

# Investigating an imprinting-like phenomenon in humans Partners and opposite-sex parents have similar hair and eye colour

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## Abstract

Research has shown that human partners are more similar than expected by chance on a variety of traits. Studies examining hair and eye colour show some evidence of positive assortment. Positive assortment may reflect attraction to self-similar characteristics but is also consistent with attraction to parental traits. Here, we examine self-reported partner hair and eye colour and the influence that own and parental colour characteristics have on these variables. Parental characteristics were found to correlate positively with actual partner characteristics for both men and women. Regression analysis predicting partner characteristics from maternal and paternal traits (which controls for own traits) revealed the greater importance of the opposite-sex parent over the same-sex parent in predicting both hair and eye colour of actual partners. The findings may reflect an influence of parental colour characteristics on human partner choice. Attraction to opposite-sex parental characteristics is seen in a wide variety of animals where it is usually attributed to imprinting processes in infancy. Although the mechanism is unclear and not necessarily confined to infancy, the data reported here are consistent with a somewhat analogous process to imprinting occurring in humans. © 2002 Elsevier Science Inc. All rights reserved.

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## 1. Introduction

It is a widespread belief that human partners look alike. Positive assortative mating, mating with partners more similar than expected by chance, may result in more stable partnerships (e.g., Hill, Rubin, & Peplau, 1976) and may have genetic benefits (e.g., Rushton, 1988; Thiessen & Gregg, 1980), although costs of inbreeding may limit the amount of self-similarity that should be tolerated (e.g., Bateson, 1980). Research has shown positive assortment ( $r = .01-.35$ ) for many physical features (reviewed by Spuhler, 1968), and partners' faces resemble each other in ways that allow them to be identified as partners at levels above chance (Griffiths & Kunz, 1973; Hinsz, 1989; Zajonc, Adelman, Murphy, & Niendenthal, 1987).

If assortative mating for a variety of traits is genuine and is due to active mate choice, how do individuals come to be attracted to (or avoid) self-similar traits? While it is conceivable that animals recognise kin through similarity to their own phenotype (e.g., Petrie, Krupa, & Burke, 1999), there is considerably more evidence of effects of early exposure to parental characteristics on later mate preferences (e.g., Bateson, 1980; Fujita, Watanabe, Widarto, & Suryoboto, 1993; Kendrick, Hinton, & Atkins, 1998; Vos, 1995). Positive assortative mating with respect to heritable characteristics should result from such imprinting even if there is no direct response to one's own phenotype.

Negative imprinting has been proposed to play a role in human mate choice. Westermarck (1894) 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). In other animals, however, parental characteristics have generally been found to be attractive in potential mates later in life, not aversive.

The idea of attraction to the opposite-sex parent's form has been a popular one since Freud (1927) and several studies indeed suggest that parental characteristics may influence partner choice. For example, Wilson and Barrett (1987) and Zei, Astolifi, and Jayakar (1981) have both reported small but significant tendencies for the daughters of older men to choose older partners, but of course, this may reflect inheritance of maternal mate choice preferences rather than an influence of paternal appearance. Race is also an observable parental trait, and Jedlicka (1980) found that children of mixed race marriages were more likely to marry someone of the same race as their opposite-sex parent than someone of the same race as their same-sex parent; such choices were consistent across first and second marriages.

Preferences have also been shown to vary in relation to parental traits. Perrett et al. (2002) investigated whether parental age predicted preferences for faces of different ages, and found that both men and women born to old parents were less impressed by youth and more positive to age cues in opposite-sex faces than were individuals with young parents. Thus, visual attraction to parental traits is a plausible explanation for the findings of correlations between parent and partner characteristics.

Hair and eye colour are other parental characteristics that offspring may learn. Significant correlations are found between own and partner's hair and eye colour, indicating assortative mating for these colour traits (Pearson, 1907; Pearson & Lee, 1903; Schiller, 1932). Wilson

and Barrett (1987) found that women's partners were significantly more likely than chance to have the same eye colour as the women's fathers (and nonsignificantly more likely than chance to have the women's mothers' eye colour); they did not present an overall contingency table but a  $2 \times 2 \chi^2$  with parent eye colour (mother and father) and boyfriend eye colour (same or different to parent) produces a nonsignificant result ( $\chi^2 = 4.8$ ,  $df = 3$ ,  $P = .19$ ). This result, in conjunction with the failure to demonstrate a significantly better match to fathers than to mothers, calls into question the conclusion that the opposite-sex parent was especially influential, and even that parental eye colour was influential at all (especially since parents' eye colours predict own eye colour).

The current study aimed to find out whether own or parental colour traits are positively associated with partner colour traits. We examined own, partner, maternal, and paternal hair and eye colour characteristics in an attempt to establish whether there is assortative mating for hair and eye colour and to determine whether such a mating pattern potentially reflects choice of self-similar and/or parent-similar characteristics.

## 2. Methods

### 2.1. Participants

Volunteer participants ( $N = 697$ ) were recruited over the Internet. Use of such data is justified by studies showing that traditional and web-based questionnaires produce similar results (e.g., Buchanan & Smith, 1999; Miller et al., 2002), and that similar experimental effects are obtained in laboratory and web-based tests (Buchanan, 2000). Respondents were included if they claimed to be heterosexual, with bi-parental upbringing and have a current partner; 303 identified themselves as women (18–63 years old, mean age 33.2) and 394 as men (17–67 years old, mean age 34.6).

### 2.2. Procedure

Participants were asked about their own, ideal, partner, and family hair and eye colour characteristics, as well as a few other questions about themselves (sex, age, and ideal sex of partner). For each characteristic, participants used a pull-down menu to select the colour that best described the hair or eyes of the person being described (own, partner, maternal, and paternal). For eye colour, choices were black, dark brown, light brown, blue, blue green, green, and hazel. For hair colour, choices were black, very dark brown, dark brown, mid-brown, light brown, and blonde. Platinum blonde, light and dark red, and grey were also included as options but participants who described any person as having such colours were excluded from the analysis due to the small sample of platinum blonde, the difficulty of coding light and dark red, and the likelihood that grey did not represent parental hair colour during childhood). Participants were also asked if any of the reported persons had dyed hair, and those reporting dyed hair on any question were excluded from the analysis.

### 2.2.1. Analysis

For analysis, eye colour was coded continuously on an eight-point scale from dark to light (1 = black, 2 = dark brown, 3 = light brown, 4 = hazel, 5 = green, 6 = blue green, 7 = blue, 8 = grey); for the binary logistic regression, these were recoded as “dark” (codes 1–3) or “light” (codes 4–8). Hair colour was graded on a six-point scale from dark to light (1 = black, 2 = very dark brown, 3 = dark brown, 4 = mid-brown, 5 = light brown, 6 = blonde); for binary logistic regression, this was recoded as “dark” (codes 1–3) or “light” (codes 4–6).

For correlational analysis, we used the nonparametric Spearman’s rho. To determine the best predictor of partner colour traits, backward conditional binomial regression was carried out (removal criterion of .10) to predict ideal and actual partner hair and eye colour from own, maternal, and paternal colour. All probabilities are quoted as two-tailed.

Since effects of hair and eye colour could be nonindependent (e.g., mother’s eye colour could affect male partners’ hair and eye colours), backward conditional binary logistic regressions were carried out using all variables (own, mother’s, and father’s hair and eye colour) to predict either partner hair or partner eye colour; none of the eye colour variables were significant predictors of partner hair colour and none of the hair colour variables were significant predictors of partner eye colour at any step, for either male or female participants, so this analysis is not presented in detail.

## 3. Results

### 3.1. Females

For women, own hair colour was significantly positively related to maternal ( $r_s = .35$ ,  $P < .001$ ) and paternal ( $r_s = .32$ ,  $P < .001$ ), but not partner ( $r_s = .10$ ,  $P = .074$ ) hair colour. Paternal hair colour ( $r_s = .13$ ,  $P = .028$ ) was significantly related to partner hair colour whereas maternal hair colour ( $r_s = .08$ ,  $P = .17$ ) was not.

Own eye colour was significantly positively related to maternal ( $r_s = .51$ ,  $P < .001$ ), paternal ( $r_s = .50$ ,  $P < .001$ ), and partner eye colour ( $r_s = .14$ ,  $P = .016$ ). Paternal eye colour was significantly positively related to partner eye colour ( $r_s = .20$ ,  $P < .001$ ) whereas maternal

Table 1  
Correlations among hair colour characteristics for females/males

	Maternal	Paternal	Partner
Own	.35**/.55**	.32**/.39**	.10/.14*
Maternal	–	.03/.16**	.08/.15*
Paternal	–	–	.13*/.18**

\* Correlation is significant at the .05 level.

\*\* .01 level (two-tailed).

Table 2  
Correlations among eye colour characteristics for females/males

	Mother	Father	Partner
Own	.51**/.60**	.50**/.56**	.14*/.14*
Mother	–	.14*/.33**	.06/.27**
Father		–	.20**/.14*

\* Correlation is significant at the .05 level.

\*\* .01 level (two-tailed).

eye colour partner ( $r_s = .06$ ,  $P = .33$ ) was not. All intercorrelations can be seen in Tables 1 and 2.

In the first step of the binary logistic regression, own, maternal, and paternal hair colour were not overall significant predictors of partner hair colour ( $\chi^2 = 5.9$ ,  $df = 3$ ,  $P = .12$ , Nagelkerke  $R^2 = .026$ ) nor were any of the individual predictors (own,  $\beta = .06$ ,  $P = .78$ , maternal,  $\beta = .36$ ,  $P = .076$ , paternal,  $\beta = .38$ ,  $P = .075$ ).

Removing the worst predictor, own hair colour, created a model that was close to significant in predicting partner hair colour ( $\chi^2 = 5.9$ ,  $df = 2$ ,  $P = .053$ , Nagelkerke  $R^2 = .026$ ). Neither maternal ( $\beta = .40$ ,  $P = .089$ ) nor paternal ( $\beta = .47$ ,  $P = .058$ ) hair colour was a significant predictor of partner hair colour. Removal of variables stopped here as neither remaining variable met the removal criterion of .10 although it is worth noting here that the correlation between partner and paternal hair colour is significant (Table 1).

For eye colour, own, maternal, and paternal eye colour were not significant predictors of partners' eye colour ( $\chi^2 = 5.7$ ,  $df = 3$ ,  $P = .12$ , Nagelkerke  $R^2 = .025$ ). Within the individual predictors, paternal eye colour ( $\beta = .59$ ,  $P = .024$ ) significantly predicted partner eye colour whereas own ( $\beta = .11$ ,  $P = .71$ ) and maternal ( $\beta = .08$ ,  $P = .76$ ) eye colour did not.

In two steps, maternal and own eye colour were removed, leaving paternal eye colour as the single best predictor of partner eye colour ( $\chi^2 = 5.3$ ,  $df = 1$ ,  $P = .021$ , Nagelkerke  $R^2 = .023$ , paternal eye colour,  $\beta = .54$ ,  $P = .022$ ).

### 3.2. Males

For males, own hair colour was significantly positively related to maternal ( $r = .55$ ,  $P < .001$ ), paternal ( $r = .39$ ,  $P < .001$ ), and partner ( $r = .14$ ,  $P = .004$ ) hair colour. Both maternal ( $r = .15$ ,  $P = .002$ ) and paternal ( $r = .18$ ,  $P < .001$ ) hair colour were significantly positively related to partner hair colour.

Own eye colour was significantly positively related to maternal ( $r = .54$ ,  $P < .001$ ) and paternal ( $r = .46$ ,  $P < .001$ ) eye colour, but not partner eye colour ( $r = .07$ ,  $P = .19$ ). Maternal eye colour ( $r = .16$ ,  $P = .002$ ) was significantly positively related to partner eye colour whereas paternal eye colour ( $r = .03$ ,  $P = .51$ ) was not. All intercorrelations can be seen in Tables 1 and 2.

In the binary logistic regression, own, maternal, and paternal eye colour were significant predictors of partner hair colour ( $\chi^2 = 11.2$ ,  $df = 3$ ,  $P = .011$ , Nagelkerke  $R^2 = .037$ ). Within the individual predictors, maternal hair colour ( $\beta = .65$ ,  $P = .005$ ) was a significant predictor

of partner hair colour but own ( $\beta = .33, P = .17$ ) and paternal hair colour ( $\beta = .42, P = .063$ ) were not.

In two steps, own and paternal hair colour were removed, leaving maternal hair colour as the single best predictor of partner hair colour ( $\chi^2 = 6.9, df = 1, P = .009$ , Nagelkerke  $R^2 = .023$ , maternal hair colour,  $\beta = .53, P = .009$ ).

For males, own, maternal, and paternal eye colour were significant predictors of partner eye colour ( $\chi^2 = 1.0, df = 3, P = .019$ , Nagelkerke  $R^2 = .035$ ). Within the individual predictors, maternal eye colour ( $\beta = .75, P = .004$ ) was a significant predictor of partner eye colour whereas own ( $\beta = .13, P = .65$ ) and paternal ( $\beta = .03, P = .90$ ) eye colour were not.

In two steps, paternal and own eye colour were removed, leaving maternal eye colour as the single best predictor of partner eye colour ( $\chi^2 = 9.7, df = 1, P = .002$ , Nagelkerke  $R^2 = .034$ , maternal eye colour,  $\beta = .46, P = .002$ ).

#### 4. Discussion

The current study demonstrates that, from the first step of the binomial logistic regression controlling for own and same-sex parent eye colour, the single best predictor of both male and female partner eye colour is the opposite-sex parents' eye colour. Opposite-sex parents' hair colour is the single best predictor of males' partners' hair colour although maternal hair colour was also found to have a positive effect on female partner hair colour. These results indicate that individuals choose partners that resemble their opposite-sex parent over and above any effects of own or same-sex parent effects. We also found evidence of assortative mating for eye colour and hair colour. Significant correlations were found between males' eye and hair colour and their reported partners' eye and hair colour. Similar correlations were also found for females although the correlation for hair colour was not quite significant ( $P = .07$ ). Our analysis suggests that such assortative mating may be more consistent with choice of partners with parent-similar traits rather than self-similar traits.

It is possible that partner resemblance to opposite-sex parents may reflect biased recall of parent or partner traits. For example, remembering that your partner has dark eyes may bias you to recall your opposite-sex parent as having dark eyes. Biased recollection affecting only the colour traits of one parent appears unlikely. If women with dark-haired partners assume their father also has dark hair because both partner and father are male, the equivalent recollection that their mother, as a female, has light hair should be just as likely. If our results were due to bias in recollection about parents, we might expect same-sex parents to have a negative impact on partner colour traits due to a gender contrast effect and this was not found.

The finding of an impact of parental traits on mate choice in this study is consistent with previous findings (Jedlicka, 1980; Wilson & Barrett, 1987; Zei et al., 1981). An attraction to visible parental characteristics has been demonstrated in many nonhuman animals (Bateson, 1980; Fujita et al., 1993; Kendrick et al., 1998; Vos, 1995) and it is possible that attraction to parental hair and eye colour traits may reflect "imprinting-like" effects in humans. Note that because we are not specifying the developmental stage at

which learning of parent traits occurs, our use of the word “imprinting” is analogous to the term “social learning.”

Potentially, the finding that individuals are attracted to faces with some characteristics of their parents (age, Perrett et al., 2002) may help explain imprinting effects, although a visual preference for opposite-sex parental colour in partners is not the only potential mechanism. It is, however, well established that people generally respond positively to familiar stimuli (the mere exposure effect; Bornstein, 1989; Zajonc, 1968) and parental traits may be very salient familiar features. Individuals may choose partners who possess similar colour traits to their parents because they initially appear more familiar than prospective mates with different colour traits.

Attraction to parental characteristics may appear to conflict with Westermarck’s (1894) hypothesis that children develop a sexual aversion to individuals with whom they live closely in infancy and early childhood. The two phenomena, however, need not be in contradiction. Bateson (1980) has shown in quail that individuals may avoid the particular individuals close to them during childhood but still be attracted to their general characteristics. Individuals can be attracted to the general colour characteristics of their parents while still learning to avoid the actual parent as an inappropriate mate.

Valuing partners who display parental eye and hair colour does not necessarily indicate that such behaviour is adaptive. Attraction to parental hair and eye characteristics may be an epiphenomenal consequence of mechanisms for learning the visual characteristics of the parental species (which seems clearly adaptive) or simply a by-product of the way in which the visual system becomes attuned to familiar traits. It is worth noting that we find that offspring appear to be attracted to the opposite-sex parent’s traits (consistent with work on birds, e.g., Vos, 1995), which is suggestive that the underlying mechanism is not indiscriminate and therefore implies an adaptive function at some level.

Evidence for imprinting in humans is important, for despite a high degree of agreement across both individuals and cultures about what is and what is not attractive, present results indicate that there are individual differences in what people find attractive (also Little, Burt, Penton-Voak, & Perrett, 2001). Learning parental characteristics may explain some individual differences in opinion about which characteristics are attractive in a partner. Attraction to parental characteristics also has implications for assortative mating. Studies showing similarity between partners cannot assume that such similarity comes about due to self-similar preferences as similarity is also consistent with attraction to parent traits. For example, the similarity between the faces of married partners (e.g., Griffiths & Kunz, 1973; Hinsz, 1989; Zajonc et al., 1987) is consistent with imprinting-like effects and it is possible that imprinting on parents may contribute to the causes of assortative mating in humans for a variety of traits.

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