Evolution and Individual Differences in Face Preference

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Abstract

Evolutionary views of facial attractiveness have noted the high agreement between individuals when judging faces for attractiveness. This paper presents views on the existence of individual differences in attractiveness judgments consistent with evolutionary theory. We also outline some of our recent work on attractiveness using both natural face images and images manipulated by computer graphics. These studies show that preferences for facial cues to different personalities, levels of masculinity and symmetry, differ between individuals. Such individual differences in attractiveness judgments may reflect learned differences between males and females, familial characteristics, and experience of social competition. For humans, as with other species, there is no optimal strategy for mate choice and parenting that applies to all individuals. Indeed, the range of personal circumstances (physical, environmental, social) will guarantee that what is a good or adequate strategy, and therefore what is attractive, will depend on the individual.

What Makes Certain Faces Attractive?

In recent years an evolutionary view has been proposed to help us understand why some faces are perceived to be more attractive than others (e.g., Cunningham, Barbee & Pike 1990; Grammer & Thornhill 1994; Jones 1995; Perrett et al. 1998). An evolutionary view posits that the attractiveness of individuals is directly linked to their value as mates; high value mates are those who can best enhance the reproductive success of the judge, and so females and males should both be sensitive to cues that indicate higher mate value. An evolutionary view also posits that individuals should agree on the characteristics that make a particular mate of high quality. For example, youth is linked to fertility in women and so all men should agree that youth is a characteristic of a high quality mate. Many authors have postulated that facial traits are advertisements of immune quality in an individual and have highlighted the importance of the heritable benefits of mating based on facial attractiveness (e.g., Grammer & Thornhill 1994). Consistent with a universal agreement on attractiveness view it has been found that not only is there a high degree of agreement from individuals within a particular culture, there is also high agreement between individuals from different

cultures (e.g., Cunningham et al. 1995; Perrett et al. 1998; see Langlois et al. 2000 for a meta-analytic review).

If particular facial traits are reliable cues to mate quality, then they should be reliably associated with attractiveness judgments. Indeed, several underlying characteristics have been identified that influence facial attractiveness. For example, most studies have begun to agree that symmetry (e.g., Grammer & Thornhill 1994; Perrett et al. 1999; Rhodes et al. 1998) and averageness (e.g., Langlois & Roggman 1990) are significant factors in judgments of facial attractiveness. For some factors the collected evidence is less clear; for example, the role of sexual dimorphism in determining facial attractiveness has been the source of much debate. The findings reported in Perrett et al. (1998; also Cunningham et al. 1990) indicate that women do not have clear preferences for "masculinized" face shapes, which are pro-posed to be found attractive from a traditional good genes view of facial attractiveness (e.g. Grammer & Thornhill 1994).

One factor lacking from this field of research, however, is the role of the perceiver. Emphasizing the between-rater agreement implies that what is judged attractive by one person is attractive to everyone. High inter-rater agreement in judgments of attractiveness may be one reason why systematic studies of the differences in facial attractiveness judgments between individuals are rare. Despite a focus on what is universal in attractiveness judgments, there are likely to exist interesting individual differences in what people are looking for in a partner's face. While we agree that within our genes lies a universally applicable blueprint for what is and what is not attractive, in this paper, we examine the possibility of individual differences in the perception of attractiveness (the "fine-grain" of attractiveness beyond species-wide desirable characteristics), and speculate as to how such differences may derive from learning and life history factors. Whilst individuals may share certain basic criteria for finding faces attractive, many factors may influence the specific types of face they find attractive. These include: early face experience, the subject's own personality and attractiveness status, environmental factors, and certain reproductive relevant changes within an individual's lifetime.

Assortative Mating for Physical and Perceived Traits

In many animal species the most widely reported mating pattern appears to be assortative mating (Burley 1983). Positive assortative mating (also called homogamy) occurs when individuals form pairs in which the individuals involved are more similar to each other on a given trait than would be expected by chance (Thiessen & Gregg 1980). Negative assortative mating (heterogamy or disassortative mating) occurs between individuals whose phenotypes are more dissimilar than expected by chance. Preferences for assortative mating may be advantageous for genetic reasons (e.g., Thiessen & Gregg 1980) or simply result in more stable partnerships (e.g., Hill, Rubin & Peplau 1976).

Early research into human assortative mating focused on examining correlations in measurements in anthropometric characteristics between partners. Spuhler (1968) conducted two studies that involved taking 43 physical measurements (such as arm length, ear lobe length, hand breadth etc.) from 205 married couples. In a sample of European Americans, he found significant positive correlations on 29 of these measurements, including 7 of 15 facial or cranial measurements. No negative correlations were reported. In a second study of Native Americans, however, none of the 40 measurements showed a significant correlation, which indicates that assortative mating for physical characteristics is not a ubiquitous finding in humans. Spuhler also presents a review of early studies on partner similarity, collecting correlation coefficients between 105 physical characteristics from research spanning nearly seventy years. The overall pattern shows low positive correlations (0.01- 0.35) for many physical features, for 247 out of 288 correlations were positive (38 significant). Roberts (1977) conducted a similar review with similar conclusions.

These early studies, however, fail to control for the effects of environmental coexistence on the correlations. It is likely that living together and sharing similar diets may have serious consequences on certain measures. Spuhler also stresses that many of the measures are intercorrelated. For example, as upper arm length increases, it is likely forearm length will increase. The large number of correlations may thus give a false impression of the number of traits that are assorted for. Two more recent studies do control for age (Malina et al. 1983) and cohabitation (Allison 1996) and still demonstrate positive assortative mating for certain characteristics. Together these studies demonstrate that positive assortative mating for certain physical characteristics does occur in human marriages.

Three studies have examined the perceived facial similarity between married couples. Griffiths and Kunz (1973) took photos of married couples, who were then split into six groups by the length of the marriage. Participants were asked to match up photos to their partner. Couples married for less than ten years were matched at levels above chance, but subjects failed to match couples married for between ten and twenty years. Couples married for over twenty years were again successfully matched by participants. This is a difficult result to interpret, but the small stimuli sets used (five couples in each group) may help explain these findings.

Zajonc et al. (1987) performed a similar experiment, hypothesizing that couples do not pair due to similarity, but become more physically alike over time due to sharing similar diets, lifestyles, and emotional experiences. They used two photographs from each individual in twelve married couples. One photo came from the first year and the second was taken in the twenty-fifth year of the marriage. Target faces were presented with six opposite sex test faces, one of which was the target's real life partner. The subject's task was to rank either the similarity or the likelihood of marriage between the test faces and the target, depending on the condition. Photos from the first year were not perceived as more similar (or more likely to be married) than expected by chance. Photos from the twenty-fifth year were

ranked as more similar and more likely to be married than chance would predict. These results differ from Griffiths and Kunz (1972), who did demonstrate similarity between newly wed couples. The "similarity" and "likelihood of marriage" rankings were almost identical, indicating subjects associated facial resemblance with the likelihood of marriage between individuals. This means that people assume that people marry people who look like themselves.

Hinsz (1989) also studied facial similarity in real couples. Photos were of two groups, engaged couples and couples married for around twenty-five years. Participants were presented with opposite sex pairs of photos, and asked to rate the similarity between the two faces. Half of the pairs presented were actual couples, and half were randomly generated couples. Real couples were rated as significantly more similar than randomly generated couples. Unlike Zajonc et al. (1987), couples that had been together for longer periods of time were not perceived as more similar than new couples.

Penton-Voak et al. (1999a) adopted a novel approach to study similarity between partners, by studying preferences for faces, rather than looking at real couples. Individual faces were photographed and the resulting images were "gender transformed" using computer graphics techniques to generate hypothetical opposite sex "siblings". Ratings demonstrated that these computer-generated images were perceptually similar to the original photographs, indicating that the transforms were successful. When the original subjects were asked to rate a set of photographs which included their opposite sex "twin", they tended to rate faces similar to their own higher in attractiveness than those to which they were dissimilar. Unfortunately, whether this really represents a preference for self-similar faces is unclear, as a preference for averageness could also generate this finding: faces very far from average receive low attractiveness ratings and such atypical faces differ from the faces of most individuals more than average faces, possibly accounting for the result.

In a second study Penton-Voak et al. gave subjects the opportunity to adjust average face shapes, making the faces appear more or less similar to the subject's own face. No systematic preference for self-similar characteristics or opposite characteristics was found.

Assortative mating also takes place for non-physical factors. In fact, stronger correlations are reported between partners for characteristics such as religion, educational level, socioeconomic status, and political beliefs than for any measured physical characteristics (Vandenberg 1972; Thiessen & Gregg 1980; Rushton 1988; Epstein & Guttman 1982). Intelligence is genetically heritable, but has a strong environmental influence. Johnson, Ahern, and Cole (1980) reviewed studies from 1928 to 1973 that examine similarity for intelligence and found positive correlations between spouses between 0.12 and 0.76 across many different tests employed. Bouchard and Mcgue (1981) reviewed sixteen standardised IQ studies and found an overall correlation of 0.37 between partners in 3817 couples. There is also evidence that assortative mating occurs for certain abnormalities in personality. Assortative mating has been observed between sufferers of schizophrenia, alcoholism,

depression, and neuroses (see Thiessen & Gregg 1980 for a review). Looking at matching for personality, Botwin et al. (1997) found positive correlations between partners for three of the Big 5 personality traits: agreeableness (dating couples, r = .27, married couples, r = .33), conscientiousness (dating, r = .27, married, r = .22), and openness (dating, r = .51, married, r = .38). No assortative mating was found for extraversion (dating, r = .25, married, r = -.10) or neuroticism (dating, r = -.18, married, r = .06).

All these studies point to consistent matching for a wide range of characteristics amongst partners, with similar individuals mating together at levels above chance. Thus no preference for self-similarity in physical features has been defined experimentally, and the perceptual basis of actual partners looking alike is unclear. Similarity could arise from assortment for attractiveness.

An assortative pattern of mating is not necessarily caused by assortative preferences (Burley 1983). Assuming that "like mates with like" because "like prefers like" is an oversimplification. In a population where a certain characteristic is universally considered attractive (a type or directional preference) an assortative pattern can still develop. For example, if height is universally considered attractive, tall people will end up with tall partners and short people will end up with short partners. This will happen because tall individuals can compete well for tall partners, leaving short people to pair up together (even if short people were most attracted to tall people).

Our recent work, however, has suggested that assortative mating for some facial characteristics may reflect the desires of individuals. We presented participants with a large collection of faces and asked to rate them for attractiveness. Participants were also asked to indicate the personality traits that they desired in a partner. Preliminary analysis indicates that the personality desires of the judges for different types of personality influenced the faces the judges selected as most attractive (Little et al. in prep.).

Botwin et al. (1997) found that individuals preferred partners who were similar to themselves on personality characteristics (positive correlations between own personality and desired for all five factors), indicating that what a person wants is somebody similar to him or herself. People also seem to get what they want, as modest positive correlations were also found between what people indicated they desired and what their current partner possessed. Given these findings, it is possible that desired partner personality influences face preference and could drive assortative mating for perceived personality traits. Indeed, in another recent study (Little et al., in prep.) of assortment we found that partners look similar in personality.

We studied 84 couples and asked observers to rate the appearance of each male and each female on five bipolar personality attributions (insecure/secure, broad-minded/narrow-minded, self-disciplined/weak willed, quiet/loud, ruthless/lenient). We found that partners looked similarly secure, broad-minded, and self-disciplined. On the remaining pair of descriptions (quiet and ruthless), partners looked complementary. That is, ruthless looking women were more likely to be partnered with quiet looking men; conversely, women who

looked lenient were more likely to have loud looking male partners. Importantly, these correlations in apparent personalities of partners remained after controlling for level of facial attractiveness. Thus assortment for personality is not a product of assortment in physical attractiveness. Although it is possible that attraction to self-similar characteristics may be one source of individual differences in preferences, there are of course other explanations for these findings. A competitive mating market in which there was a universal preference for desirable traits would also result in an assortative pattern.

Early Experience

Theorists have proposed that imprinting at an early age influences later behaviors including mate preferences. Imprinting has been demonstrated in both birds (zebra finches - Vos, 1995; quail - Bateson 1980) and mammals (rats - D'Udine & Alleva 1983; sheep and goats - Kendrick et al. 1998); there is even suggestive evidence for primates (Fujita 1993). Imprinting has also been proposed to play a role in human mating. Westermarck (1894) has argued that children have an innate tendency to develop a sexual aversion to individuals with whom they live closely in infancy and early childhood (usually siblings and parents). Originally proposed as a mechanism to avoid sibling incest, such negative imprinting would prevent inbreeding in a population. Westermarck's hypothesis has received empirical support from a series of ethnographic studies.

Kibbutzim in Israel form a natural experiment of the hypothesis (e.g. Shepher 1971). Children are socialized from infancy in a mixed sex peer group and live separately from their parents in the group (parents spend time with their children in the afternoons). Thus the relationship between group members is similar to the relationship individuals have with siblings in other cultures (a lengthy period of intimate contact with other individuals during childhood). Importantly they also lack a culturally imposed incest taboo, a competing hypothesis to account for the scarcity of between-sibling sexual relationships. In one study of Kibbutzim there were no cases of heterosexual activity or marriage between members of the same group (Shepher 1971). Shepher also presents census data in support of Westermarck: out of 2769 marriages involving individuals raised in Kibbutzim, there were no cases of individuals marrying others from the group in which they were raised.

Sim-pua marriages in Taiwan also provide a natural experimental test of the Westermarck hypothesis. Until the mid-1940s women in much of China and Taiwan gave away their infant daughters, and raised other women's daughters instead as future wives for their sons. This meant that future husbands and wives were raised together in a situation resembling siblings' relationships. Wolf (1993) reports that children raised in this way are extremely reluctant to consummate their marital bond. "Major marriage" offers a natural control group; here a son was sent a girl from another family after the age of puberty. Such couples had often not met until the marriage ceremony, thus preventing any

Westermarckian aversion to sexual activity. In comparison, husbands in sim-pua marriages were three times as likely to visit brothels as men married in the major fashion, an observation that Wolf interpreted as a lack of satisfaction with the sexual aspect of their marriages. Later census studies of more than 14,000 marriages indicate that 2.5 sim-pua marriages end in divorce for every major marriage that does so, and the fertility of major marriages is 25 percent higher than sim-pua marriages (Wolf 1993). The Chinese data complement the findings of the Kibbutz studies. Kibbutz data shows that children raised together avoid sexual contact with one another and the Chinese data shows that if children raised together are forced into a relationship, then these relationships are less stable and less productive in terms of children. Both findings suggest that there is something that becomes "unattractive" in others that are co-socialized through early life. Westermarkian imprinting can result in individual differences in partner preference.

Westermarck's hypothesis deals with negative imprinting, learning to avoid characteristics of those that are present in early childhood, but the most documented form of imprinting in animals deals with positive imprinting—being attracted to early exemplars as potential mates. The underlying mechanisms may be the same: avoid the particular individuals with whom one has been reared but be attracted to their general characteristics.

Is there then a tendency for humans to become attracted to individuals similar to those with whom they are raised that could be the result of positive imprinting? As family members tend to resemble one another, adult sexual preferences for mates who are similar to family members may lead to some similarity in physical appearance between partners. Large-scale studies of anthropometric characteristics indicate that married couples tend to be physically similar to each other (though the degree of similarity is small), and there is some evidence that partners do indeed resemble each other in ways that can be visually detected by others (see above). Penton-Voak et al.'s (1999a) work is also relevant here as again, because of family resemblance, a preference for self-similar faces could reflect imprinting on parental facial characteristics. Collectively, the findings of these partner similarity studies could be attributed to the development of weak preferences for family-like (i.e. self-similar) facial characteristics in life, although this is by no means the only possibility. Indeed an imprinting based explanation fails to explain the idiosyncrasies of the data generated, such as Zajonc et al.'s findings of a reported increase in partner similarity with age.

There are two studies that do indicate that parental characteristics, specifically opposite sex parental characteristics, can influence later choice of partner. Zei, Astofli, and Jayakar (1981) examined the tenth Italian census data to investigate the relationship between father's age and husband's age for a sample of over 350,000 women, finding small but consistently positive correlations between these variables indicating that the daughters of older men subsequently tend to choose older husbands. Using a questionnaire, Wilson and Barrett (1987) showed within a sample of 314 young British women there was a positive correlation of borderline significance between father's age at the time of the daughter's birth

and the daughter's partner's age. The positive relationship between father's and partner's age is consistent with the possibility of imprinting—daughters may imprint on the visual characteristics of their father (such as their age) as children and later find these characteristics preferable in their own partner. Although both studies are suggestive of sexual imprinting in humans, it should be noted that the correlations in both studies are very small and account for little of the variance in the data (the correlations in Zei et al.'s study are between 0.05 and 0.08; in Wilson's study the same correlation is 0.11).

To summarize then, sexual imprinting may play a role in human mate choice with the possibility of avoidance or attraction to particular characteristics of parents or siblings. Given the importance of imprinting in other species and several suggestive studies on humans, it would be interesting to explore the role of sexual imprinting in humans further.

Perceiver Attractiveness

Across the animal kingdom not all members of a given species engage in the same mating behavior. There may be a range of strategies which different individuals can employ based on the environmental conditions and their own condition. For example, Burley's work with Zebra finches has demonstrated that manipulating the attractiveness of individuals using colored leg bands changes the mating strategy they employ. Zebra finches mate monogamously (both in the wild and in captivity) with both males and females equally sharing parental duties. Giving males "attractive" leg bands results in those males engaging in polygynous mating, whereas those males given green bands (unattractive) continue to attempt to mate monogamously (Burley 1986). Presumably being of higher attractiveness allows a male to pursue a more favored strategy. Females made attractive with colored leg bands were found to spend less time carrying out parental duties than both those typical of their sex and unattractive females, but still had higher reproductive success. Mates of attractive females spent more time than those typical of their sex carrying out parental duties (Burley 1986). Again, higher attractiveness allowed females to adjust their strategy.

More recent work has indicated that condition may also influence an individual's preferences as well as their perceived attractiveness. For example, the red coloration of male sticklebacks decreases in intensity with parasite load and female sticklebacks demonstrate a preference for intense male coloration. Females in poor condition, however, show an unexpected preference for less intensely colored (i.e. poorer condition) males (Bakker et al. 1999).

Increases in attractiveness cause Zebra finches to employ different reproductive tactics and female condition, which is linked to attractiveness, influences the preferences in sticklebacks. Given these findings, it seems plausible to postulate that attractive humans may be able to adopt sexual strategies different to unattractive individuals. In a recent study we explored how women's self-rated attractiveness influenced male face preference. Using

faces manipulated with computer graphics we found that there is a relatively increased preference for masculinity and an increased preference for symmetry for women who regard themselves as attractive (Little et al., in review). This finding may reflect a condition-dependent mating strategy analogous to behaviors found in other species. It is unlikely that high quality males will invest equally in high and low quality females. This means that, despite equal heritable benefits to the females, there are differential benefits for high and low quality females selecting high quality males. A preference for males whose phenotype indicates reduced immune quality in low quality females could be adaptive, if the costs of reduced paternal investment outweigh the proposed heritable immunity benefits. It is also possible that women who are of "high mate value" (or who believe their mate value to be high) may be more likely to attract and retain a "high mate value" male (who possesses cues to heritable quality such as masculinity and symmetry) than a lower mate value female. The perceiver's attractiveness then is one important between-individual variable in judgments of facial attractiveness. It is also worth noting that it is a variable that can change due to accident, disease, or ageing—such changes may, as in Zebra finches, radically alter an individual's sexual strategies and impact on their preferences.

Within-individual Changes

As a final point, it also worth noting that as well as between-individual differences, there may also exist within-individual differences. Recent research into male facial attractiveness has revealed that female preferences for male faces may vary over the menstrual cycle, and with personal circumstances. Despite a preference for feminine faces most of the time, during the follicular phase of the menstrual cycle when conception is most likely, women prefer relatively masculine faces (Penton-Voak et al. 1999b; Penton-Voak & Perrett 2000). There were trends to suggest that personal circumstances also influence face preferences: women currently in a relationship preferred marginally more masculine faces overall, and tended to undergo a larger shift toward masculinity at peak fertility than women without partners (Penton-Voak et al. 1999b). Women using oral contraception showed no cyclic shifts.

A mixed strategy in female mate choice has been put forward as one explanation of this finding. Females may choose a long-term partner on the basis of cooperation and high parental care (indicated by a low masculine appearance), whilst occasionally pursuing extra-pair copulations with males with proposed markers of good genes for immunity (indicated by a relatively masculine appearance) when conception is most likely. These studies show that face preferences can change over even a short period of time (28 days is the standard menstrual cycle model). The suggestion of differences in preference that are linked to current partnerships—women in relationships may look for different qualities advertised in the faces of men than women not in relationships—again suggests definitions of attractiveness change for individuals over time.

Conclusions

Evolutionary theory has proved to be a powerful theoretical tool in exploring human facial attractiveness. Beauty increasingly appears to be ingrained in our biology: characteristics associated with evolutionarily relevant advantages for the choosing individual are perceived as attractive. People generally agree on what is and what is not attractive. Although evolutionary theories suggest that attractiveness judgments and partnership choices should reflect strategies that increase inclusive fitness (maximizing the number of descendants), this does not preclude different individuals following different strategies, and being attracted to different faces.

Individual differences in preferences can be consistent with evolutionary theory. While some aspects of face perception appear innate, other aspects are clearly influenced by experience; it seems unlikely that individuals are born with a representation of what a perfect mate looks like. Hard-wired propensities to attend to face-like stimuli early in life provide the opportunity to learn the details of facial appearance. Attractiveness judgments may reflect learned differences between males and females, familial characteristics and experience of social competition. Preferences for visual cues to different personalities, levels of masculinity and symmetry differ between individuals. For humans, as with other species (Burley 1986), there is no optimal strategy for mate choice and parenting that applies to all individuals. Indeed the range of personal circumstances (physical, environmental, social) will guarantee that what is a good or adequate strategy, and therefore what is attractive, will depend on the individual.

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