H

Health Markers

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Synonyms

Indicator traits

Definition

Health markers are phenotypic traits that signal some aspect of mate quality, and these indicators may be used during mate choice. Health markers are generally considered honest, condition-dependent signals.

Introduction

Mate preference and mate choice in humans is notoriously complex. However, humans are the product of their evolutionary history and, in particular, two key processes: natural and sexual selection. To put this in perspective, we only need think back to our recent history over many hundreds of thousands of years. Under natural selection, traits that increased survival will have been favored. For example, individuals with a more robust immune system would likely live longer perhaps because they are more resistant to parasites and pathogens. And likewise, traits that indicate high quality, such as "good genes," could be favored during mate choice. Under this scenario, sexual selection will favor particular individuals or genes because they will have higher reproductive fitness. The role of phenotypic traits in sexual selection has been the subject of considerable research in animals (reviewed in Andersson 1994) and, more recently, has gained traction in evolutionary psychology (e.g., Thornhill and Gangestad 1996; Barrett et al. 2002; Rhodes 2006).

Phenotypic Indicators of Health in Animals and Humans

In animals, many species have dramatic sexual dimorphism such that males may have elaborate plumage in birds (like peacocks), bright coloration in lizards, or large antlers in antelope, to name but a few examples (Andersson 1994). These traits are clearly the target of selection, and they can be easily measured although what they may signal to a potential mate is far more difficult to discern. On the one hand, a sexually dimorphic trait may be arbitrary such as in the case of Fisherian runaway selection (Andersson 1994), or alternatively, it may be condition-dependent and signal quality (Hamilton and Zuk 1982). In the case of humans, while females are still the limiting sex (i.e., females are more choosey than males), male traits are perhaps not as obvious as in

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the animal kingdom. This raises two important questions. First, what male traits are important to females when they choose a mate, and second, what do these traits signal to a potential mate? Likewise, we should also ask what female traits are important to males because while females may be more choosey than males, male choice can play a significant role in fitness.

Physical Traits, Symmetry, and Mate Preference in Humans

Particular physical features are found to be attractive both within and across cultures (Langlois et al. 2000). While humans may use a wide range of traits linked to socioeconomic factors, personality, trustworthiness, etc., the focus here will be on phenotypic traits that signal health or quality. One commonly used measure of quality is fluctuating asymmetry (FA), which is a random deviation from perfect bilateral symmetry. Individuals with higher levels of FA are thought to reflect developmental instability – an inability to deal with environmental stressors during development (Thornhill and Gangestad 1996). Measures of FA are influenced by exposure to pathogens or environmental contaminants, poor nutrition, parasite load, and numerous other factors (Rhodes 2006). Therefore, individuals with higher symmetry are considered more attractive and in better condition/health. In humans, body and facial symmetry are two sources of information available during mate choice.

Symmetrical human bodies are preferred and are likely condition-dependent because they are less likely to be associated with psychosis, premature birth, and inbreeding (Livshits and Kobylianski 1991). Similarly, among women with relatively large breasts, individuals with lower FA were more fecund (i.e., had more children; Møller et al. 1995). While this result suggests that breasts are sexually selected via male preference for larger breasts, more detailed study is required to determine the nature of breast FA relative to health.

The relationship between attractiveness and facial symmetry in humans has received considerable interest in the last two decades, particularly given the ease with which images can be quantified and manipulated on a computer (Rhodes 2006). Importantly, computer-generated images allow for the control of a wide range of confounding traits such as skin, hair, and eye color. So, do humans find symmetrical faces more attractive? It turns out that it depends on the method used to generate a choice of two computer images in which one of them shows less symmetry. In early studies a mirror image was created of one half of a face that was mirrored across a vertical midline (termed a chimera). This technique was later shown to be unreliable because it resulted in some distortion of features (see Rhodes 2006 for details). A more recent technique is facial blending, which produces a more reliable end-product. The two methods yield different results. Humans find symmetrical faces more attractive when the images are produced using facial blending but not when they are produced as chimera images. But do symmetrical faces signal FA, which theoretically is an important index of mate quality? Or, put differently, does facial symmetry signal health in humans? FA in humans is controversial, and there are instances where studies have claimed to measure FA, but did not, or did not meet other essential criteria such as demonstrating repeatability. In a recent review, Rhodes (2006) concluded that there is little evidence that facial symmetry signals health, and recent meta-analyses have likewise come to this conclusion with respect to nonhuman animals. There is still work to be done before we can say unequivocally that facial symmetry reflects underlying health, but it is an intriguing hypothesis.

Condition-Dependent Signals and the Role of MHC and "Good Genes" in Mate Preference

Immunocompetence, or the strength of an individual's immune system, has been touted as a target of selection because having offspring with a robust immune system is likely to raise inclusive fitness. This may be accomplished by selecting a

mate with a complementary immune system in order to increase major histocompatibility complex (MHC) diversity (the genes governing immune responses; Winternitz and Abbate 2015). Put another way, humans should prefer MHC-dissimilar or MHC-diverse mates because a polymorphic MHC is a better tool kit with which to deal with rapidly evolving parasites and pathogens. It is of course more complicated than simply selecting a mate with a dissimilar MHC because there might be an optimal MHC diversity or there may be a specific MHC that correlates with "good genes" at that moment in time (reviewed in Winternitz and Abbate 2015). But how would an animal or a human know that a potential mate has an appropriate MHC complement? One possibility is that MCH is linked to a cue that is easily accessible to a receiver. In the case of humans, body odor has been linked to MHC such that favorable MHC genes correlate with more attractive body odor. Visual cues may also play a role. For example, men that were heterozygous in three loci for MHC genes were also rated as having more attractive faces than males that were homozygous at one or more of these loci (Roberts et al. 2005). While MHC condition-dependent mate preference in humans has been controversial, the variation in results can in part be explained by differences in methods, and the weight of evidence is in favor of MHC preference playing a role in sexual selection (Winternitz and Abbate 2015).

Sexual Dimorphism in Facial Traits, Attractiveness, and Indicators of Health

During and after puberty, sexual dimorphism in facial and body features becomes more pronounced as testosterone levels rise in males and females suppress testosterone through estrogen production. Although testosterone plays a key role in reproduction, it is thought to suppress immune responses and therefore comes at a cost. At the same time, relative testosterone levels can be apparent in facial features. During and after puberty, males with higher levels of testosterone may develop higher cheek bones and more pronounced jaws (Winternitz and Abbate 2015). These traits may honestly signal health because males are able to pay the cost of expressing these traits although testosterone is immunosuppressive. Females are therefore predicted to prefer males with these traits. Indeed, populations or cultures from areas of greater parasite/pathogen prevalence place more weight on attractiveness (Gangestad and Buss 1993). This particular study used 37 different societies from six continents and five islands. Participants were asked to rate attractiveness using 18 traits, and this was assessed in relation to the prevalence of seven key pathogens prevalent in humans. Interestingly, this result held true for both sexes even when a range of confounding variables, such as average annual income, latitude, and geographical region, were controlled for.

Conclusion

While a great deal of research has focused on human evolutionary psychology in the past two decades, the field has a long way to go. In part, this has to do with some of the constraints of working on humans in a modern society with easy access to modern medicine and pharmaceuticals. For example, taking birth control pills alters hormone profiles and may influence mate preference. Nevertheless, the ease with which we can sequence genomes and manipulate imagery for mate preference trials also means we have better tools with which to answer key questions.

How much evidence is there for condition-dependent, or health, signals in humans? As it turns out, the evidence is scattered and not substantial. First, the jury is out on whether facial symmetry, which is thought to be more attractive, is in fact an indicator of health. However, there is evidence that more attractive individuals have greater heterozygosity, which is linked to immunocompetence. Therefore, if females prefer males with more attractive faces and these males are heterozygous at MHC loci, there could very well be fitness benefits to such traits/health markers. Furthermore, attractiveness is also more important in societies where the risk of pathogen

transmission is greater. Again, mate choice in these systems could be relying on health markers. Finally, aspects of body symmetry are linked to traits that influence fitness.

We particularly need more studies on societies far removed from Western influence where resources are more limited and, therefore, where health markers may be particularly informative with respect to fitness.

Cross-References

- ▶ Intersexual Selection
- ▶ Intrasexual selection
- ▶ Natural Selection
- ▶ Sexual Selection

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