll does not look alive, but our friends (hopefully) do. Recent results demonstrate that the animacy of a face is perceived categorically (Looser & Wheatley, 2010) – a smooth transition between a real face and an artificial one elicits a steep change in perception. Further, the perceived midpoint between real and artificial faces is not at the objective halfway-mark. Instead, it is shifted towards the human end of the spectrum. Observers are somewhat conservative with regard to calling faces “human.” The eyes appear to carry much of the information supporting these decisions – the perceived animacy of the entire face is largely accounted for by the ratings obtained from the eyes shown in isolation. This is perhaps not so surprising – the eyes are at or near the top of feature hierarchies for various face recognition judgments (Fraser, Craig & Parker 1990) and if we believe the lyrical saying that the eyes are the “windows to the soul” it stands to reason that their appearance might dictate whether people think we have a soul in the first place.

Here, rather than examine how the animacy of the eyes is perceived in isolation, we attempted to alter perceived animacy by transplanting human or doll eyes into an ambiguous face. Our manipulation allowed us to examine how the information carried by the eyes interacts with the larger context of the face and look for asymmetries in how real and artificial eyes affect subjective judgments of animacy.

We used 6 pairs of human and doll faces (3 male, 3 female) to create image sequences that spanned the continuum between real faces and artificial faces in increments of 10% (Figure 1). Human faces depicted Caucasian individuals with neutral expression and no visible piercings, tattoos, or facial hair. Doll faces were drawn from a variety of sources and were selected on the basis of similarity to a particular human face. We cropped each image to remove the external contour of the face and rescaled images as necessary to match sizes. In a

pilot study with 10 subjects (6 female), we presented these stimuli to participants in a fully randomized order to determine the point of subjective equality (PSE) between human faces and doll faces along the morph continuum. Participants saw each face for 500ms at a viewing distance of approximately 60cm and were asked after each presentation to provide a 1–7 rating of how real the face looked – a rating of ‘7’ meant that the face was clearly a real person, and a rating of ‘1’ meant that the face was clearly a doll. We estimated the PSE for each subject by computing the average rating assigned to stimuli at each morph level and fitting a cumulative Gaussian function to the data. We found that the average PSE across subjects was a morph level of approximately 60% human, which differed significantly from the 50% midpoint of the morph sequences ($t(9)=2.5$, $p=0.03$) in agreement with previous work.

Having established the subjective midpoint of the human/doll continuum, we continued by carrying out “eye transplants” on our images to examine how the appearance of the eyes would interact with the appearance of the face in ambiguous images. For each original morph sequence, we created two alternate sequences – one in which the eyes from the parent human image were transplanted into all images in the continuum, and another in which the eyes for the parent doll image were similarly transplanted. In these sequences, the eyes thus remain constant, but the remainder of the face gradually morphs between human and doll appearance. We presented these images to 9 new participants (5 female), such that each participant provided ratings for 2 morph sequences (one of each sex) that were not altered, 2 morph sequences in which human eyes were transplanted in, and finally 2 sequences in which doll eyes were transplanted in. The particular sequences assigned to each of these three conditions were counterbalanced across subjects. Using the same display parameters as our pilot study, we asked participants to provide a 1–7 rating for each face according to how real the face appeared to them.

We examined the effects of transplanting human and doll eyes into images along these morph continua in two ways. First, we compared the average responses made in all three conditions at the 60%-Human morph level, since this was the point of subjective equality obtained in our pilot study. When the surrounding face is maximally ambiguous, how do the eyes modulate the perception of “life” in the face? We found that the original 60% Human images elicited an average rating of 4.2 (s.e.m. = 0.30) from our participants, which is what we’d expect at the PSE (4 being the midpoint of our 1–7 scale). Further, our two “eye transplant” conditions exhibited an interesting asymmetry relative to the baseline established by the original sequences. Specifically, when doll eyes were transplanted into the face, subject ratings were significantly more doll-like ($M=3.3$, s.e.m. = 0.26, $t(8)=-2.3$, $p < 0.05$, one-tailed paired-samples t-test, corrected for multiple comparisons), but human eyes transplanted into the same face did not lead to a difference in perceived animacy ($M = 4.7$, s.e.m. = 0.24, $t(8)=1.1$, $p=0.30$).

We continued by examining the interaction between the appearance of the eyes and the appearance of the rest of the face. We ran a 2×11 repeated-measures ANOVA with eye appearance (100% Human or 100% Doll) and facial appearance (0%–100% Human in 11 increments) as within-subject factors. This analysis revealed main effects of face appearance ($F(10,80)=59.95$, $p<0.001$, $\eta^2=0.88$) and eye appearance ($F(1,8)=25.00$, $p=0.001$, $\eta^2=0.76$)

and also a significant interaction between eye and face appearance ($F(10,80)=2.11$, $p = 0.033$, $\eta^2=0.21$). Examining the psychometric curves for all three conditions (Figure 3), we can see that transplanting human eyes shifts perceived animacy slightly towards higher ratings, while transplanting doll eyes compresses the range of animacy values.

We conclude that the larger face context interacts with eye appearance in the perception of animacy. Our data also suggests that artificial eyes have a larger impact than real eyes, which is in keeping with recent results examining critical features that cause artificial faces to look “uncanny” (Macdorman et al., 2009). Diagnostic information for judging animacy may therefore be distributed across multiple parts of the face to varying degrees, with the ultimate percept depending on the integration of many cues of varying strength and reliability.

Acknowledgments

Stimulus images (Human faces) courtesy of Michael J. Tarr, Center for the Neural Basis of Cognition, Carnegie Mellon University, <http://www.tarrlab.org/>. BB was supported by COBRE Grant P20 RR020151 from the National Center for Research Resources (NCRR), a component of the National Institutes of Health (NIH). Its contents are the sole responsibility of the authors and do not necessarily represent the official views of NCRR or NIH. Special thanks also to Candida Braun of the North Dakota Governor’s School for her assistance.

References

- Fraser IH, Craig GL, Parker DM. Reaction time measures of feature saliency in schematic faces. *Perception*. 1990; 19:661–673. [PubMed: 2102999]
- Looser CE, Wheatley T. The Tipping Point of Animacy: How, When, and Where We Perceive Life in a Face. *Psychological Science*. 2010; 21:1854–1862. [PubMed: 21097720]
- MacDorman K, Green R, Ho C, Koch C. Too real for comfort? Uncanny responses to computer generated faces. *Computers in Human Behavior*. 2009; 25:695–710.

Figure 1.

An example morph sequence depicting a woman morphed with a doll in increments of 10%. The 60% human image (outlined in green) is the point of subjective equality for perceived animacy.

Human Eye Transplant

Doll Eye Transplant

Figure 2.

An example of the “eye transplants” used in our task. At left, a 60% morph between a woman and a doll has had human eyes substituted for the morphed eyes. At right, doll eyes have been used.

Figure 3. Average animacy ratings for the original morph sequence (black line), human eye transplants (red line) and doll eye transplants (blue line). Error bars represent ± 1 standard error of the mean across participants.