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Cross-Trait Assortment for Intelligence and Physical Attractiveness in a Long-Term Mating Context

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We investigated cross-trait assortative mating for the traits of physical attractiveness and intelligence using data from the Wisconsin Longitudinal Study. It was hypothesized that more physically attractive individuals would have a spouse that was more intelligent, but that this association would be moderated by sex. Specifically, we predicted that more physically attractive women would have more intelligent husbands, but that a man's physical attractiveness would not predict his wife's intelligence. The results of correlation and regression analyses were consistent with these predictions, although the effect sizes were small. Additionally, we identified an interaction in which women's physical attractiveness was more strongly associated with their husbands' intelligence for more intelligent women than for less intelligent women. We conclude with suggestions for further research addressing cross-trait assortative mating for physical attractiveness and intelligence.

Public Significance Statement
Physically attractive women had more intelligent husbands. A man's physical attractiveness was not associated with his wife's intelligence. The results provide new information on cross-trait assortative mating.

Keywords: physical attractiveness, intelligence, sex differences, assortative mating

Although there may be an intrapersonal positive association between physical attractiveness and intelligence, the results are equivocal (Banks, Batchelor, & McDaniel, 2010; Denny,

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This research uses data from the Wisconsin Longitudinal Study (WLS) of the University of Wisconsin-Madison. Since 1991, the WLS has been supported principally by the National Institute on Aging (AG-9775, AG-21079, AG-033285, and AG-041868), with additional support from the Vilas Estate Trust, the National Science Foundation, the Spencer Foundation, and the Graduate School of the University of Wisconsin-Madison. Since 1992, data have been collected by the University of Wisconsin Survey Center. A public use file of data from the Wisconsin Longitudinal Study is available from the Wisconsin Longitudinal Study, University of Wisconsin-Madison, 1180 Observatory Drive, Madison, Wisconsin 53706 and at http://www.ssc.wisc.edu/wlsresearch/data/. The opinions expressed herein are those of the authors.

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2008; Kanazawa, 2011; Kanazawa & Kovar, 2004; Mitchem et al., 2015; Van Dogen, 2012). Nonetheless, it seems reasonable to expect such an association because both traits are highly valued in mates (e.g., Buss et al., 1990; Lippa, 2007). Given that (a) assortative mating, defined by Buss (1985) as "the coupling of individuals based on their similarity on one or more characteristic" (p. 47) is a well-established phenomenon, that (b) intelligent individuals tend to have intelligent mates (e.g., Escorial & Martin-Buro, 2012), and that (c) physically attractive individuals tend to have physically attractive mates (Feingold, 1988), we might expect cross-trait assortative mating (Buss & Barnes, 1986). That is, intelligence and physical attractiveness may both signal mate value, allowing the possessor of a high value in one trait (e.g., high intelligence) to trade for a mate possessing a high value in the other trait (e.g., physical attractiveness). Because intelligence and physical attractiveness are substantially heritable (Kanazawa & Kovar, 2004; McGovern, Neale, & Kendler, 1996; Polderman et al., 2015), the two traits likely exhibit genetic and, consequently, phenotypic intrapersonal correlations.

The possibility of cross-trait assortative mating is consistent with an implication of sexual strategies theory (Buss & Schmitt, 1993) that, although both men and women value intelligence and physical attractiveness in mates, the value of these traits is moderated by sex. Specifically, compared with women, men emphasize physical attractiveness more heavily as a fitness indicator when judging the value of potential mates. The importance of physical attractiveness and the sex difference related to its value are well established (Buss, 1989; Buss et al., 1990; Todosijević, Ljubinković, & Arančić, 2003). Buss and Shackelford (2008) referred to physical attractiveness as the "cardinal component of women's mate value" (p. 136).

That women, more than men, value intelligence in potential mates is less well established. Women may place greater emphasis on intelligence because it indicates the ability of a potential mate to acquire resources (Kanazawa & Kovar, 2004), which makes intelligence a valued trait, but less of a direct fitness indicator than physical attractiveness. Alternatively, intelligence may be a direct fitness indicator that is sexually selected (Miller, 2000). A man's level of education (a proxy for intelligence) correlates with the physical attractiveness of his wife. For example, Hamermesh and Biddle (1994) found that women who are below average in attractiveness are more often married to men with less education (in contrast, see Kanazawa, Hu, & Larere, 2018).

Buss and Shackelford (2008) observed that a woman's objectively assessed physical attractiveness was not correlated with the importance she placed on intelligence in a mate (rated from 0 = *unimportant* to 3 = *indispensable*), suggesting that women do not adjust the degree to which they value intelligence in a mate as a function of their own mate value. However, the importance of other mate characteristics, such as other "good genes" indicators (e.g., physical fitness), parenting skills (e.g., likes children), good partner indicators (e.g., loyal), and resource acquisition characteristics (e.g., good earning capacity) *did* increase with a woman's physical attractiveness (Buss & Shackelford, 2008).

Li, Bailey, Kenrick, and Linsenmeier (2002) provided participants with a budget from which they could allocate "mate dollars" to purchase traits in a hypothetical mate. Li et al. (2002) found that the number of dollars allocated to intelligence depended not only on participant sex, but also on the number of mate dollars provided. When provided a smaller budget, both men and women allocated a larger percentage of mate dollars to intelligence. When provided a larger budget, the percentage of mate dollars allocated to intelligence decreased for both sexes. Li et al. (2002) framed these results in terms of necessities and luxuries, with intelligence being a necessity, but after a minimum level of intelligence was purchased, additional intelligence (i.e., a luxury) was not a priority. Sex differences indicated that physical attractiveness is a greater priority or necessity for men, whereas status and the ability to acquire resources is a greater priority or necessity for women.

In sum, there is some theoretical and empirical support for the premise that intelligence and physical attractiveness might be positively correlated. However, in a recent review of the literature, Mitchem et al. (2015) found only a small positive correlation between facial attractiveness and intelligence in children. This correlation decreased with age and was negligible in adulthood. Additionally, Mitchem et al. (2015) analyzed data from two twin samples, one from the United States and one from Aus-

tralia, to conduct two genetically informed studies. In each study, they not only failed to find phenotypic associations between the two traits, but also obtained null results for the genetic correlations.

Rationale for the Current Study and Predictions

The current investigation represents an attempt to egress from directly testing the intrapersonal association between physical attractiveness and intelligence and instead tests a single premise undergirding the possibility of such an association (Kanazawa & Kovar, 2004). The premise is that there is cross-trait assortative mating for intelligence and physical attractiveness. The need for testing this premise was recognized by Mitchem et al. (2015), who noted that ". . . although people report that both facial attractiveness and general intelligence are desirable in mates (Buss et al., 1990; Kenrick, Groth, Trost, & Sadalla, 1993), there appear to be no empirical studies demonstrating cross-trait assortment involving facial attractiveness and intelligence in human couples" (p. 246). Additionally, following sexual strategies theory (Buss & Schmitt, 1993), we hypothesize that the pattern of cross-trait assortative mating will be moderated by sex such that a woman's physical attractiveness will be correlated with her husband's intelligence, but that a man's physical attractiveness will not be correlated with his wife's intelligence.

Method

Description of the Sample

Data from the Wisconsin Longitudinal Study (WLS) were analyzed to test the predictions. The WLS was initiated in 1957, with the last wave of data collection in 2011. The original sample included 10,317 Wisconsin high school seniors. Reflecting the demographics of the state, the sample is largely Caucasian (Herd, Carr, & Roan, 2014; Sewell, Hauser, Springer, & Hauser, 2003). For some participants, data were also collected from their spouse. The data for the current investigation reflect participant-estimated IQ and physical attractiveness in 1957, and spouse-estimated IQ in 1957.

For men, estimated IQ data are available for 4,991 participants, estimated IQ of their spouse is available for 1,363 participants, and rated attractiveness data are available for 4,018 participants. For women, estimated IQ data are available for 5,326 participants, estimated IQ of their spouse is available for 1,300 participants, and rated attractiveness data are available for 4,416 participants.

Measures

Intelligence. The WLS data file includes a "preferred measure of IQ" based on the participant's Henmon-Nelson test score. The Henmon-Nelson Test of Mental Ability is a 30-min test consisting of 90 items of increasing difficulty in spatial, verbal, and mathematical ability. Test administration was standardized across the state of Wisconsin during the first wave of data collection. Estimated IQ data are available for 4,991 participants. In 2003, WLS administrators began collecting data directly from the participant's spouse. The information allowed the administrators to check the Wisconsin state records for the spouse's Henmon-Nelson score. The reliability of the test is estimated to be high ($\alpha \approx .95$; e.g., Ganzach, 2016; Hansen, 1968; Harley, 1977) and scores on the Henmon-Nelson test scores exhibit a strong association with full IQ test (e.g., WAIS) scores (Kling, Davis, & Knost, 1978).

Physical attractiveness. Participant's 1957 yearbook photo was rated by six men and six women using a Likert-type scale from 1 (*not at all attractive*) to 11 (*extremely attractive*) in the years 2004 or 2008. The photos were in black and white and displayed the participant's full head, including hair. The raters were recruited from the Madison Senior Scholars program and were approximately the same age cohort (*M* age of raters = 78.5 years) as the WLS participants. The measure of physical attractiveness is the average of the ratings across raters. The reliability of the measure is estimated at $\alpha = .87$ (Hauser & Weir, 2010). Normed average coder ratings are available for 8,434 participants.

Results

Correlations between the participant's physical attractiveness, the participant's intelligence, and their spouse's intelligence are displayed in Table 1. For women, each of the correlations was significant, but for men the only significant correlation was between their intelligence and

Table 1
Intercorrelations Between Study Variables by Participant Sex

Variables	PA	PI	SI
Physical attractiveness (PA)	—	.03	−.03
Participant's intelligence (PI)	.11*	—	.11*
Spouse's intelligence (SI)	.11*	.16*	—

Note. Males above and females below the diagonal. N = 1,091–4,416.
* $p < .001$.

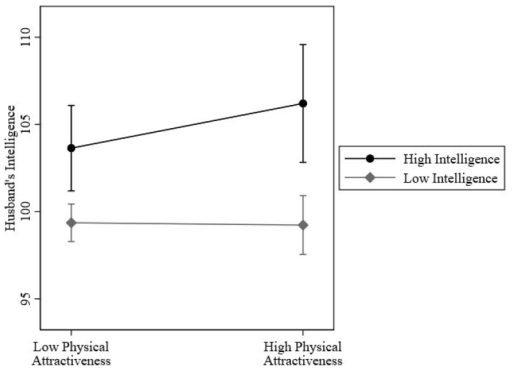

Figure 1. The interaction of female physical attractiveness and intelligence in the prediction of husband's intelligence. Note: "High" scores indicate 1 *SD* above the mean while "low" scores indicate 1 *SD* below the mean on the respective measure; postregression prediction estimates and 95% confidence intervals are displayed.

that of their spouse. Controlling for the age of marriage did not change the associations between physical attractiveness and spouse's estimated IQ. To test the prediction that the magnitude of the correlation between physical attractiveness and spouse's intelligence would be larger for women than for men, the magnitudes of the correlations were contrasted using Fisher's r to z transformation. The difference was significant, $z = 2.57$, $p < .01$.

Next, two hierarchical regression analyses were conducted, one for female participants and one for male participants.[1] In each analysis, the IQ of the participant's spouse was predicted. Participant's IQ and physical attractiveness was entered in Step 1 and the interaction term of the two variables was entered in Step 2. As displayed in Table 2, when predicting the IQ of a woman's spouse, a woman's physical attractiveness and IQ each accounted for unique variance. Additionally, the interaction term in Step 2 was statistically significant. A representation of this interaction is displayed in Figure 1, which shows that for more intelligent women, their physical attractiveness is positively associated with their husband's intelligence. This pattern is not apparent for less intelligent women. The hierarchical regression predicting the IQ of men's spouse yielded a single significant effect: a man's intelligence is positively associated with that of his wife. See Table 3 for the results.

Table 2
Hierarchical Regression Predicting Female Respondent's Husband's IQ

Variables	Step 1	Step 2
Participant's IQ	.15***	.15***
Physical attractiveness	.09**	.08**
Participant's IQ × Physical Attractiveness		.06*
ΔR^2	.03***	.003*

* $p < .05$. ** $p < .01$. *** $p < .001$.

Discussion

Evidence for the covariance of intelligence and physical attractiveness is mixed (e.g., Banks et al., 2010; Van Dogen, 2012). The current study examined a single premise underlying the possibility of physical attractiveness/intelligence covariation: cross-trait assortative mating for intelligence and physical attractiveness. Considering this possibility in the context of sexual strategies theory (Buss & Schmitt, 1993) led to the prediction that a woman's physical attractiveness would predict her husband's intelligence, but a man's physical attractiveness would not predict his wife's intelligence. The results of correlational and regression analyses supported these predictions. The correlation between physical attractiveness and spousal estimated IQ was only significant for women, and the association between these two variables was significantly larger in women than for men.

Additionally, hierarchical regression analyses revealed a significant interaction in which physical attractiveness was more strongly associated with a husband's intelligence in more intelligent

[1] Sensitivity analyses indicated that there was no indication of collinearity (all VIF scores were less than 1.01) and that the model residuals were normally distributed.

Table 3
Hierarchical Regression Predicting Male Respondent's Wife's IQ

Variables	Step 1	Step 2
Participant's IQ	.11***	.11***
Physical attractiveness	−.04	−.04
Participant's IQ × Physical Attractiveness		−.02
ΔR^2	.01**	.00

** $p < .01$. *** $p < .001$.

women. This result was not predicted and, therefore, requires additional interpretation. We speculate that women are motivated to secure a mate with equal or higher intelligence and, therefore, that more intelligent women have a smaller pool of potential mates. The motivation for a mate of higher intelligence would be similar to women's preference for a mate who is taller relative to her own height (e.g., Stulp, Buunk, & Pollet, 2013). A potential explanation may be that given that a woman's mate value (more than a man's mate value) is a function of her physical attractiveness, more intelligent women who are also more physically attractive will be better able to secure more intelligent husbands.

Limitations and Future Research

The current study contains several limitations. These limitations include issues of measurement (e.g., ratings of a single black and white "headshot" photo; use of a single estimated IQ score) and the varying quality, specificity, and availability of several variables in the WLS. Given that overall physical attractiveness is a composite of multiple facets, it may useful to deconstruct physical attractiveness to examine how the more molecular facets are individually associated with mate characteristics. The same may be said in reference to the measure of intelligence: We were unable to examine if it was a particular aspect of intelligence (e.g., verbal ability) that was at the root of the effects or whether, for instance, the effects were at the level of *g* (Prokosch, Yeo, & Miller, 2005).

Importantly, although it might also be predicted that more intelligent men would secure more physically attractive mates and that this would not hold for women, the WLS does not include variables that allow for this prediction to be tested. As these results were obtained from a sample of married couples, it is also unknown the degree to which similar trends would be found with a different population or in a short-term mating context. Future research may be able to address some of the deficiencies.

Lastly, the application of sexual strategies theory to assortative mating may produce other hypotheses concerning cross-trait assortative mating, with one sex using traits valued by the opposite sex to obtain traits in a mate that they themselves value. Yet how this manifests may be surprising. Two recent studies (Kanazawa et al., 2018; Kanazawa & Still, 2018) showed that associations of physical attractiveness with important outcome variables are not simple (e.g., linear). Kanazawa, Hu, and Larere (2018) found that very unattractive women had husbands with higher earnings than women judged to be simply unattractive or average. This trend did not hold when the sexes were reversed. In conclusion, although the current results elucidate how women's mate choices might drive cross-trait assortative mating for physical attractiveness and intelligence, the effect sizes suggest that this effect alone would produce only a slight intrapersonal correlation between physical attractiveness and intelligence. However, there are other sources of possible trait covariance which warrant examination.

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