



Original Article

No relationship between intelligence and facial attractiveness in a large, genetically informative sample



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ABSTRACT

Theories in both evolutionary and social psychology suggest that a positive correlation should exist between facial attractiveness and general intelligence, and several empirical observations appear to corroborate this expectation. Using highly reliable measures of facial attractiveness and IQ in a large sample of identical and fraternal twins and their siblings, we found no evidence for a phenotypic correlation between these traits. Likewise, neither the genetic nor the environmental latent factor correlations were statistically significant. We supplemented our analyses of new data with a simple meta-analysis that found evidence of publication bias among past studies of the relationship between facial attractiveness and intelligence. In view of these results, we suggest that previously published reports may have overestimated the strength of the relationship and that the theoretical bases for the predicted attractiveness–intelligence correlation may need to be reconsidered.

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1. Introduction

Some evolutionary models predict that traits contributing to survival or reproductive success will tend to be positively correlated (Hansen, 2006; Rowe & Houle, 1996; but, see Falconer & Mackay, 1996; Lerner, 1954). Examples of such positive correlations have been observed in humans [IQ and sperm quality: Arden, Gottfredson, Miller, and Pierce (2009); IQ and height: Keller et al. (2013); birth rate, completed family size, and age at last childbirth: Kosova, Abney, and Ober (2010)], animals [energy storage and metabolic activity in *Drosophila melanogaster*: Clark (1990); body weight across environmental niches in *Alsophila pometaria*: Futuyma and Philippi (1987); activity metabolism and locomotor performance in *Thamnophilis sirtalis*: Garland (1988)], and plants [size and pest resistance in *Ipomoea purpurea*: Rausher and Simms (1989); life history and morphological traits in *Holcus lanatus*: Billington, Mortimer, and McNeilly (1988); life history and morphological traits in *Impatiens capensis*: Mitchell-Olds (1986)]. There are two basic types of explanation for why these correlations occur. One is that the conditions in the environment, such as pathogen levels or the availability of adequate nutrition, have similar effects on both of the

correlated traits (Møller, 1997). The other is that the phenotypic correlation is caused by a correlation between the effects of the alleles influencing the two traits (Falconer & Mackay, 1996).

Genetic correlations, in turn, can come about in two principal ways. One is pleiotropy, whereby a gene affects multiple phenotypic characters. Pleiotropy is a common property of genes (Falconer & Mackay, 1996) and is a proposed explanation for genetic correlations between a large number of medical (Flint & Mackay, 2009; Solovieff, Cotsapas, Lee, Purcell, & Smoller, 2013) and psychological (Kovas & Plomin, 2006; Lee et al., 2013) traits, many of which appear to be highly polygenic (e.g., Davies et al., 2011; Purcell, Wray, Stone, & International Schizophrenia Consortium, 2009; Stahl et al., 2012). Antagonistic pleiotropy, whereby alleles that improve one fitness-related trait deteriorate another fitness-related trait, can lead to stable genetic polymorphism and persistent negative genetic correlations between fitness-increasing traits. However, the conditions under which genetic polymorphism is maintained by antagonistic pleiotropy are restrictive (Hedrick, 1999; Prout, 2000), and most investigations in non-human animals have found positive rather than negative correlations between fitness-increasing traits (Roff, 1997). On the other hand, to the degree that the genetic variation in directionally selected traits is due to the aggregate effects of deleterious mutations across many loci (Houle, 1998), genetic correlations between fitness-increasing traits should be positive. Under this scenario, pleiotropic loci that affect two or more fitness-increasing traits should tend to harbor common alleles that are favored by selection and rare mutations that are selected against because they negatively affect both traits.

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Even when the traits are affected by non-overlapping sets of genes, a second possible cause of genetic correlations is assortative mating on two or more traits simultaneously, which can lead to non-random associations between alleles at different loci (i.e., gametic phase disequilibrium; Crow & Felsenstein, 1968). To the degree that overall attractiveness is a composite of multiple sexually selected traits, positive assortment between mates on overall attractiveness necessarily implies positive cross-trait correlations between traits positively related to attractiveness. When this occurs, individuals who inherit alleles that increase the sexual attractiveness of one trait from one parent will be more likely to inherit alleles that increase the sexual attractiveness of the other trait from the other parent, leading to positive genetic correlations between sexually selected traits when scaled such that scores increase with attractiveness.

Both intelligence (Miller, 2000) and facial attractiveness (Gangestad, Thornhill, & Yeo, 1994; Thornhill & Gangestad, 1999) have been hypothesized to be sexually selected traits related to fitness, perhaps because their large mutational target sizes (Davies et al., 2011) reveal a partner's load of deleterious mutations (Gangestad & Yeo, 1997; Keller, 2007; Miller, 2000). If so, then as described above, there are two basic explanations for why facial attractiveness and intelligence might be expected to be positively genetically correlated. First, because these traits are influenced by a large number of genes, there is likely to be some degree of overlap between them. While such overlap could lead to negative genetic correlations from antagonistic pleiotropy, the restrictive conditions under which antagonistic pleiotropy can maintain negative genetic correlations at equilibrium (Hedrick, 1999; Prout, 2000) suggest that a better expectation is that pleiotropic loci lead to positive genetic correlations via transiently polymorphic, recurrent deleterious mutations that reduce both intelligence and facial attractiveness. Second, given that people rate both facial attractiveness and intelligence as desirable in romantic and sexual partners (Buss & Barnes, 1986; Buss et al., 1990; Kenrick, Sadalla, Groth, & Trost, 1990), it is also possible that cross-trait assortative mating (intelligent people choosing more facially attractive mates, and vice-versa) produces statistical associations between alleles affecting the two traits. These two possible causes of genetic correlations are not mutually exclusive; for example, Keller et al. (2013) used an extended twin-family design that accounted for the genetic effects of assortative mating to demonstrate that both processes contributed roughly equally to the genetic correlation between human height and IQ.

Several social psychological theories also predict a correlation between intelligence and facial attractiveness. For instance, status generalization theory holds that visible characteristics affecting social status, including facial attractiveness, cause perceivers to generate matching expectations about other traits of the target (Jackson, Hunter, & Hodge, 1995)—for example, more attractive individuals are assumed to be more intellectually and socially competent, to have more integrity and compassion, and so on (Eagly, Ashmore, Makhijani, & Longo, 1991; Moore, Filippou, & Perrett, 2011). Although this theory primarily predicts correlations between visible status cues and perceived levels of internal characteristics, Jackson et al. (1995) argue that, due to the more positive evaluations attractive individuals receive in social and intellectual contexts, they may also receive more opportunities to develop intellectual competence than unattractive individuals. Moreover, attractive individuals may form self-concepts based on social feedback that include notions of superior intellectual ability, potentially motivating intellectual achievement (L. A. Jackson et al., 1995). Thus, both social psychological and evolutionary considerations seem to predict, a priori, a positive phenotypic correlation between intelligence and facial attractiveness.

1.1. Empirical findings

A survey of the published studies on intelligence and attractiveness is summarized in Table 1. The general pattern, identifiable in Jackson et al.'s (1995) and Langlois et al.'s (2000) meta-analyses, appears to be that a small-to-moderate correlation is found in children ($\bar{r} = .19$,

weighted by sample size), but the relationship diminishes with age ($\bar{r} = .02$, weighted by sample size). However, interpretation of these meta-analytic results is difficult, not only because meta-analyses are vulnerable to the “file drawer problem”, whereby null results are less likely to be published than positive ones (Borenstein, Hedges, Higgins, & Rothstein, 2011), but also because of inconsistencies in operational definitions of intelligence and attractiveness across included studies and because many of the included studies had design flaws (e.g., non-independence of intelligence and attractiveness ratings) that could have created biases in the results (Table 1).

Several empirical studies have tested the attractiveness–intelligence correlation since these meta-analyses were published. In contrast to the pattern noted above, Zebrowitz and Rhodes's (2004) found a moderate positive correlations in both children and adults, but only among individuals with below-median attractiveness levels; averaging together the correlations in high- and low-attractiveness groups likely would have resulted in effects more consistent with the earlier meta-analyses. Similarly, Denny (2008) showed that low intelligence may predict low attractiveness in a large sample of school children but that “[f]or much of the distribution of intelligence there is no significant relationship between being attractive and intelligence” (p. 618). Kanazawa (2011) analyzed two large samples of children and young adults, including the one from Denny (2008). Controlling for parental education and income, birth weight, age at puberty, and physical health reduced but did not eliminate the association he observed between physical attractiveness and general intelligence. A serious limitation of the Denny (2008) and Kanazawa (2011) studies is that the raters of attractiveness were familiar with targets' intelligence, leading to potential rater biases that may have artificially induced the correlation under investigation [e.g., see Moore et al. (2011) for a demonstration of an intelligence ‘halo’ effect on perceived attractiveness.] Most recently, Kleisner, Chvátalová, and Flegr (2014), using reliable, independently collected measures of intelligence and facial attractiveness, failed to find a statistically significant correlation in either male or female young adults. However, this study, like those of Zebrowitz and Rhodes (2004) and many studies included in Jackson et al.'s (1995) and Langlois et al.'s (2000) meta-analyses, utilized a very small sample, rendering its results somewhat inconclusive.

Finally, we observe that nine of 41 previously reported correlations (22%) were negative and that only 17 of 41 (41%) were statistically significant. If there truly is some level of positive correlation between intelligence and facial or physical attractiveness, both of these outcomes could reflect high sampling variance due to the small samples most past studies have employed (median $N = 83$; Table 1). Although the literature in general seems to affirm that a correlation exists (median $r = .09$; Table 1), the validity of any such meta-analytic result depends both on the individual included studies utilizing appropriate research methods and on the meta-analysis as a whole being free of biases, including publication bias.

1.2. Present study

The present study is the first to utilize highly reliable and independently collected measures of facial attractiveness and general intelligence in a sample much larger than most individual studies in the past have had access to. Importantly, our study also utilizes a genetically informative twin dataset, allowing us to partition the covariation between attractiveness and intelligence into its genetic and environmental components.

2. Methods

2.1. Overview

We combined data from two twin samples to test the hypothesis that facial attractiveness and intelligence are correlated. The first sample comprised participants ($n = 399$) enrolled in the Longitudinal Twin

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