## Perceived Facial Distortions in Selfies Are Explained by Viewing Habits

**To the Editor** In their recent article, Ward et al[1] analyze the effect of camera distance on the relative sizes of facial dimensions in photographs. They argue that these dimensions are distorted in "selfies"—photographs that people take of themselves with a smartphone camera at arm's length. Given the increasing popularity of selfies, they express concern that such photographs affect decisions about cosmetic medical procedures. We agree with the authors' calculations of facial dimensions in photographs. We wish, however, to clarify the cause of perceived nasal widening in selfies. The perceived nasal widening is not, as the authors suggest, due to physical distortion in the photographs.

When you see a person's face from different distances, the image cast on your retinas changes, but the apparent 3-dimensional shape does not. Your brain takes into account the distance to the face and interprets the retinal images accordingly. What about when you look at photographs of faces, such as selfies? Every photograph of a face has a viewing distance from which the dimensions in the photograph (such as the nasal-bizygomatic ratio) faithfully reproduce the dimensions that the viewer would see when looking at the real 3-dimensional face from a specific distance. The trick is to find the correct viewing distance. With selfies, or any other photograph, you should view from a distance such that the visual angle subtended by the face in the photograph equals the angle that the face subtended from the camera's position when the photograph was taken.[2] For a selfie, this distance is going to be much closer than for a typical portrait, because the photograph was captured from close up. When you view from the correct distance, the perceived facial dimensions should closely match the true dimensions (assuming a high-quality lens is used, as in modern smartphone cameras).

What happens if you view a photograph of a face from the wrong distance? When viewing from too close, the face appears compressed in depth and flatter than it actually is. When viewing from too far, the face appears stretched in depth and rounder than it is.[3,4] Importantly, these effects are not caused by distortions in the photographs but by a mismatch between the correct and actual viewing distances. The reader can try this out with the photographs in the article by Ward et al.[1] The correct distance for the selfie is very close: roughly twice the photograph's width. The correct distance for the other photograph is approximately 10 times the width. If you view the selfie from close up, it should look less distorted. Indeed, research suggests that people usually view photographs taken with short focal lengths—such as selfies—from much too great a distance.[4] This is the reason for the perceived distortion, and there is nothing inherently distorted in the photographs. Evaluations of perceived shape in photographs must take into consideration human perception and viewing habits, in addition to the physical properties of photographs.

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**1**. Ward B, Ward M, Fried O, Paskhover B. Nasal distortion in short-distance photographs: the selfie effect [published online March 1, 2018]. *JAMA Facial Plast Surg*. doi:10.1001/jamafacial.2018.0009

**2**. Kingslake R. *Optics in Photography*. Bellington, WA: SPIE Optical Engineering Press; 1992. doi:10.1117/3.43160

**3**. Třebický V, Fialová J, Kleisner K, Havlíček J. Focal length affects depicted shape and perception of facial images. *PLoS One*. 2016;11(2):e0149313. doi:10.1371/journal.pone.0149313

**4**. Cooper EA, Piazza EA, Banks MS. The perceptual basis of common photographic practice. *J Vis*. 2012;12(5):8. doi:10.1167/12.5.8

**In Reply** Drs Cooper and Banks raise an important, well-studied point: the human visual system can correctly convert from a 2-dimensional image (or a 2-dimensional projection on the retina) into 3 dimensions when the objects subtend the same angle and distance at initial capture and when subsequently viewed. In real life, this is almost instantaneous. The moment we see an individual in front of us, we perceive them and there is essentially no chance of there being a mismatch and the correct viewing angle/distance is a moot point. Interestingly, this phenomenon is mostly studied in controlled environments (eg, using a bite bar) and for specific tasks (eg, estimating angles between planes). As far as we know, it has never been studied for the specific task of evaluating the appearance of one's nose. As the authors of the Letter to the Editor have rightfully noted, if the viewing distance is too close then there is a mismatch between the "correct" and actual viewing distances. As our Discussion stated, "photographs taken at shorter distances will increase the perceived ratio of nasal breadth to bizygomatic breadth."[1] The focus here is on this perceived distortion.

Regardless of that, in the real world photographs are viewed and captured on various devices, from various distances and angles. Thus, the chances that an uninformed user will stumble on the correct viewing distance and angle are slim. For this reason, we must educate users both on the way the brain interprets images (as Cooper and Banks suggest) and on the physical dimensions of 2-dimensional objects on the image plane (our Research Letter).[1] This will allow them to take a more rigorous approach when evaluating their facial features, regardless of image viewing conditions. All that being said, we appreciate the comment and believe that it complements and improves our initial publication. We hope this discussion will be the precursor to new research on how we evaluate portrait photographs.

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