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SHORT AND SWEET

Flashed face distortion effect: Grotesque faces from relative spaces

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Abstract. We describe a novel face distortion effect resulting from the fast-paced presentation of eye-aligned faces. When cycling through the faces on a computer screen, each face seems to become a caricature of itself and some faces appear highly deformed, even grotesque. The degree of distortion is greatest for faces that deviate from the others in the set on a particular dimension (eg if a person has a large forehead, it looks particularly large). This new method of image presentation, based on alignment and speed, could provide a useful tool for investigating contrastive distortion effects and face adaptation.

We discovered an interesting face distortion effect while preparing a set of face images for an identification experiment. We obtained a set of faces from a Slovakian database (SmartNet IBC, no date) and eye-aligned them using PsychoMorph (Tiddeman et al 2001). To check the consistency of the eye alignment, we started skimming through the images on the computer at a fast pace. After a while, we made a few remarks to one another about the 'aesthetically challenged' faces in the set. They began to appear highly deformed and grotesque. But after inspecting the especially ugly faces individually, each of them appeared normal or even attractive.

It seemed that, after continuously flipping through the eye-aligned faces at a steady rate, each one began to appear as a caricature of itself. If a person had a large jaw, it looked particularly large, almost ogre-like. If a person had a slender nose, then it looked remarkably thin. Many of the distortions, however, were quite difficult to articulate. If we stopped the sequence and returned to these particular faces, however, they quickly returned to normal. We entertained the idea that Slavic faces were inherently bizarre, but we replicated the effect with faces from several other databases.

We standardised the presentation rate and found that roughly 4 – 5 faces per second was ideal (see Movie 1 in the Supplementary Online Material at http://dx.doi.org/10.1068/p6968). After gazing at a continuous sequence for a minute or so, many of the faces will appear highly distorted, even monstrous. The degree of distortion is greatest for faces that deviate from the others in the set on a particular dimension. If one face has an especially large or pronounced forehead compared to the others in the set, for example, then it appears particularly bulbous.

Relative encoding seems to drive the effect. That is, forcing the observer to encode each face in light of the others. By eye-aligning the faces, it becomes much easier to compare their shape and the relative location of their features, so the differences between them become more evident. The fast, steady presentation rate may also encourage this relative encoding. If the faces are not eye-aligned or if they are presented too slowly or quickly, then the effect lessens. Or, if we insert a brief gap in the sequence, the effect almost completely disappears (see Movie 2).

This effect is most certainly related to work on adaptation, and the 'face distortion after effect' specifically (Webster and MacLin 1999). In the basic paradigm, participants study a single artificially distorted face for a few seconds to several minutes followed by an unaltered face that now appears distorted in the opposite direction to the adapting face. Adaptation to a distorted face that is fat, happy, contracted, male, etc, causes neutral faces to appear thin, sad, expanded, female, etc (see Hills et al 2010 for review). Similar effects have been demonstrated for distortion effects of identity, ethnicity, orientation, and attractiveness (Leopold et al 2001; Rhodes et al 2003, 2004; Webster et al 2004).

There must, however, be some degree of homogeneity among the faces for the outliers to stand out and for the effect to occur. The distortion effect, therefore, seems to depend on the outlying dimensions among the images in the set, and these dimensions do not seem to be limited to facial features or configurations. For example, if a photograph is brightly lit compared to the others, then it appears overexposed. Presumably, then, the effect relies on the same contrastive mechanism that gives rise to shape-contrast effects. Suzuki and Cavanagh (1998), for example, demonstrated that a briefly flashed line distorts a circle into an ellipse that appears elongated orthogonally to the line orientation. Owing to the multidimensional nature of the faces in our flashed face distortion effect, the resulting distortion is not on any single dimension, but on every dimension along which the face images vary. In contrast, face distortion after effects commonly result from prolonged exposure to one face with a single exaggerated dimension defined by the experimenter, such as the distance between the eyes.

The dimensions that can be caricatured in our effect, therefore, are not limited to those that can be easily defined and modified by experimenters. For example, only Greeble experts (Gauthier and Tarr 1997) could determine whether a Greeble's 'belly horn' is abnormally large or pointy (see Movie 3). Indeed, it becomes difficult to identify or label the basis of the face distortions if the faces are rotated 180° (see Movie 4), much like the Thatcher effect (Thompson 1980).

Traditionally, face adaptation effects have been interpreted within the framework of Valentine's (1991) face-space model, in which faces are encoded by their positions in a multidimensional space. A variety of similar metaphors have been used in conjunction with this model, such as a two-pool neural net and exemplar or prototype accounts (Robbins et al 2007). While it is too early to know which model or theoretical framework will be the most useful in defining this flashed face distortion effect, and predicting its boundary conditions, face-space accounts or shape-contrast effects may serve as useful starting points for investigating this interesting effect.

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