Symmetry and Visual Appeal

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We are so used to the perfectly drawn faces in fairytale books or magazines, that when asymmetry appears in real life, we are startled. We notice people with lopsided smiles, or grins that are adorned with one dimple instead of two; we use eyeliner and layers of eyeshadow to cover up a size difference between two eyes. A face with a mole on one cheek but not on the other makes us pause, and we marvel over the perfect geometry of a beautiful movie star's symmetrical face.

Our eyes are highly equipped to detect bilateral facial symmetry, implying that facial symmetry must be important in some way. Symmetry in other objects can be detected by low-level visual mechanisms, but the detection of symmetry in one's face calls upon higher-level, more complicated visual mechanisms. Was there an evolutionary pressure to develop these higher-level visual mechanisms, so that we would better be able to detect facial symmetry? (Rhodes, 2005). Correlation does not necessarily indicate causation, but the signs of a strong positive correlation between symmetry and visual appeal seem apparent. In one study, photo manipulation was used to generate faces with varying levels of facial symmetry. The people who were asked to judge this series of faces consistently selected the faces with the greatest bilateral symmetry as most attractive (Rhodes, 1995). As given by Little's 2011 paper on facial attractiveness, symmetry can be defined as "the extent to which one-half of an object is the same as the other half (Little, 2011)." What, if anything, does symmetry have to do with facial attractiveness?

Figure 1: In Rhodes 1995 study, people were asked to rate how attractive these faces (each manipulated to display varying levels of symmetry) were. The most symmetrical

One logical proposal for the attractiveness of facial symmetry lies in the idea of "perceptual bias." By this principle, people are predisposed to recognize certain stimuli in a certain way, preventing information from being processed in a wholly objective way (Gross, 2015). Human vision is built on bilateral symmetry – we have two eyes, one on each side of our face; the muscles associated with each eye's vision likewise display bilateral symmetry. Human vision can also be naturally divided into two fields – left, and right. When a visual point on one field can be matched to one on the other half of their field, the brain is able to process the visual information, and create a mental image with much more ease. Literally, a person with a symmetrical face is "easy on the eyes." Similarly, symmetry provides a template that allows a person's brain to construct at least half of an internal prototype that new information can be matched to. This rough outline that symmetry creates would also explain why people who have "average" looking faces are generally more attractive (Little, 2003).

By this vein of logic, faces that are symmetrical, but presented as upside down (with the mouth above the eyes, for example) should also be thought of as more attractive. However, this is not true – once the face we are viewing is inverted and therefore no longer upright, symmetry no longer increases the attractiveness of said face. An alternate explanation looks at the supposed genetic benefits conferred on a person with excellent facial symmetry. A mate can offer two different types of benefits – direct, and indirect. "Financial security" is an example of the former case, and does not necessarily measure a mate's genetic mettle. Rather, direct benefits confer a person and their offspring with an advantage in the present day; for example, an abundance of wealth or social status is immediately useful to a person and his or her offspring. Indirect benefits are subtler, and could entail long-term genetic benefits for future offspring. These then calls into question what, if any genetic benefits that facial symmetry could imply (Little, 2011).

Of note is that there are two different types of facial symmetry to consider. One is "fluctuating asymmetry" (hereon abbreviated as FA), and "directional asymmetry" (known as DA). Directional asymmetry is asymmetry that takes into account the prevalence of hemi-face dominance; in these situations, the line of symmetry splitting the face of a person who exhibits directional asymmetry will not be in the center middle of his or face. Rather, human faces are often larger on the right side, and this asymmetry is exploited when one is trying to convey different states of mind. For example, people are wont to show more of the right side of their face when they want to hide their emotions (Simmons, 2004).

Fluctuating asymmetry, or its absence in a person's face, is a better indicator of a person's health. This is what we usually think of, when we consider "asymmetry" in a person's face affecting how attractive they are. Fluctuating asymmetry describes variance over the line of symmetry splitting a person's face. They encompass variations on top of directional asymmetry and result from a person's experiences during early development. If a person's immune system is weak, and unable to sufficiently defend against outside stress, a person's face will begin to exhibit greater deviations from perfect symmetry. Therefore, larger amounts of fluctuating asymmetry can be a reflection of instability during development (Simmons, 2004). Incidentally, males tend to exhibit higher amounts of fluctuating asymmetry, because testosterone represses the immune system during development. This hormone weakens the body so that it is more susceptible to parasitic infections that would prevent perfect facial symmetry from forming. Greater amounts of testosterone are also related to increased rates of prostate cancer. Yet, testosterone also makes the development of secondary sexual traits possible, traits that are very often thought of as attractive in men (Rhodes, 2003). There then appears to be a trade-off between the good health of symmetry, and those secondary sexual traits – unless a person's immune system can superbly defend against parasites and other environmental stresses, even when weakened by testosterone. In the animal world, male peacocks show off their striking plumage as a way of indicating that they can survive and thrive in spite of an attribute that should have evolutionary detriments. For humans, secondary sexual traits can be like the peacock's striking tail – an indication of health so robust and well-adapted, that their body can compensate for the costs of suppressing the immune system. This is the "immunocompetence-handicap hypothesis," wherein a person who can bear a higher parasite burden, can also display greater expression of secondary sexual traits (Rhodes, 2003).

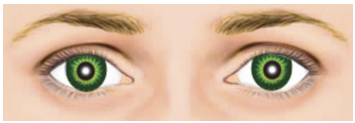
However, we must not neglect the genetic factors that can increase male facial masculinity (masculinity that results from greater expression of secondary sexual traits). There is a widespread believe that a facially masculine man should be able to offer greater benefits (genetic or otherwise) to their offspring, but such a postulate has not been rigorously researched. Whether or not increased masculinity actually offers an evolutionary advantage should be considered with regards to the population as a whole. Since "masculinity" (again, defined here as secondary sexual traits associated with males) has a genetic factor, males with more masculine faces will also have sisters who are facially more masculine; there is nothing contradictory about this statement, given that the amount of testosterone a person produces is related to their genetic make-up. Facial masculinity in a male may or may not make the male more attractive to their prospective mate, but their sisters are, on the whole, viewed as less attractive (Lee, 2014). The "immunocompetence-handicap hypothesis" would have one choose a man with more masculine features for the perceived indirect benefits for one's offspring, but the same "masculine" traits would give one's daughters a reproductive disadvantage. Interestingly, men with feminized faces are sometimes found to be more attractive for said "feminine" features, implying that females who are regarded as more attractive for their "feminine faces" would not have brothers who have a reproductive disadvantage (Little, 2011).

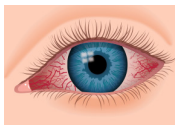
"Symmetry may not necessarily confer an evolutionary advantage of any sort, and instead, increased health is the main factor that determines overall attractiveness."

Meanwhile, in a 2004 study by Koehler, researchers found that high facial femininity was associated with higher body symmetry. In turn, increased levels of high facial femininity and high body symmetry were associated with overall attractiveness, implying that body asymmetry was also an indicator of developmental instability (Koehler, 2004). Likewise, feminine faces may be more attractive, but they are not healthier than their supposedly less "feminine" peers. This further suggests that the evolutionary benefits that could be conferred by seeking attractive facial traits is tenuous (Rhodes, 2003). It may be more effective, then, to separate symmetry away from concepts of masculinity and femininity as a category of attractiveness (Little, 2011).

Perhaps more important to consider is that, while the reasons for and existence of a biological preference for facial symmetry are debated and uncertain, the strong correlation between healthy faces and greater attraction is clear. Here, we think of a study done on sclerae, the typically white covering around the eyeball. As previously mentioned, humans have two eyes; when we cry, normally white sclera become pink or red. White scleras are a reflection of normality, are healthier. When one eye is red, the face exhibits asymmetry; when both eyes are white, or both eyes are red, the face exhibits symmetry. People in the study had a negative reaction to seeing two red eyes, a better reaction to seeing one red eye and one healthy white eye, and the best, most positive reaction to seeing two white scleras. In relation to the symmetrical red eyes, the asymmetry of having one white eye was positive; however, in the end, the normality of two health white scleras was preferred above all. In this situation, the color of the sclera was not an indication of genetic makeup, but a nonpermanent reflection of a person's current mood. Symmetry in this case would not necessarily confer an evolutionary advantage of any sort, and instead, increased health is the main factor that determines overall attractiveness (Provine, 2013).

Indeed, in spite of a lack of perfect symmetry, faces can, and are still found attractive. A lopsided smile, indeed, may only add to the charm of a person; Marilyn Monroe's beauty mark lent her face asymmetry but invited imitation, not disgust. In the end, it would appear that the general human predilection towards good health holds true, even if the cost entails an amount of asymmetry.





Figures 2 and 3: White vs red sclera

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