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Title: Assortative Mating and the Evolution of Human Trait Covariation

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Abstract:

Human traits covary. For instance, a person's standing height predicts their intelligence test scores; and the Big Five personality dimensions correlate under a "general factor of personality." Trait covariation poses a puzzle for evolutionary theories of mind and behavior and myriad hypotheses attempt to explain specific patterns of trait correlation, including shared condition-dependence, life history strategies, and facultative calibration. Here we show that one process, assortative mating for mate value, generates a signature pattern of covariation. We use agent-based models to demonstrate that assortative mating causes the evolution of a positive manifold of desirability, *d*, such that an individual who is desirable as a mate along any one dimension tends to be desirable across all other dimensions. Further, we use a large cross-cultural sample with n = 14,478 from 45 countries around the world to show that this *d*-factor emerges in human samples, is a cross-cultural universal, and is patterned in a way uniquely consistent with an evolutionary history of assortative mating. Our results suggest that assortative mating can explain the evolution of a broad structure of human trait covariation.

Significance Statement:

Mate choice lies close to reproduction, the engine of biological evolution. Patterns of mate choice consequently have power to direct the course of evolution. Here we provide evidence that one pattern of human mate choice—the tendency for mates to be similar in overall desirability—caused the evolution of a structure of correlations that we call the *d* factor. Because of this *d* factor, individuals who are desirable as a mate on one trait dimension tend to be desirable across all other dimensions as well. We combine computer simulations with analysis of a large cross-cultural sample to show that this pattern of trait correlation appears across cultures and is uniquely consistent with a human evolutionary history of assortative mating.

Introduction

Humans mate with self-similar partners across a wide array of dimensions. For example, mated partners tend to be improbably similar to one another in terms of education (1), intelligence (2), and physical attractiveness (3). One critical dimension of assortative mating is that for “mate value,” or overall desirability as a mating partner (4). To the extent that all individuals vie for the most consensually desirable partners on the mating market, those highest in mate value tend to have the greatest power of choice and use that power to select high mate value partners (5). Mated partners consequently tend to have correlated mate values (6).

Such assortative mating for mate value creates “cross-character assortment”: correlations between mated partners on otherwise independent traits (7). Consider a scenario in which humans mate assortatively for mate value and mate value is determined by just two preferred characteristics: kindness and intelligence. Here, all else equal, a kind person will be higher in mate value and will tend to attract higher mate value partners. These high mate value partners, relative to randomly chosen partners, are disproportionately likely to be intelligent. Assortative mating for mate value will therefore pair kind people with intelligent partners at above-chance rates. Such cross-character assortment does occur in married couples for specific traits; for instance, physically attractive women tend to marry wealthier men (8).

When mated partners produce offspring, this pattern of mate choice translates into a pattern of inheritance. Offspring inherit correlated traits from their assortatively mated parents because human individual differences tend to be heritable (9). A kind person mated to an intelligent partner will be relatively likely to produce offspring who are both kind and intelligent. This inheritance of correlated traits, iterated across generations, can cause the evolution of trait covariation: traits that are initially distributed randomly with respect to one another in the population gradually become correlated across generations. Consistent with this rationale, human couples do in fact show evidence of assortative mating at both the phenotypic and genetic level (10, 11). Further, trait covariances are frequently mediated by genetic factors, including both pleiotropic and correlated genes (12, 13). Finally, the genetic correlation between height and intelligence appears to emerge due to contributions from both pleiotropic genes and from covariance in underlying genes due to cross-character assortative mating (13).

Beyond height and intelligence, a large prior literature explores, either directly or indirectly, correlations between desirable traits (see Table S1 for a non-comprehensive review). Findings from this literature are mixed, with some trait correlations proving robust and others, such as between physical attractiveness and intelligence, finding only infrequent support. However, this literature is also marked by relative homogeneity in participant populations and great heterogeneity in sample sizes, measures, and methods. Furthermore, studies in this literature very rarely test assortative mating as a potential source of trait covariation. In light of this, in the current research we sought to provide three novel contributions.

First, in conjunction with computational models of assortative mating, we analyze a new sample of real-world data that is both large and includes participants from around the world. Second, unlike the prior literature, we do not focus on covariation in absolute trait levels but on covariation in desirability—that is, in deviation of trait value from the opposite sex's preferences. This is a subtle but important distinction. To the degree that one sex's ideal preference is not maximal on a trait dimension, mate value will be nonlinear with respect to that trait dimension. For example, people most strongly express a preference for mates in the 90th percentile of intelligence, rather than the 99th (14). This preferences makes mate value a non-linear function of intelligence: all else equal, high mate value people will be relatively high on intelligence, whereas moderate mate value people could be close to either the 99th or 75th percentile on intelligence. The trait covariation created by assortative mating for mate value will consequently be nonlinear with respect to these trait dimensions as well. The effects of assortative mating will therefore be clearest when analyzing covariation in terms in desirability, rather than in terms of absolute trait level.

Third and finally, while previous work has explored assortative mating's power to construct covariation between two trait dimensions, assortative mating actually predicts the evolution of a broader covariance structure among preferred traits (7). Humans express mate preferences for a wide array of traits (15) and these preferences predict real mate choices (16). When multiple preferences contribute to mate selection, assortative mating for mate value has the potential to produce intercorrelation in desirability across all preferred characteristics. More than just bivariate correlations, what should emerge from assortative mating for mate value across generations is a positive manifold of desirability, which we call *d*, organized around mate value such that a person who is desirable as a mate along any one preferred dimension tends also to be desirable across all other dimensions.

Here we test this hypothesis using agent-based models and a large cross-cultural sample. We first use a series of evolutionary agent-based models to demonstrate that assortative mating causes the evolution of a general factor of desirability, *d*, within a set of initially uncorrelated traits and to identify a pattern of results diagnostic of this process. Next, we compare data from these simulated populations to a sample of n = 14,487 people from 45 countries around the world. We use this cross-cultural sample to show that this *d*-factor does in fact emerge across human populations and that it is patterned precisely as predicted by our evolutionary agent-based models, suggesting human desirability covariation is partially explained by an evolutionary history of assortative mating.

Results

First, we examine the results of a series of evolutionary agent-based models demonstrating the evolution of desirability covariation in simulated mating markets. Agents within these simulations possess a set of 10 traits, drawn initially from random normal distributions, and 10 corresponding mate preferences. Agents compute attraction to one another as mates by computing the Euclidean distance between their own preferences and each potential mate's traits. Agents next select each other as mates based on these attractions and reproduce with their chosen partners. Agents with trait values closer to a randomly determined optimum value have more "energy." Agents with more energy produce more offspring, introducing a selection pressure favoring agents with trait values—and preferences for trait values—closer to optimum. Offspring inherit traits and preferences from their parents and start the life cycle anew by calculating their attraction to one another. This process repeats for 1,000 generations of simulated evolution. Agents within these simulations mate assortatively for overall "mate value," the extent to which their traits match the opposite sex's mate preferences overall. Across model runs, the correlation between partner mate values in the final generation of the model was r_{mean} = .93, 95% CI [.93, .94], where mate value was calculated as the Euclidean distance between each agent's trait values and the average value preferred for each trait by the opposite sex. This agent-based model therefore allowed us to assess whether an evolutionary history of assortative mating for mate value would construct a *d*-factor from initially random traits such that agents who are more desirable along any given trait dimension tend to be desirable across all others as well.

To determine whether agent populations evolved a *d*-factor, we computed the "desirability" of each agent on each trait dimension as the absolute deviation between that agent's trait value and the average of all opposite-sex agents' preferred value for that trait. These desirability values were scaled such that a higher desirability value indicated the agent was closer to the opposite sex's preferred value on that trait. We then subjected these trait-level desirability values to principal component analysis, extracting just the first principal component at each generation. In the final generation, we additionally saved each agent's factor score on the *d*-factor and the loading of each trait onto this *d*-factor.

Figure 1 shows that the agent populations in the primary agent-based model do in fact evolve a *d*-factor from initially uncorrelated traits. In the first generation of evolution, when agent traits were uncorrelated, the *d*-factor explained just M = 15.36%, 95% CI [15.22%, 15.50%] of the variance in trait-level desirability across model runs. However, after 1,000 generations of assortative mating, this *d*-factor increased in size to explain M = 40.58%, 95% CI [39.04%, 42.12%] of the variance in trait-level desirability. Although agent traits were initially distributed randomly, by the final generation of the agent-based model, a *d*-factor evolved such that agents that were desirable as a mate on any given trait dimension were likely to be desirable across all other trait dimensions.

Evidence that assortative mating produced this *d*-factor comes from two additional effects (Figure 1). First, if the *d*-factor represents a general dimension of desirability as a mate, agent *d*-factor scores should strongly correlate with their overall mate value. Indeed, a multilevel model with agents nested within model runs shows that, in the final generation, agent mate values strongly predict their factor scores on the *d*-factor across model runs, $\beta = .98$, $SE = 0.002$, $p < .001$.

Second, if the *d*-factor evolves because of assortative mating's ability to create cross-character assortment, traits that generate stronger cross-character assortment should tend to load more strongly onto the *d*-factor. To test this prediction, we calculated the cross-character assortment generated by each trait dimension as the average correlation between desirability on that dimension and partner desirability across each of the other nine trait dimensions. We then used each trait's cross-character assortment estimate to predict its factor loading onto the *d*-factor. Indeed, in the final generation of the agent-based model, traits that generated stronger cross-character assortment tended to load more strongly onto the *d*-factor across model runs, β = 1.14, *SE* = 0.03, $p < .001$. That is, more than merely correlating with one another, trait-level desirabilities correlate in a systematic way: each trait dimension's loading onto the *d*-factor is proportional to its actual involvement in cross-character assortative mating.

Precisely the same pattern of effects emerges in all 45 countries of the human cross-cultural sample (Figure 2). We calculated the desirability of all participants in this sample in the same way as for the agent-based models: the absolute deviation between each participant's trait value and the opposite sex's average preference value. Consistent with prior research (e.g. 14), participants on average expressed high but not maximal preferences on each of the five dimensions; the average preference value across traits and across participants was *M* = 5.85 (*SD* = 1.12) out of a maximum of 7. Accordingly, trait-level desirabilities were strongly but imperfectly correlated with absolute trait values; Table S1 presents the correlations between absolute trait values and desirabilities for both males and females across countries. Participant mate values were calculated as the scaled Euclidean distance between participant traits and opposite-sex preferences.

We estimated the *d*-factor separately for each country by extracting the first principle component from participant trait-level desirabilities in that country. Across all countries, this *d*-factor explained r^2_{mean} = 42.33%, 95% CI [40.15%, 44.51%] of the variance in trait-level desirability. As in the primary agent-based model, participants who were more desirable as a mate along any one preference dimension were more likely to be desirable across all preference dimensions.

A multilevel model predicting participant factor score from overall mate value, with participants nested within country, showed that, as in the primary agent-based model, participant mate value nearly perfectly predicted *d*-factor scores, $\beta = 0.99$, $SE = 0.02$, $p < .001$. Finally, a multilevel model predicting *d*-factor loading from cross-character assortment found a significant relationship, $\beta = .35$, $SE = .05$, $p < .001$, such that, across countries, traits that generated more cross-character assortment also loaded more strongly onto *d*. This means that desirability dimensions are not only correlated, but that they show a systematic pattern of covariance: in human data, just as in agent-based models of evolution under assortative mating, preferred trait dimensions load onto the *d*-factor to the degree that they are actually involved in cross-character assortative mating.

Several further analyses establish that this pattern of results is robust and diagnostic of an evolutionary history of assortative mating (see supplementary information). First, the pattern of results observed in the primary agent-based model is robust to higher mutation rates and to lower levels of assumed trait heritability. Second, the pattern of results observed in the primary agent-based model and the cross-cultural human sample are diagnostic in that they do not emerge in agent-based models where mate choice is not assortative for mate value. Third, trait covariation could alternatively emerge because different traits are manifestations of a common underlying condition variable (17, 18). However, the pattern of results observed in the primary agent-based model and across countries does not emerge in a simulation in which agent traits are manifestations of an underlying condition factor and mate choice is not assortative for mate value.

Two further results suggest this pattern of effects is specifically explained by assortative mating and is not a mathematical inevitability or a byproduct of background trait covariation. First, it is possible that the *d*-factor and mate value relate simply because they are both calculated based on deviations between an individual's traits and the opposite sex's preferences. However, whereas mate value is directly the deviation between a person's traits and the opposite sex's preferences, the *d*-factor is a structure of covariances between deviations across dimensions. Any relationship between mate value and the *d*-factor thus depends on the existence of such a pattern of covariances. Indeed, the pattern of effects observed across countries does not emerge when mate value and the *d*-factor are calculated based on scrambled participant traits that do not share the raw data's correlational structure. This shows that a *d*-factor is not inevitable, but rather depends on the particular covariance structure produced by assortative mating. Second, the *d*-factor could be a byproduct of some other source of covariation with no intrinsic connection to mate value. However, the pattern of results observed in the cross-cultural sample and primary agent based model do not emerge when mate value and *d* are computed based on deviations from random values rather than from the opposite sex's mate preferences. This demonstrates that the *d*-factor is specifically organized around the opposite sex's mate preferences and is not simply a byproduct of independent trait covariation.

Finally, this pattern of results could plausibly emerge due to participant self-report biases. For instance, participants who rate themselves more desirably on any one dimension could be more likely to rate themselves and their partner desirably across all dimensions due to positive illusions or other self-report rating biases (19, 20). However, the *d*-factor and the diagnostic pattern of results still emerge in two smaller samples in which participant trait ratings are not derived from participant self-reports.

Discussion

These results document a pattern of desirability covariation, *d*, that emerges across 45 countries such that a person who is desirable as a mate on any one trait dimension is more likely to be desirable as a mate across all other trait dimensions. Scores on the *d*-factor are nearly perfectly correlated with individual mate value. Finally, more than merely correlating with one another, desirability dimensions load onto this *d*-factor to the degree that they actually generate cross-character assortment. This pattern of results is precisely the same pattern that emerges in agent-based models of evolution under assortative mating but that does not emerge in models without assortative mating. Overall, this suggests that an evolutionary history of assortative mating has produced a specific pattern of desirability covariation in humans.

While promising, this research does have limitations and leaves open some important future directions. First, although we do find evidence of a *d*-factor consistent with an evolutionary history of assortative mating, assortative mating is also clearly not explaining all of the trait covariation in our data. This can be seen, for instance, in the fact that the correlation between *d*-factor loading and cross-character assortment is much weaker in the cross-cultural sample than it is in the agent-based models, indicating other factors are influencing the degree of trait covariation in our data. These other factors likely include measurement variance, condition-dependence processes, facultative calibration, and even direct effects between traits—for instance, intelligence likely directly affects financial prospects by influencing occupational success. Teasing apart the relative contributions of assortative mating and these other sources of observed covariation is a clear next step for future research.

A second important future direction is resolving the mixed findings in this broader research area. For instance, although in our samples physical attractiveness, intelligence, and health load onto the *d*-factor in theoretically consistent ways, other studies have failed to find correlations between these traits (e.g. 21, 22). These inconsistencies must be explained. One obvious candidate explanation is difference in measurement. For example, prior studies finding null correlations between physical attractiveness and intelligence have often used standardized intelligence tests whereas our samples exclusively used rated intelligence. It is possible that these measures produce different results because they tap different constructs. For instance, rated intelligence measures might be more likely to show covariance patterns consistent with assortative mating because they more closely tap the folk concept of intelligence that actually drives mate choice. After all, people select mates on the basis of their lay perceptions, and not on the basis of standardized intelligence exams. However, this does open a clear question for future research: if the folk concept of intelligence does not tightly map onto *g*, what precisely does it track? And of course, although the pattern of results found in the primary agent-based models are mirrored in all of our human samples, across self-reports, partner-reports, third-party reports, and combinations therein, it is impossible to completely rule out rater bias as an alternative explanation for our results. Stronger evidence for the existence of a *d*-factor must come from future research exploring desirability covariation independent of subjective ratings entirely.

Despite these limitations, the universality and patterning of the *d*-factor in our cross-cultural samples resemble a fingerprint of assortative mating on the evolution of human trait distributions. Previous work has documented the organizing effects of mate choice between specific preferred trait dimensions (13). Our results show that these patterns of desirability covariation emerge not merely between specific traits but rather across all preferred trait dimensions and that these patterns of trait covariation emerge across cultures from around the world. Assortative mating appears to have shaped patterns of inheritance throughout human evolution such that mate value is not distributed randomly across individuals; rather, desired traits covary around an underlying dimension of mate value. This fact contributes to explaining the existence of human trait covariation across domains and highlights the importance of mate choice in broadly understanding human evolution.

Materials and Methods

Agent-Based Model

We constructed and analyzed an evolutionary agent-based model of a mating market. The primary model generated 200 agents at the start of each model run. Each agent possessed 10 traits, initially drawn from random normal distributions centered on $M = 4$ with $SD = 2$. Agents also had 10 corresponding mate preferences; preferences, like traits, were initially drawn from random normal distributions centered on $M = 4$ with $SD = 2$. Each agent was additionally assigned an energy value based on the value of their traits. At the start of each model run, the model selected a random value as optimal for each trait dimension. Each agent earned energy proportional to the absolute deviation between their trait value and optimum value for that trait dimension such that agents who were closer to the optimum value across all traits had more energy. These energy values were used to control reproduction and introduce natural selection into the model. Finally, all agents had a sex: half of all agents were randomly assigned to be female and the remaining half were male.

After initialization, agents followed a life cycle in which they computed how attracted they were to one another, selected each other as mates based on these attractions, reproduced with their chosen mates, and then died. This life cycle was repeated for 1,000 generations of evolution.

Attraction. In the first phase of the life cycle, agents computed how attracted they were to one another based on their mate preferences. Each agent computed their attraction to all opposite-sex agents. Attraction was calculated as the Euclidean distance between the agent's preference vector and each potential mate's trait vector. These distances were then scaled and transformed such that a value of 10 indicated that the potential mate perfectly matched the agent's preferences, whereas a value of 0 indicated that the potential mate was the worst possible fit to the agent's preferences. This attraction algorithm has shown to be a good model of the algorithm used by human mate choice psychology (23).

Mate selection. The attraction calculation phase produced two matrices: one matrix containing how attractive each male agent found all female agents and another containing how attractive each female agent found all male agents. In the next phase of the life cycle, the model multiplied these attraction matrices together to produce the mutual attraction matrix. Each cell of this matrix represented how mutually attracted all possible agent couples would be. The model next paired the most mutually attracted possible couple and then removed this couple from the mutual attraction matrix. This pairing process iterated until all possible couples were formed.

Reproduction. Agents next reproduced with their chosen partner. Agent couples reproduced in proportion to the sum of their energy values. In this way, agents who had trait values closer to optimum—and mate preferences for these trait values—were more likely to reproduce each generation. Energy values were scaled prior to reproduction such that highest energy couple in each generation had 10% greater reproductive success on average than the lowest energy couple, yielding a moderate and realistic selection pressure in favor of optimum traits and preferences (24). Each offspring inherited each of their preference and trait values randomly from either parent. A small amount of random normal noise ($M = 0$, $SD = .006$), equivalent to .1% of the total trait range, was added to each inherited trait to simulate mutation. This is intended to simulate the cumulative effects of many, small-impact mutations (e.g. see (25)). Half of all offspring were randomly assigned to be female; the other half were randomly assigned to be male. The number of offspring produced each generation was equal to the starting population size.

Death. After reproduction, all agents of the parent generation died. Offspring then began the life cycle anew in the next generation. After 1,000 generations of evolution, the model retained the final generation of parent couples. The result for each model run was a final population of $n = 200$ that represented the results of evolution under conditions of assortative mating.

Cross-cultural data

Participants. Participants in the cross-cultural sample were $n = 14,487$ individuals (7,961 female) from 45 different countries from all inhabited continents around the world. Participants in each study site were recruited from two sources: roughly half of all participants were recruited from university populations and the remaining half were recruited from community samples. Not all study sites kept records of participant sample source; however, among those sites with records ($n = 6,637$), 47.14% ($n = 3,129$) of participants came from community samples. All participant data was collected in person because online samples tend to be less representative of populations in developing countries (26). Participants were $M = 28.79$

years old (*SD* = 10.64) and ages ranged from 18 to 91 (*Mdn* = 25). Most participants (*n* = 9,236, 63.75%) reported being in an ongoing, committed, romantic relationship. Of these, 49.26% reported being in a dating relationship, 12.59% were engaged, and 38.14% were married. This study was approved by the University of Texas at Austin Institutional Review Board and by the equivalent at each researcher's home university.

Measures. All participants reported their mate preferences in an ideal long-term mate, described as a committed, romantic partner, using a 5-item mate preference instrument. This instrument contained five 7-point bipolar adjective scales on which participants rated their ideal partner's standing on five separate traits: intelligence, kindness, health, physical attractiveness, and financial prospects. Each trait was rated between two extremes, for instance, from 1 representing "very unkind" to 7 representing "very kind." Participants additionally used the same rating scales to describe their own standing on each of these five traits and to rate their actual long-term partner, if they had one. This mate preference instrument was translated into local languages and back-translated by researchers at each study site.

Data analysis

Data analysis proceeded in several parallel stages for both the agent-based models and the cross-cultural data. First, within each country and each model run, we calculated the average preferences of all males and the average preferences of all females. These preferences were used to compute two values within country and within model run. We first calculated the overall mate value of each agent, each participant, and their partners as the Euclidean distance between that individual's traits and the average preferences of the individual's opposite sex. This mate value estimate is a single summary value that reflects the degree to which each person or agent embodies the preferences of the opposite sex across all dimensions. These distances were scaled such that a value of 10 meant the individual perfectly matched the opposite sex's average preferences and a value of 0 meant the individual provided the worst possible match to the opposite sex's preferences. Prior studies have found that these Euclidean mate values predict both desirability as a mate and power of choice on the mating market (23). For plotting purposes, agent mate values were standardized to a common scale within model runs before producing figures to control for variation in population mate values across model runs.

Second, we used average preferences to calculate each agent and each participant's "desirability" on each trait dimension. Desirabilities were calculated as the absolute difference between the individual's trait value for each dimension and the opposite sex's average preference value for that dimension; desirability values were re-scaled such that higher values indicated a closer fit to the opposite sex's preferences. Rather than a single summary variable as for mate value, this yields a vector of values for each agent or participant, with each value reflecting the degree to which that agent or participant matches the opposite sex's mate preference on that specific trait dimension.

Next, we subjected these desirability scores to principal component analysis. Principal component analyses were run separately for each run of the agent-based model and for each country within the cross-cultural sample. Male and female desirability scores were additionally analyzed separately because men and women have different mate preferences (15). Each principal component analysis extracted a single principle component, the *d*-factor, from trait-level desirabilities. From these principal component analyses, we saved the total variance in trait-level desirability explained by this *d*-factor (averaged across males and females), the loadings of each desirability dimension onto this *d*-factor, and each participant or each agent's factor score.

All data, model script, and analysis script are available on the Open Science Framework (https://osf.io/6g4pq/?view_only=cc6d7e1f76a3474d8c917c544acc1033).

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Figure Legends

Figure 1. Results from the primary agent-based model. Agents within this simulation evolve a *d*-factor that explains a moderate portion of trait variation (a). Scores on this *d*-factor strongly predict agent mate value (b). Traits that more strongly predict partner mate value load more strongly onto the *d*-factor (c). Dots represent individual observations; colored lines represent trend lines for individual model runs; black lines represent overall trends across model runs. Different colors correspond to observations from different model runs.

Figure 2. Results from the human cross-cultural sample. Across countries, the *d*-factor explains a moderate amount of variance in trait-level desirability (a). Scores on the *d*-factor are strongly correlated with participant mate value across countries (b). Desirability dimensions that more strongly predict partner mate value tend to load more strongly onto the *d*-factor across countries (c). Dots represent individual observations; colored lines represent trends from individual countries; black lines represent average trends across countries. Different colors correspond to observations from different countries.

Figures

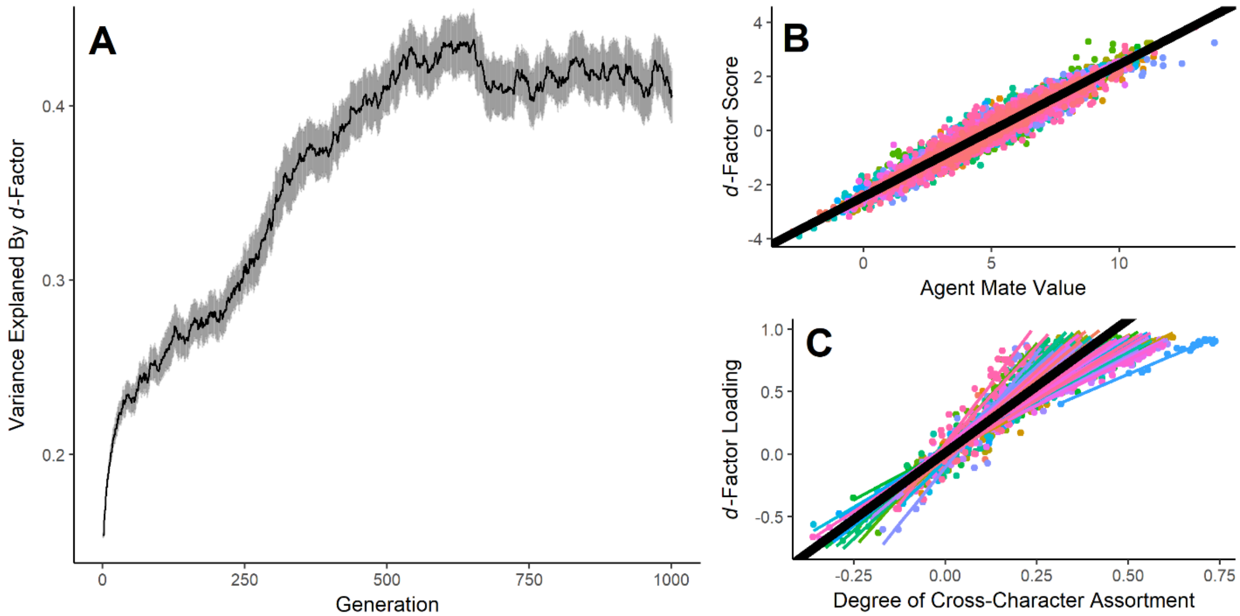


Figure 1

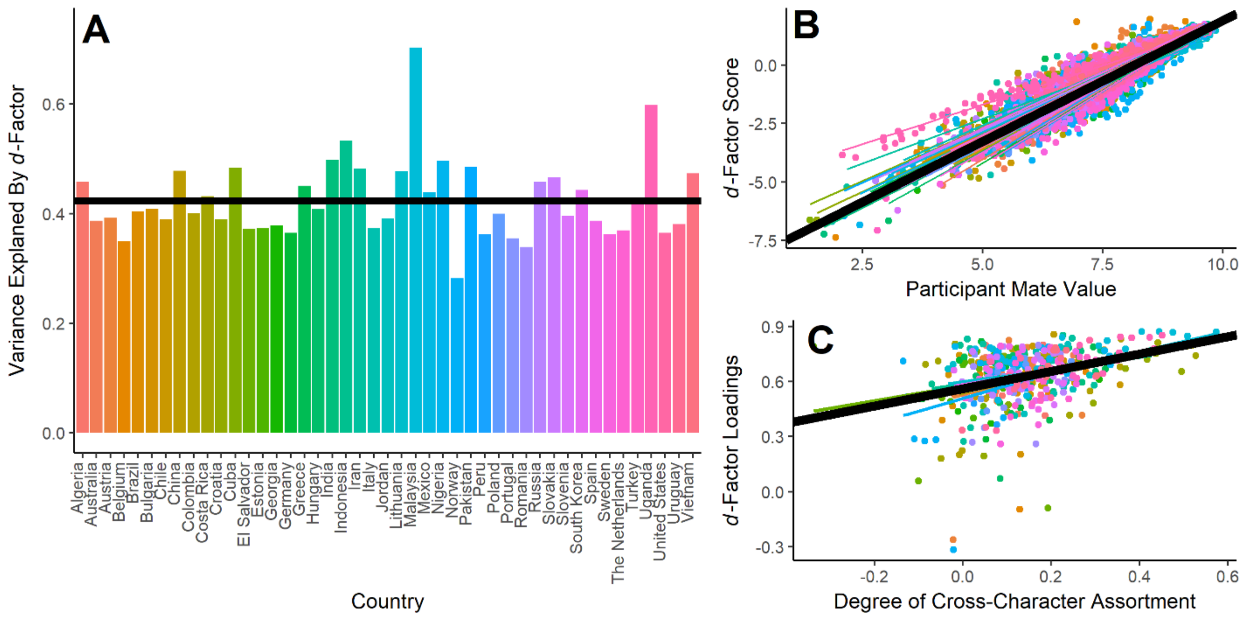

A
Variance Explaned By d-Factor
0.0
0.2
0.4
0.6
Algeria
Australia
Austria
Belgium
Brazil
Bulgaria
Chile
China
Colombia
Costa Rica
Croatia
Cuba
El Salvador
Estonia
Georgia
Germany
Greece
Hungary
India
Indonesia
Iran
Italy
Jordan
Lithuania
Malaysia
Mexico
Nigeria
Norway
Pakistan
Peru
Poland
Portugal
Romania
Russia
Slovakia
Slovenia
South Korea
Spain
Sweden
The Netherlands
Turkey
Uganda
United States
Uruguay
Vietnam
Country
B
d-Factor Score
0.0
-2.5
-5.0
-7.5
2.5
5.0
7.5
10.0
Participant Mate Value
C
d-Factor Loadings
0.9
0.6
0.3
0.0
-0.3
-0.2
0.0
0.2
0.4
0.6
Degree of Cross-Character Assortment

Figure 2

Supplementary Information

Supplementary Model 1: Manipulating the Mutation Rate in the Primary Agent-Based Model

To assess the robustness of the results reported in the primary agent-based model, we ran a secondary version of this model in which the mutation rate was increased by factor of 10 to a value of 0.06. The *d*-factor explained less variance in trait-level desirability in the final generation of the modified model compared to the primary model: M = 26.89%, 95% CI [25.62%, 28.15%] relative to M = 40.58%, 95% CI [39.04%, 42.12%]. Nonetheless, the variance explained by the *d*-factor was still significantly greater than the variance explained in the initial generation, M = 15.25%, 95% CI [15.12,15.38]. As in the primary agent-based model, agent mate value strongly predicted agent *d*-factor scores, $\beta = 0.87$, $SE = 0.02$, $p < .001$. Agents who were higher in overall mate value still scored higher on the *d*-factor than agents lower in overall mate value. Traits that generated greater cross-character assortment also loaded more strongly onto the *d*-factor, $\beta = 1.01$, $SE = 0.01$, $p < .001$. Overall, the pattern of effects documented in the primary agent-based model emerge even when the assumed mutation rate is increased by a factor of 10. These results suggest that this pattern of results is robust to assumptions about mutation rates.

Supplementary Model 2: Simulating Imperfect Heritability

One limitation of the primary agent-based model is that it assumes all traits are perfectly heritable: all trait and preference variation is due to inherited factors. To determine whether this simplification spuriously produces the *d*-factor we observed, we created a separate set of models that simulate imperfect heritability. These models are identical to the primary model except for how inherited trait and preference values relate to agent features. In these models, each agent has a set of "manifest" trait and preference values. These manifest values are the sum of an inherited trait or preference value, inherited from parents just as in the primary model, and random normal noise. The standard deviation of this noise was calibrated such that, on average, inherited values explained a fixed percentage of the variance in manifest trait values, simulating imperfect heritability. Agents selected each other as mates on the basis of their manifest traits and preferences, but offspring inherited only their parent's inherited values, with mutation, and not the noise component of their manifest trait and preference values.

We ran two such models with two levels of heritability: 50% heritability, based on a meta-analysis of heritability studies (9), and 75% heritability, chosen to be intermediate between the 50% heritability model and the primary agent-based model. We conducted the same set of analyses on these models in the primary agent-based model, focusing analysis on the manifest values rather than the inherited values. Figure S1 shows that these models produced the same pattern of effects observed in the primary agent-based model and the cross-cultural data, although with effects attenuated proportional to the degree of assumed heritability. In both models, the *d*-factor gradually evolves to explain a larger proportion of the variance in trait-level desirability in the final generation of evolution (h^2 = .50: M = 16.43%, 95% CI [16.21%, 16.66%]; h^2 = .75: M = 25.01%, 95% CI [24.02%, 26.00%]) compared to the first generation of evolution (h^2 = .50: M = 15.25%, 95% CI [15.14%, 15.36%]; h^2 = .75: M = 15.31%, 95% CI [15.19%, 15.44%]). In both models, *d*-factor scores were strongly correlated with agent mate value: h^2 = .50: β = .58, SE = 0.03, p < .001, h^2 = .75: β = .93, SE = 0.01, p < .001. Finally, traits that generated stronger cross-character assortment also tended to load more strongly onto the *d*-factor: h^2 = .50: β = .46, SE = 0.03, p < .001, h^2 = .75: β = 1.02, SE = 0.03, p < .001.

These supplementary models demonstrate that the *d*-factor and the associated pattern of effects observed in the primary model also emerge in models that assume imperfect heritability. The *d*-factor is smaller, and its relationship with other variables weaker, in models that assume lower heritability—this makes sense, as manifest values have a larger random noise component in these models. However, in all models we nonetheless observe the same diagnostic pattern of effects.

Supplementary Model 3: The *d*-Factor and Random Mate Choice

Figure S2 shows that the pattern of effects found in the primary agent-based model and cross-cultural sample do not appear in a model in which mate choice is random with respect to mate preferences and agents therefore do not mate assortatively for overall mate value. Here the *d*-factor explains only a small proportion of the variance in trait-level desirability in both the first generation, M = 15.34%, 95% CI [15.23%%, 15.46%] and the final generation, M = 16.26, 95% CI [16.10%, 16.43%]. Further, this change from the first to the final generations appears to emerge because of a sudden increase in variance explained within the first few generations followed by no change over the subsequent generations—perhaps due to the initial effects of selection. This contrasts with the continuous, gradual evolution of the *d*-factor observed in the primary models. Agent mate values do predict their *d*-factor scores, but relatively weakly, β = 0.23, SE = 0.02, p < .001. Finally and critically, a trait's ability to generate cross-character assortment does not predict its loading on to the *d*-factor when mate choice is not assortative for mate value, β = -0.002, SE = 0.03, p = .95. These results indicate mate choice that is not assortative for mate value will not, on its own, cause the evolution of a *d*-factor as observed in the primary agent-based model and the cross-cultural human sample.

Supplementary Model 3: Desirability Covariance as a Function of Common Cause Rather Than Assortative Mating

One potential alternative explanation for the covariation in desirability is a common condition variable that influences the development of all traits (17, 18). To assess whether condition-dependence alone would produce the pattern of effects observed in the primary agent-based model, we constructed an alternative model in which agents do not inherit separate trait values from their parents, but rather inherit a single condition variable. The model then creates each agent's 10 trait values by adding random noise to their random condition variable, with a pre-determined standard deviation, such that agent condition variables explain approximately 45% of the variance in each of their traits. Agent condition variables can thus be thought of as an underlying factor that determines the development of all agent traits. Agent energy values were determined by their manifest trait values. The optimal trait value was set to a value of 7 for all traits across model runs, rather than being randomly set as in the primary model. This simplification ensured that an increase in condition (e.g. by mutation) simultaneously moved all agent traits closer to optimum. Agents in this model still reproduced in proportion to energy, yielding a selection pressure in favor of higher condition values. Agents in this model paired randomly with respect to preferences and therefore did not mate assortatively for mate value. We allowed such a population of agents to evolve for 1,000 generations in the same way as populations in the primary agent-based model and conducted the same analyses on the final agent populations.

Figure S3 shows the results of the condition-dependent agent-based model. Because the condition variable determines all trait values, the *d*-factor does explain a large proportion of the variance in trait-level desirability in the final generation, M = 47.94%, 95% CI [47.29%, 48.58%]. Agent mate value is strongly related to agent *d*-factor scores, $\beta = 0.97$, $SE = 0.002$, $p < .001$. However, *d*-factor loadings were independent of cross-character assortment in this model, $\beta = 0.05$, $SE = 0.06$, $p = .37$.

Overall, the pattern of desirability covariation produced by condition-dependence is qualitatively different from the pattern of desirability covariation produced by assortative mating. Both processes produce a large *d*-factor that is correlated with agent mate value. But crucially, condition-dependence, in the absence of assortative mating for mate value, does not produce the correlation between *d*-factor loadings and the degree of cross-character assortment generated by each trait. That the human data across cultures more closely approximates the pattern of the primary agent-based model than the condition-dependent model suggests that desirability covariation in humans is better explained by an evolutionary history of assortative mating than by condition-dependence alone.

These results of course do not indicate that none of the covariance observed in the cross-cultural sample is explained by condition-dependence; rather, it merely demonstrates that condition-dependence alone is not sufficient to explain the specific pattern of effects we observed. Condition-dependence and assortative mating could and likely do independently contribute to human trait covariation. Furthermore, condition-dependence and assortative mating could be complementary sources of trait covariation. For instance, it is possible that some preferred traits initially signal orthogonal dimensions of condition. However, through assortative mating for mate value, these independent dimensions of condition become correlated with one another as a *d*-factor emerges. So the apparent unidimensionality of condition could in part emerge due to assortative mating.

Supplementary Models 3 and 4: Assessing the Specificity of the *d*-Factor across Cultures

Results of the primary analyses demonstrate a pattern of desirability covariation that occurs in human data from across cultures and that is consistent with the pattern of results observed in agent-based models in which populations evolve under conditions of assortative mating. Here we conduct two tests designed to assess the specificity of this *d*-factor. First, it is possible that the *d*-factor and participant mate value correlate not because of an evolutionary history of assortative mating but merely because both the *d*-factor and participant mate values were calculated using deviations from the opposite sex's preferences. If this were the case, even random trait ratings should produce the pattern of results observed in the cross-cultural human data and the primary agent-based model as long as mate value and the *d*-factor are both calculated using deviations of these random traits from the opposite sex's preferences.

To test this alternative hypothesis, we randomly scrambled participant trait ratings from the cross-cultural sample within country, within sex, and within trait. The result was that, for each trait variable, each participant was randomly assigned the trait rating of another same-sex participant from their country. This scrambling maintains the mean, standard deviation, and distribution of each trait variable but removes all above-chance correlations between trait variables. We then used these scrambled trait ratings to compute participant mate values and to estimate the *d*-factor and participant *d*-factor scores. For comparison, we also applied the same scrambling procedure to the trait values of agents within the primary agent-based model. We then applied the same analyses to the scrambled human and agent data as to the primary human and agent-based model samples.

Figure S4 shows the results of analyzing the scrambled human data. Across cultures, the *d*-factor based on scrambled human data explained significantly less variance in trait-level desirability (r^2_{mean} = 25.29, 95% CI [24.56%, 26.02%]) than the *d*-factor based on unscrambled human data (r^2_{mean} = 42.33, 95% CI [40.14%, 44.51%]). Participant mate value in the scrambled human data did predict participant *d*-factor scores, $\beta = 0.37$, $SE = 0.03$, $p < .001$; however, this relationship was weaker than found in the unscrambled human data. Finally, the degree of cross-character assortment generated by a desirability dimension did not relate to that dimension's loading onto the *d*-factor in the scrambled human data, $\beta = 0.02$, $SE = 0.05$, $p = .72$.

Importantly, a similar pattern of results emerges when data from the primary agent-based model are scrambled in the same fashion. Figure S5 presents these results. In the final generation of the agent-based model, the *d*-factor based on scrambled data explains a significantly smaller proportion of the variance in trait-level desirability: r^2_{mean} = 15.37%, 95% CI [15.25%, 15.48%]). Scrambled *d*-factor scores do relate to agent mate values calculated from the same traits, but do so relatively weakly $\beta = 0.23$, $SE = 0.02$, $p < .001$. The loading of each desirability dimension onto the *d*-factor did not relate to its ability to generate cross-character assortment, $\beta = -0.01$, $SE = 0.03$, $p = .75$.

Overall, these results show that, although the *d*-factor and mate value are both calculated with respect to deviation from the opposite sex's mate preferences, the pattern of effects documented in the primary analyses is not inevitable. When trait-level data is randomized, the *d*-factor explains a relatively small proportion of the variance in trait-level desirability, factor scores on the *d*-factor relate only weakly to mate value, and loadings onto the *d*-factor do not relate to cross-character assortment. The correlational structure created by an evolutionary history of assortative mating is necessary to produce the effects observed in the primary analyses of both agent-based models and the cross-cultural human data.

Next we conducted a series of analyses to test an alternative aspect of specificity: that is, could the results of the primary analyses emerge if mate value and the *d*-factor were calculated with respect to deviations from any trait point or are they specific to deviations from the opposite sex's mate preferences? To assess this in the cross-cultural sample, we first created a random preference vector for each sex within country by pulling five draws from a random uniform distribution constrained between values of 1 and 7. We then calculated each participant's random-point "mate value" as the scaled Euclidean distance between their own traits and this random vector, rather than the opposite sex's preferences. Additionally, we calculated trait-level desirability as the absolute deviation between participant traits and each of these random preferences and estimated the *d*-factor based on these random-point desirabilities.

The results were broadly similar to but nonetheless distinct from the primary analyses (Figure S6). The *d*-factor calculated with respect to a random point still explained a moderate proportion of trait-level desirability, r^2_{mean} = 41.35%, 95% CI [39.48%, 43.22%]. Factor scores on the random-point *d*-factor also correlated strongly with random-point mate value, but the relationship was weaker than in the primary analyses, $\beta = 0.69$, $SE = 0.04$, $p < .001$. Finally, desirability dimensions that generated more cross-character assortment did load more strongly onto the *d*-factor, $\beta = 0.35$, $SE = 0.05$ $p < .001$. However, this effect was much less consistent across cultures, as evidenced by the larger variance in the random effect of slope across cultures, $s^2 = 7.54$, for the random-point *d*-factor compared to $s^2 = 0.03$ in the primary analyses. Indeed, in some countries the relationship between factor loading and cross-character assortment was negative for the random-point *d*-factor.

The same pattern of differences emerges when the data from the primary agent-based model are reanalyzed such that agent desirability and mate value are calculated with respect to a random point (Figure S7). As in the cross-cultural sample, the random-point *d*-factor explains a still-moderate proportion of the variance in trait-level desirability, r^2_{mean} = 40.24%, 95% CI

[38.70%, 41.77%]. Random-point *d*-factor scores do relate to agent random-point mate values, but the relationship is weaker than in the primary analyses: $\beta = 0.40$, $SE = 0.03$, $p < .001$. Unlike the human cross-cultural data, dimensions that load more strongly onto the random-point *d*-factor no longer generate more cross-character assortment, $\beta = .13$, $SE = 0.09$, $p = .15$. However, like in the cross-cultural sample, in this model, the variance in the random slope component is much larger ($s^2 = 1.83$) than in the primary analyses ($s^2 = 0.23$) such that the relationship between *d*-factor loading and cross-character assortment is sometimes negative.

Overall, in both the agent-based models and the human cross-cultural sample, a different pattern of effects emerges when the *d*-factor and mate value are calculated with respect to a random point in the trait space rather than the opposite sex's average mate preferences. The random-point *d*-factor still explains a moderate proportion of the variance in trait-level desirability; however, scores on this random-point *d*-factor have a weaker relationship with mate value than does the true *d*-factor and the relationship between cross-character assortment and factor loadings is less consistent for the true *d*-factor than the random-point *d*-factor. That the same difference in pattern of effects emerges in the human cross-cultural data as in the agent-based model data suggests that the *d*-factor in the cross cultural sample is not arbitrary, but rather is organized around the opposite sex's preferences because of an evolutionary history of assortative mating.

Supplementary Model 5: Desirability Covariance as a Function of Participant Rating Biases Rather Than Assortative Mating

The results of the primary agent-based model as well as the primary analysis of the cross-cultural sample document a *d*-factor that appears patterned as though it evolved through a history of assortative mating. However, participant rating biases could provide an alternative explanation for this *d*-factor. If participants suffer from “positive illusions,” (19, 20) participants who see themselves more positively on any one dimension could be biased to see themselves and their partner desirably across all other dimensions. This participant rating bias, rather than assortative mating, could explain the cross-cultural pattern of covariation between desirabilities across trait dimensions.

However, the pattern of effects observed in the cross-cultural human sample emerges in two additional samples that are not limited to participant self-reports. The first is a dyadic sample of newlyweds. The details of this sample have been reported elsewhere (23). Participants were 214 people composing 107 newlywed couples. Each participant reported their ideal long-term mate preferences for 40 personality dimensions using a 40-item Big Five questionnaire. For each participant, we also have ratings of each participant’s actual traits on the same 40 dimensions from four sources: participant self-reports, partner ratings, and the ratings of two independent interviewers. We calculated a composite trait rating for each participant on each of the 40 dimensions by averaging together these self, partner, and third-party interviewer reports. We then conducted the same analyses on this newlywed sample as on each country from the cross-cultural sample, calculating mate value as the Euclidean distance between the trait composites and the opposite sex’s average references and calculating trait-level desirabilities on each dimension as the absolute difference between each participant’s trait composite and the opposite sex’s average preference on that trait dimension.

The *d*-factor explained $r^2 = 24.30\%$ of the variance in trait-level desirability in this newlywed sample. Scores on this *d*-factor were strongly related to participant mate value, just as in the cross-cultural sample and the primary agent-based model, $\beta = 0.92$, $SE = 0.03$, $p < .001$ (Figure S8). Finally, traits loaded on to the *d*-factor in this sample to the extent that they generated cross-character assortment, $\beta = .70$, $SE = 0.08$, $p < .001$. Even when participant trait ratings are not based exclusively on self-reports, a *d*-factor emerges from participant desirabilities patterned exactly as in the primary agent-based model. This strongly suggests that the *d*-factor is not entirely an artifact of participant self-report biases.

The *d*-factor in this newlywed sample additionally shows the same degree of specificity observed in the primary agent-based model and the cross-cultural sample. To assess the specificity of the newlywed *d*-factor, we calculated participant desirabilities based on 100 random scramblings of participant traits and separately based on 100 random preference points (Figure S9). A *d*-factor based on scrambled participant traits explains just $r^2_{\text{mean}} = 6.06\%$, 95% CI [6.02%, 6.09%] of the variance in participant desirabilities. As in the primary agent-based model and the cross-cultural sample, scores on this scrambled *d*-factor relate only weakly to participant mate value, $\beta = 0.15$, $SE = 0.01$, $p < .001$, and loadings onto the *d*-factor were unrelated to traits' predictive power, $\beta = -0.01$, $SE = 0.02$, $p = .46$.

Furthermore, consistent with the primary agent-based model and cross-cultural sample, the newlywed random-point *d*-factor explained a moderate proportion of the variance in trait-level desirability, $r^2_{\text{mean}} = 22.67\%$, 95% CI [22.48%, 22.86%]). However, scores on this *d*-factor relate relatively weakly to participant mate value, $\beta = 0.40$, $SE = 0.02$, $p < .001$. Finally, traits do load onto the random-point *d*-factor to the extent that produce cross-character assortment, $\beta = .65$, $SE = 0.05$, $p < .001$; however, this relationship is less consistent than in the primary analysis as evidenced by the variance in the random slope component in the random-point analysis ($s^2 = 25.83$) and the occasional negative slopes relating desirability predictive power and *d*-factor loading (Figure S10).

Overall, the results of these specificity tests perfectly match those observed in the primary agent-based model and the cross-cultural sample. A *d*-factor based on scrambled traits does not explain substantial variance in trait-level desirability, scores on this *d*-factor relate only weakly to participant mate value, and the extent to which traits generate cross-character assortment does not relate to how strongly they load onto this scrambled *d*-factor. This indicates that the *d*-factor in the newlywed sample is not tautologous and its emergence does in fact depend on the covariance structure created by assortative mating. This *d*-factor is additionally specific to mate value: a *d*-factor produced based on deviations from a random point, rather than the opposite sex's preferences, does not relate as strongly to participant mate value and shows an inconsistent relationship between cross-character assortment and factor loading.

Finally, we conducted the same analyses using composite trait ratings from this sample based only on the third-party interviewer ratings. This removes participant positive illusions or rating biases from the data entirely. These analyses produced the same results as in the cross-cultural sample and the primary agent-based model (Figure S11). The *d*-factor explained r^2 = 25.52% of the variance in trait-level desirability when trait ratings are based only on interviewer reports. Scores on this *d*-factor were still strongly related to participant mate value, $\beta = 0.95$, $SE = 0.02$, $p < .001$. Finally, traits loaded on to the *d*-factor in this sample to the extent that they generated cross-character assortment, $\beta = 0.62$, $SE = 0.09$, $p < .001$. Overall, results from this newlywed sample, even when stripped of participant's own rating biases, precisely mirror those observed in the primary analyses and suggest that the *d*-factor and its specificity are not byproducts of participant self-report biases.

However, one shortcoming of this newlywed sample is that the trait measurements in this sample overlap only partially with the traits included in the human cross-cultural sample. For example, kindness is likely captured by variables such as "warm" and "selfish" and intelligence by "intelligent" and "analytical." However, in the newlywed sample, we did not analyze variables corresponding to health, wealth, or physical attractiveness. For this reason, we finally analyzed a third human sample. This sample contained data on n = 382 people who were members of 191 romantic, heterosexual dyads. Participants were M = 49.86 years old (SD = 14.48) and were in their relationships for Mdn = 216.7 months. Participants reported their ideal preferences in a long-term, committed romantic partner on 20 7-point bipolar adjective scales. These scales included the five dimensions collected in the cross-cultural sample in addition to others, including characteristics such as masculinity/femininity, religiosity, and desire for a family. Participants additionally rated themselves and their romantic partner on each of these dimensions. We averaged these self- and partner-reports to create a trait composite for each participant across all 20 dimensions and conducted the same analyses on these 20 dimensions as in the agent-based models, cross-cultural sample, and newlywed sample.

Again, the same pattern of effects observed in the primary agent-based models and the cross-cultural sample emerged in this sample even when trait ratings were not based exclusively on self-report. The *d*-factor explained r^2 = 25.52% of the variance in trait-level desirability. Scores on the *d*-factor strongly predicted participant mate value, β = 0.95, SE = 0.02, p < .001 (Figure S12). Finally, traits loaded on to the *d*-factor in this sample to the extent that generated cross-character assortment, β = .62, SE = 0.09, p < .001. Finally, precisely same pattern of results still emerges in this sample even when analyses are based exclusively on partner-reports—excluding self-reports entirely (Figure S12). The *d*-factor still explains r^2 = 25.52% of the variance in trait-level desirability; *d*-factor scores strongly predict participant mate value (β =

0.95, *SE* = 0.02, $p < .001$); and traits that generate more cross-character assortment loaded more strongly onto the *d*-factor ($\beta = 0.55$, *SE* = 0.14, $p < .001$).

Supplementary Figure Legends

Figure S1. Results from agent-based models in which traits and preferences are imperfectly heritable. The *d*-factor still evolves to explain an above-chance level of variation in trait-level desirability when heritability is set to 75% (a) or 50% (d). Agent mate value strongly predicts factor scores when heritability is set to 75% (b) or 50% (e). Finally, traits generate greater cross-character assortment still load more strongly onto the *d*-factor (c: $h^2 = 75\%$; f: $h^2 = 50\%$).). Colored lines represent individual model runs; black lines represent average trends across model runs.

Figure S2. Results from the agent-based model in which agents do not mate assortatively for mate value. The *d*-factor explains only a small proportion of the variance in trait-level desirability (a). Agent mate value only weakly predicts agent scores on the *d*-factor (b). Finally, traits that generated more cross-character assortment do not load more strongly onto the *d*-factor (c). Colored lines represent individual model runs; black lines represent average trends across model runs.

Figure S3. Results of an agent-based model wherein traits are determined by an underlying condition variable. The *d*-factor explains a large proportion of the variance in trait-level desirability (a). Additionally, *d*-factor scores are strongly related to agent mate value (b), however the relationship is less consistent across model runs than in the primary agent-based model. Finally, the degree to which traits generate greater cross-character assortment is not correlated with loadings onto the *d*-factor (c).

Figure S4. Results from the cross-cultural data when trait ratings are scrambled so as to remove their correlational structure. The *d*-factor based on this scrambled data explains a relatively small proportion of the variance in trait-level desirability (a). Factor scores on this scrambled *d*-factor relate only weakly to participant mate values calculated from the same data (b). Finally, desirabilities generate greater cross-character assortment do not load onto the *d*-factor more strongly overall (c).

Figure S5. Results from the primary agent-based model when agent trait values are scrambled so as to remove their correlational structure. The *d*-factor based on this scrambled data explains a relatively small proportion of the variance in trait-level desirability (a). Factor scores on this scrambled *d*-factor relate only weakly to agent mate values calculated from the same data (b). Finally, desirabilities that generate greater cross-character assortment do not load more strongly onto the *d*-factor (c).

Figure S6. Results from the cross-cultural sample when mate value and the *d*-factor are calculated based on deviations from a random point. The random-point *d*-factor still explains a moderate proportion of the variance in trait-level desirability (a). However, the relationship between *d*-factor scores and mate value is much weaker than in the primary analyses (b) and the relationship between factor loadings and cross-character assortment is less consistent (c).

Figure S7. Results from primary agent-based model when agent mate value and the *d*-factor are calculated based on deviations from a random point. The random-point *d*-factor still explains a moderate proportion of the variance in trait-level desirability (a). However, the relationship between *d*-factor scores and mate value is much weaker than in the primary model (b) and the relationship between factor loadings and cross-character assortment is less consistent (c).

Figure S8. The relationship between *d*-factor scores and participant mate value (a) and desirability factor loading and predictive power (b) in the newlywed sample. Even when participant trait ratings are not based exclusively on self-report, mate value strongly predicts *d*-factor scores and traits load onto the *d*-factor to the extent that they generate cross-character assortment.

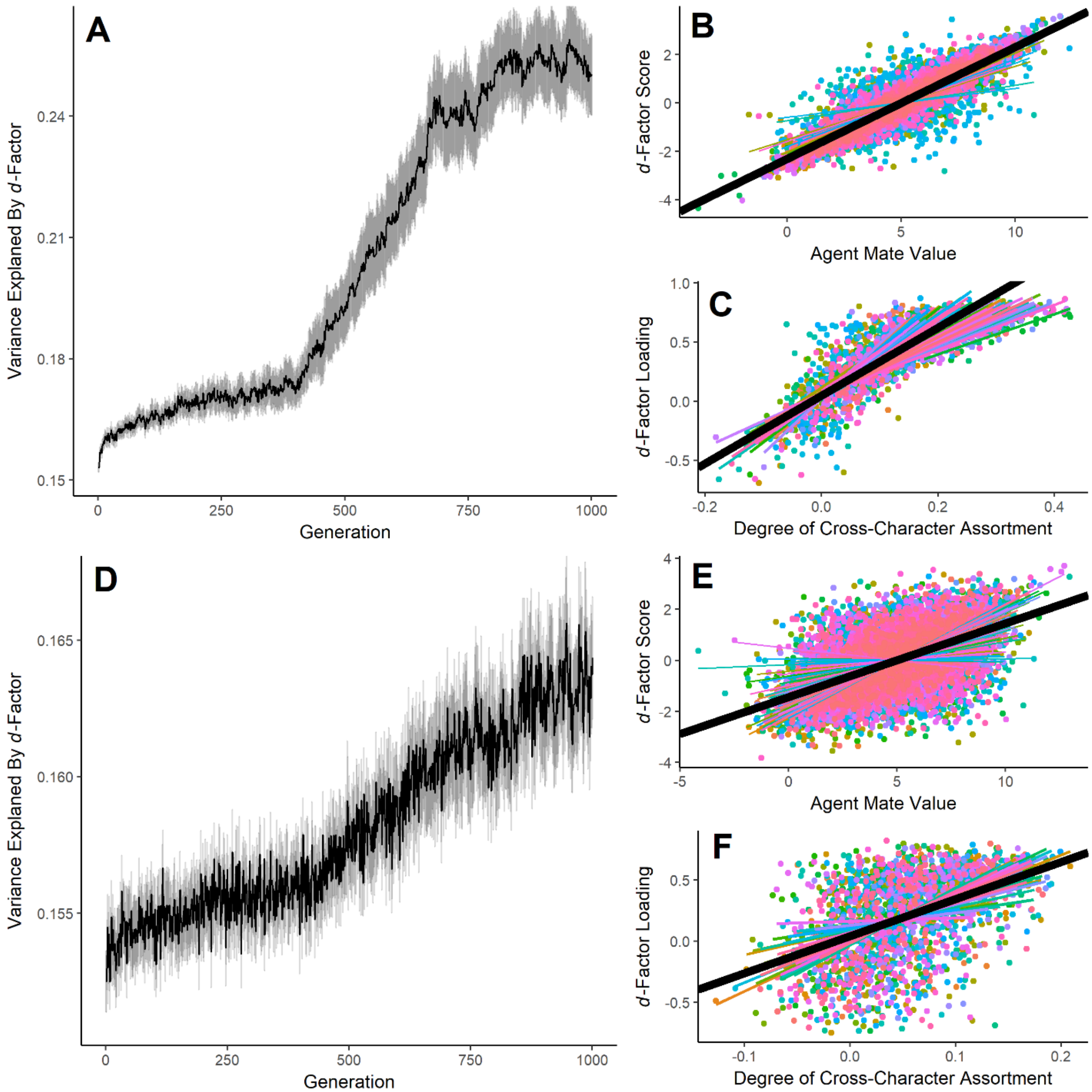
Figure S9. Analysis of the newlywed sample when desirabilities are calculated based on scrambled traits. Scores on this scrambled *d*-factor do relate significantly but weakly to participant mate values (a). Furthermore, traits that generate stronger cross-character assortment do not tend to load more strongly onto the scrambled *d*-factor (b).

Figure S10. Analysis of the newlywed sample when desirabilities are calculated with respect to 100 random points rather than the opposite sex's mate preferences. Participant mate value does predict scores on this random-point *d*-factor, but only weakly (a). Furthermore, traits that generate more cross-character assortment do load more strongly onto the random-point *d*-factor, however this relationship is less consistent than observed in the primary analyses (b).

Figure S11. The relationship between *d*-factor scores and participant mate value (a) and desirability factor loading and predictive power (b) in the newlywed sample when trait composites are based only on third-party interviewer report. Mate value still strongly predicts *d*-factor scores and traits load onto the *d*-factor to the extent that they generate cross-character assortment.

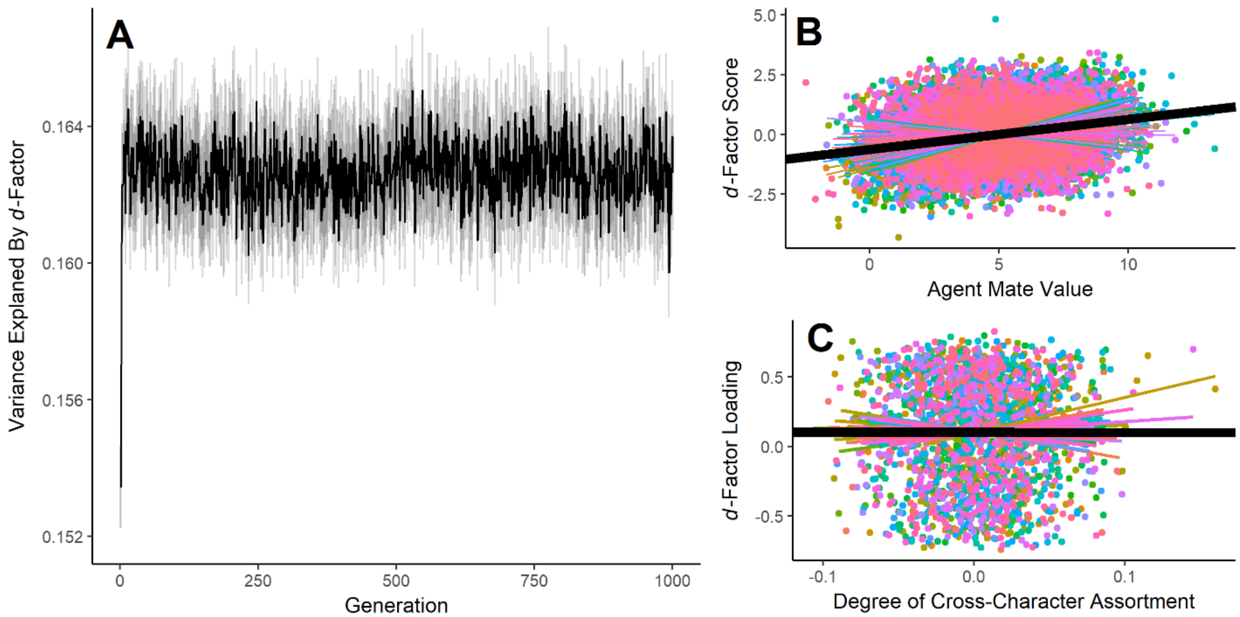
Figure S12. The relationship between *d*-factor scores and participant mate value (a) and desirability factor loading and predictive power (b) in a sample of romantic dyads in which trait ratings are based on composites of self- and partner-report. Mate value still strongly predicts *d*-factor scores and traits load onto the *d*-factor to the extent that they predict partner mate value. The same results emerge when trait ratings are based exclusively on partner report (c and d).

949 **Supplementary Figures**



950

951 Figure S1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Variance Explaned By d-Factor
0.164
0.160
0.156
0.152
0
250
500
750
1000
Generation
B
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5.0
2.5
0.0
-2.5
0
5
10
Agent Mate Value
C
d-Factor Loading
0.5
0.0
-0.5
-0.1
0.0
0.1
Degree of Cross-Character Assortment

Figure S2

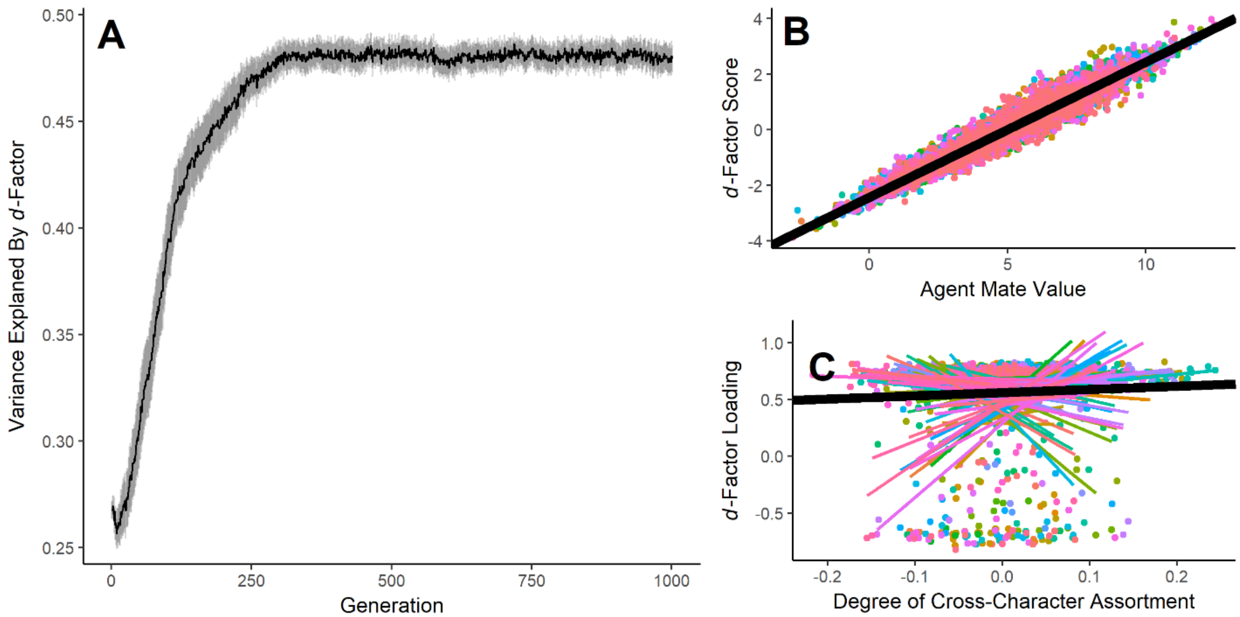
A
Variance Explained By d-Factor
Generation
B
d-Factor Score
Agent Mate Value
C
d-Factor Loading
Degree of Cross-Character Assortment

Figure S3

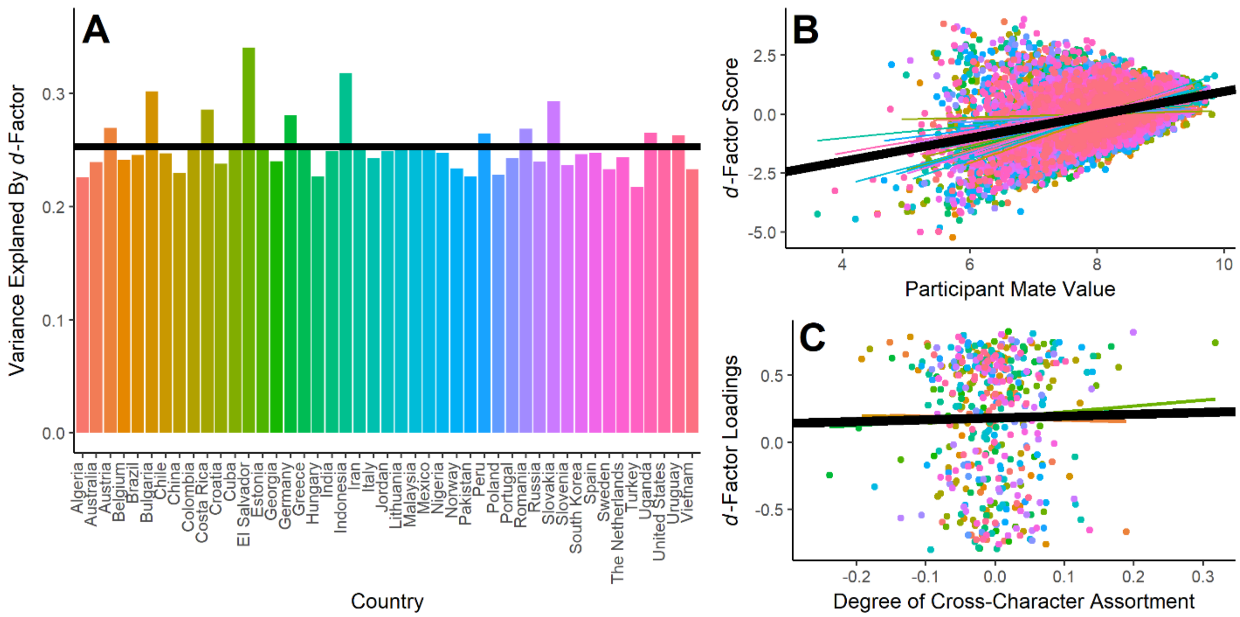
A
Variance Explaned By d-Factor
0.0
0.1
0.2
0.3
Algeria
Australia
Austria
Belgium
Brazil
Bulgaria
Chile
China
Colombia
Costa Rica
Croatia
Cuba
El Salvador
Estonia
Georgia
Germany
Greece
Hungary
India
Indonesia
Iran
Italy
Jordan
Lithuania
Malaysia
Mexico
Nigeria
Norway
Pakistan
Peru
Poland
Portugal
Romania
Russia
Slovakia
Slovenia
South Korea
Spain
Sweden
The Netherlands
Turkey
Uganda
United States
Uruguay
Vietnam
Country
B
d-Factor Score
2.5
0.0
-2.5
-5.0
4
6
8
10
Participant Mate Value
C
d-Factor Loadings
0.5
0.0
-0.5
-0.2
-0.1
0.0
0.1
0.2
0.3
Degree of Cross-Character Assortment

Figure S4

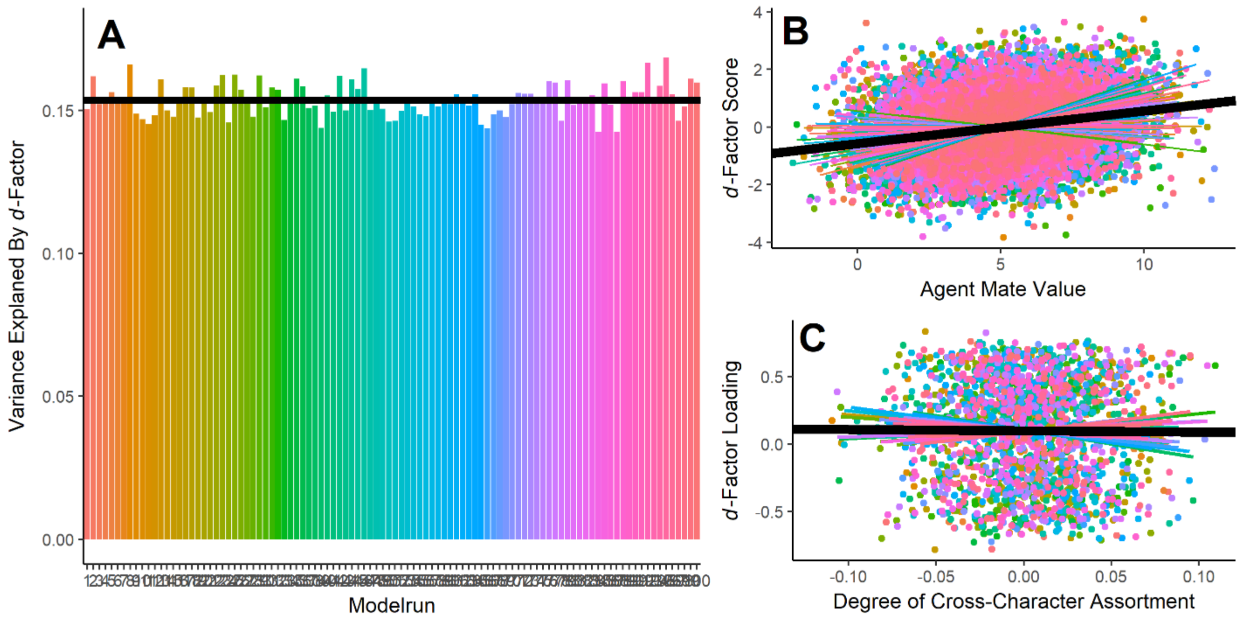
A
Variance Explaned By d-Factor
0.15
0.10
0.05
0.00
Modelrun
B
d-Factor Score
4
2
0
-2
-4
0
5
10
Agent Mate Value
C
d-Factor Loading
0.5
0.0
-0.5
-0.10
-0.05
0.00
0.05
0.10
Degree of Cross-Character Assortment

Figure S5

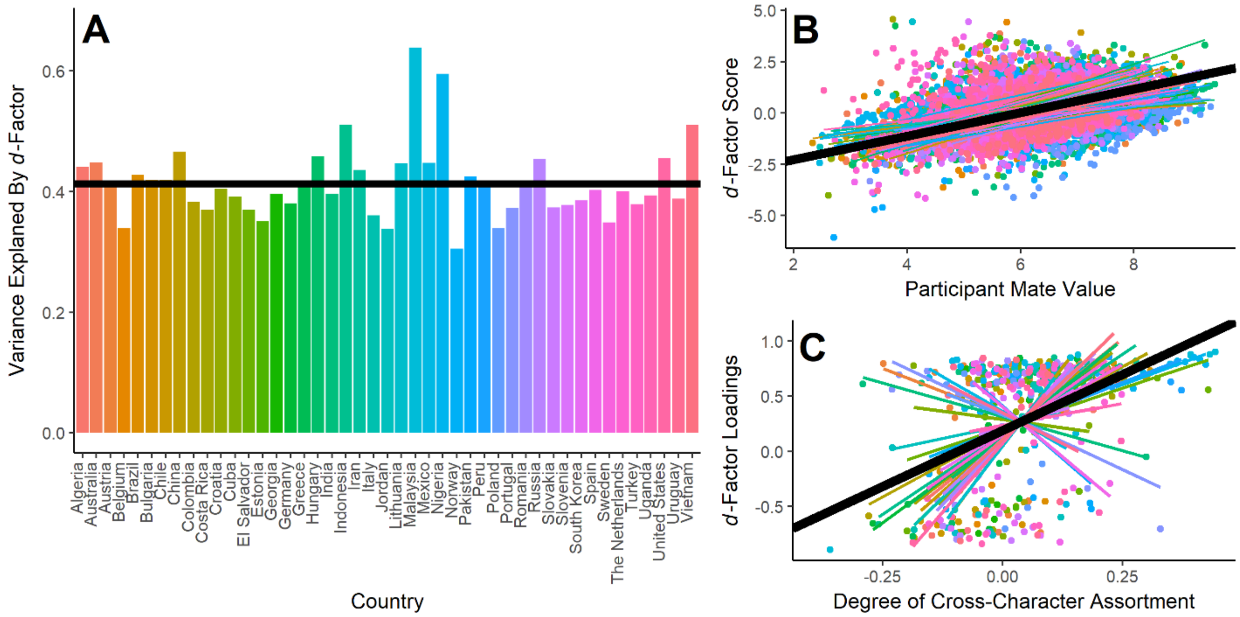
A
Variance Explaned By d-Factor
0.0
0.2
0.4
0.6
Algeria
Australia
Austria
Belgium
Brazil
Bulgaria
Chile
China
Colombia
Costa Rica
Croatia
Cuba
El Salvador
Estonia
Georgia
Germany
Greece
Hungary
India
Indonesia
Iran
Italy
Jordan
Lithuania
Malaysia
Mexico
Nigeria
Norway
Pakistan
Peru
Poland
Portugal
Romania
Russia
Slovakia
Slovenia
South Korea
Spain
Sweden
The Netherlands
Turkey
Uganda
United States
Uruguay
Vietnam
Country
B
d-Factor Score
5.0
2.5
0.0
-2.5
-5.0
2
4
6
8
Participant Mate Value
C
d-Factor Loadings
1.0
0.5
0.0
-0.5
-0.25
0.00
0.25
Degree of Cross-Character Assortment

Figure S6

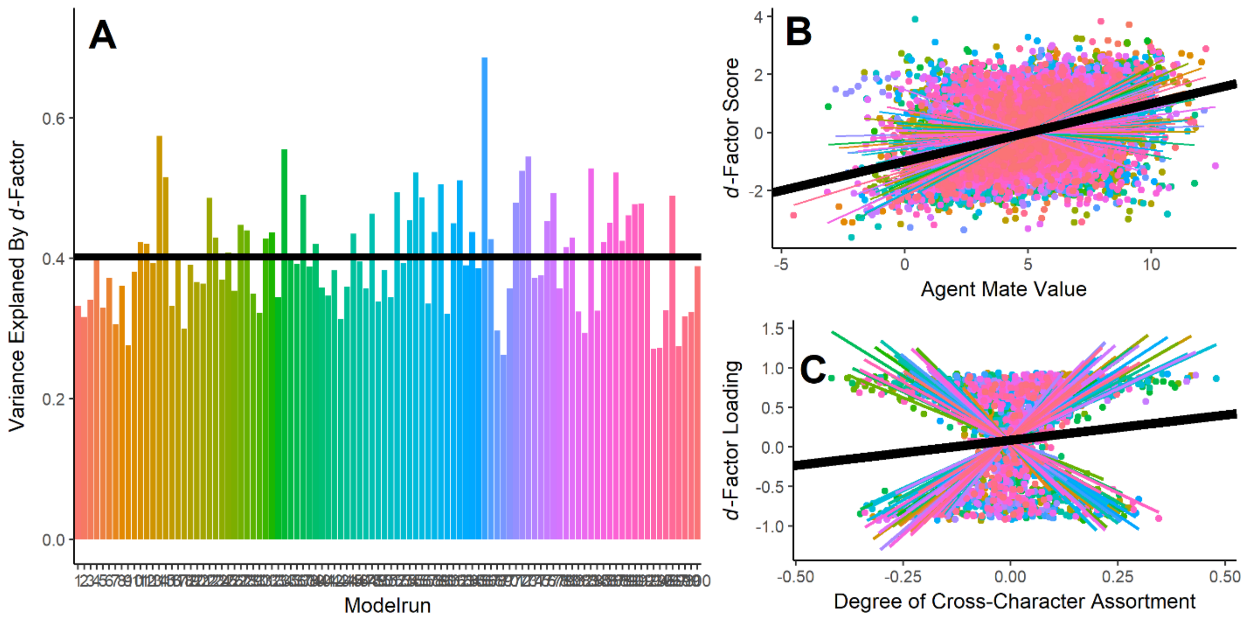
A
Variance Explained By d-Factor
0.6
0.4
0.2
0.0
Modelrun
B
d-Factor Score
4
2
0
-2
-5
0
5
10
Agent Mate Value
C
d-Factor Loading
1.5
1.0
0.5
0.0
-0.5
-1.0
-0.50
-0.25
0.00
0.25
0.50
Degree of Cross-Character Assortment

Figure S7

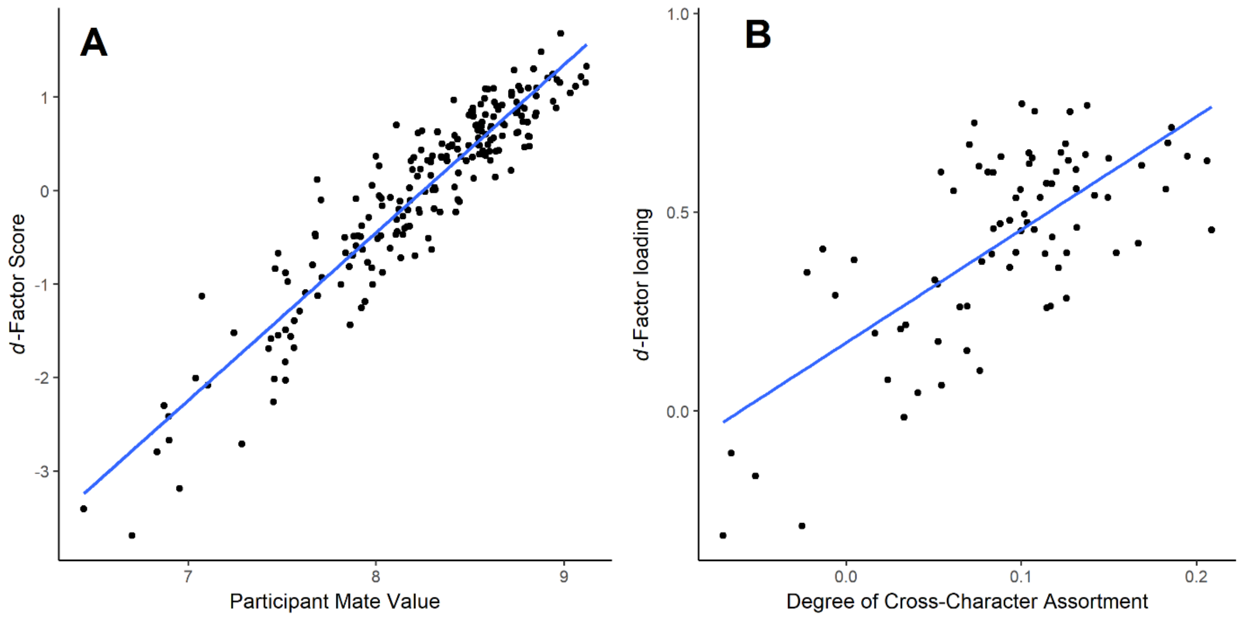
A
d-Factor Score
Participant Mate Value
1
0
-1
-2
-3
7
8
9
B
d-Factor loading
Degree of Cross-Character Assortment
1.0
0.5
0.0
0.0
0.1
0.2

Figure S8

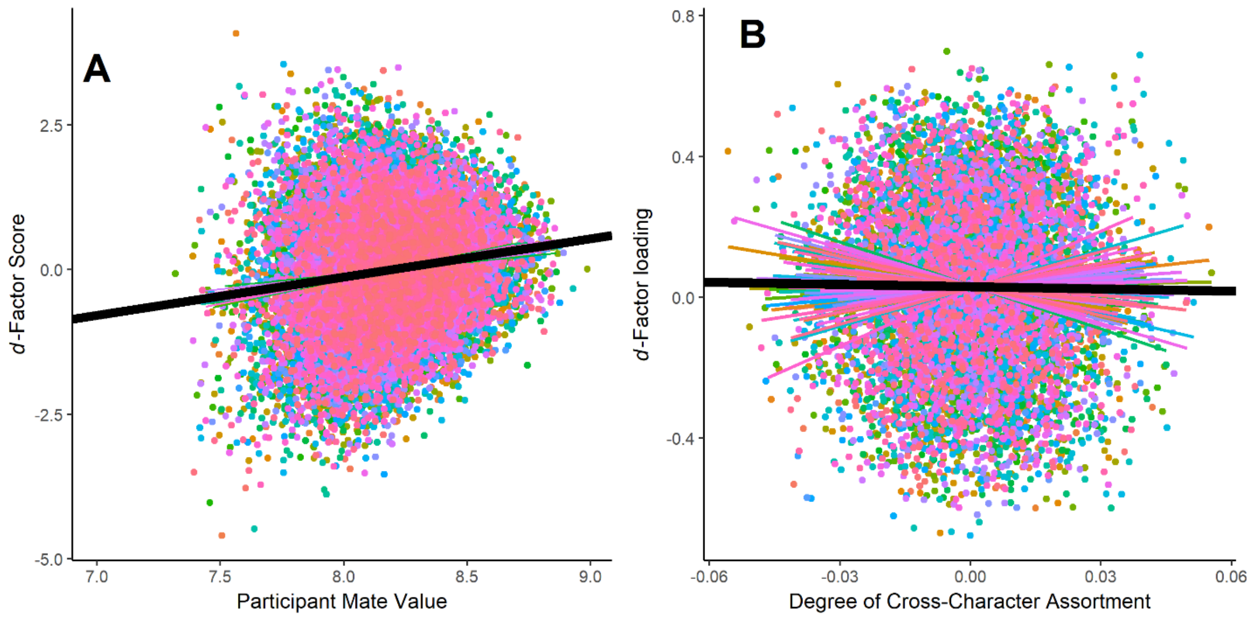
A
2.5
0.0
-2.5
-5.0
d-Factor Score
7.0
7.5
8.0
8.5
9.0
Participant Mate Value
B
0.8
0.4
0.0
-0.4
d-Factor loading
-0.06
-0.03
0.00
0.03
0.06
Degree of Cross-Character Assortment

Figure S9

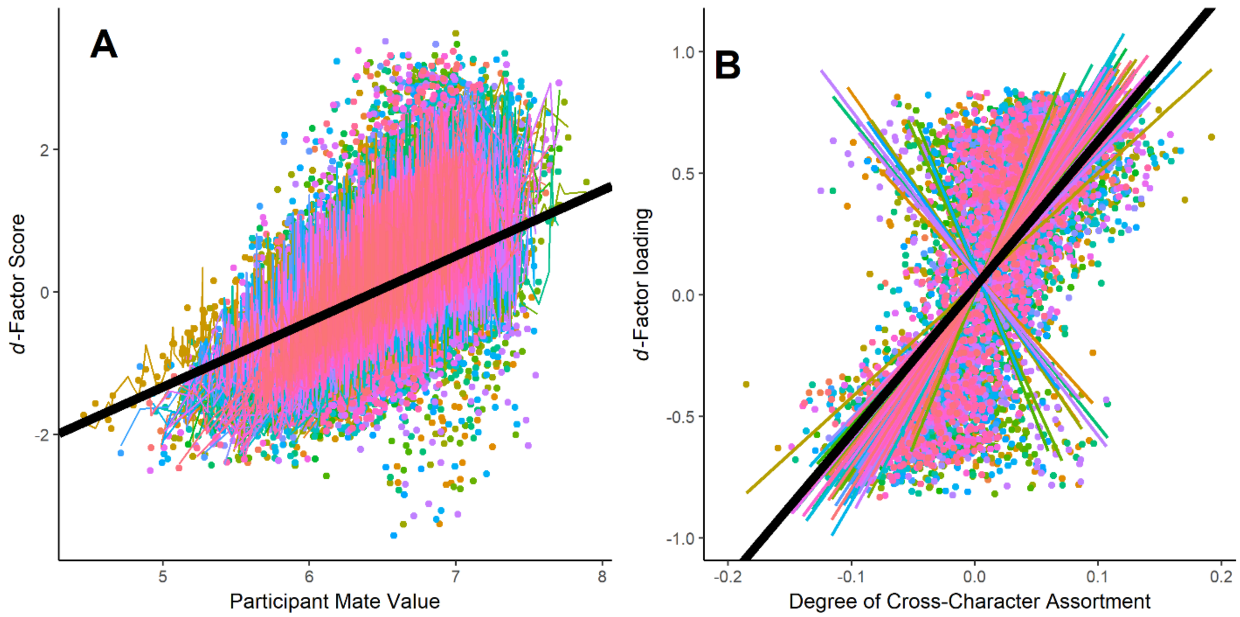
A
d-Factor Score
2
0
-2
5
6
7
8
Participant Mate Value
B
d-Factor loading
1.0
0.5
0.0
-0.5
-1.0
-0.2
-0.1
0.0
0.1
0.2
Degree of Cross-Character Assortment

Figure S10

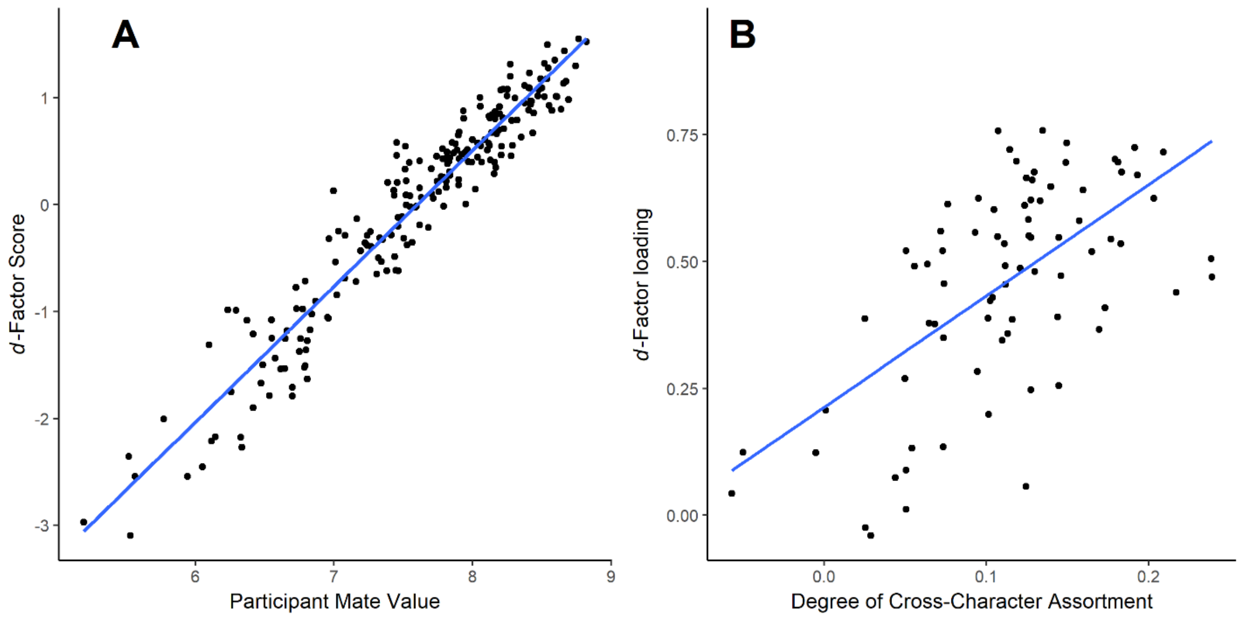
A
d-Factor Score
Participant Mate Value
1
0
-1
-2
-3
6
7
8
9
B
d-Factor loading
Degree of Cross-Character Assortment
0.75
0.50
0.25
0.00
0.0
0.1
0.2

Figure S11

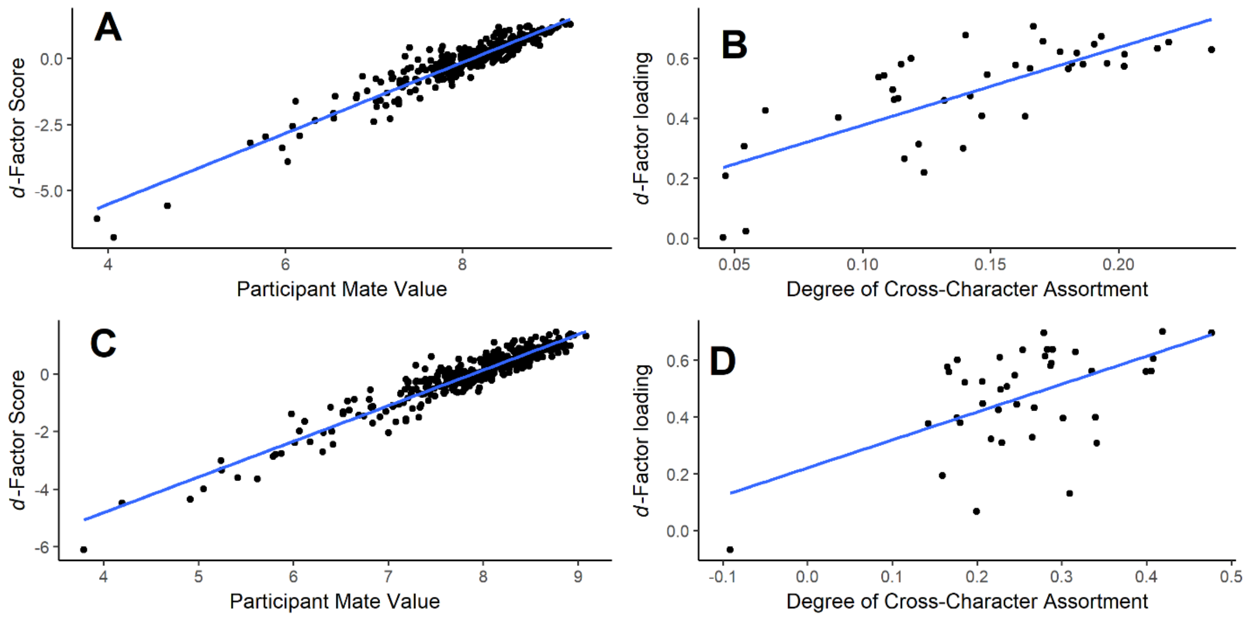
A
d-Factor Score
0.0
-2.5
-5.0
4
6
8
Participant Mate Value
B
d-Factor loading
0.6
0.4
0.2
0.0
0.05
0.10
0.15
0.20
Degree of Cross-Character Assortment
C
d-Factor Score
0
-2
-4
-6
4
5
6
7
8
9
Participant Mate Value
D
d-Factor loading
0.6
0.4
0.2
0.0
-0.1
0.0
0.1
0.2
0.3
0.4
0.5
Degree of Cross-Character Assortment

Figure S12

985 **Table S1**

986 *Correlations between putatively desirable traits in the prior literature*

Reference	Desirable Trait Correlation	Correlation Found?
Ashton, M. C., et al. (2000). Fluid intelligence, crystalized intelligence, and the openness/intellect factor. *Journal of Research in Personality (34)*, 198-207.	Fluid intelligence & Openness (+)	YES
Ashton, M. C., et al. (2000). Fluid intelligence, crystalized intelligence, and the openness/intellect factor. *Journal of Research in Personality (34)*, 198-207.	Crystalized intelligence & Openness (+)	YES
Ashton, M. C., et al. (2000). Fluid intelligence, crystalized intelligence, and the openness/intellect factor. *Journal of Research in Personality (34)*, 198-207.	Overall intelligence & Openness (+)	YES
Banks, G. C., et al. (2010). Smarter people are (a bit) more symmetrical: a meta-analysis of the relationship between intelligence and fluctuating asymmetry. *Intelligence (38)*, 393-401.	Intelligence (g-factor) & overall bilateral bodily symmetry (+) (meta-analytic)	YES
Bourdage, J. S., et al. (2007). Big Five and HEXACO model personality correlates of sexuality. *Personality and Individual Differences (43)*, 1506-1516.	Relationship exclusivity & Honesty-Humility (+)	YES
Bourdage, J. S., et al. (2007). Big Five and HEXACO model personality correlates of sexuality. *Personality and Individual Differences (43)*, 1506-1516.	Relationship exclusivity & Conscientiousness (+)	YES
Bourdage, J. S., et al. (2007). Big Five and HEXACO model personality correlates of sexuality. *Personality and Individual Differences (43)*, 1506-1516.	Relationship exclusivity & Agreeableness (+)	YES
Dunkel, C. S. (2013). The general factor of personality and general intelligence: evidence for a substantial association. *Intelligence (41)*, 423-427.	General factor of personality (GFP; substantive correlations among the socially desirable big five personality traits) (all +)	YES
Dunkel, C. S. (2013). The general factor of personality and general intelligence: evidence for a substantial association. *Intelligence (41)*, 423-427.	General factor of personality (GFP) & Intelligence (g-factor) (+)	YES
Escasa, M., et al. (2010). Male traits associated with attractiveness in Conambo, Ecuador. *Evolution and Human Behavior (31)*, 193-200.	Physical attractiveness & Warriorship (+)	YES
Escasa, M., et al. (2010). Male traits associated with attractiveness in Conambo, Ecuador. *Evolution and Human Behavior (31)*, 193-200.	Physical attractiveness & Hunting ability (+)	YES
Escasa, M., et al. (2010). Male traits associated with attractiveness in Conambo, Ecuador. *Evolution and Human Behavior (31)*, 193-200.	Physical attractiveness & Social rank (+)	YES
Feingold, A. (1992). Good-looking people are not what we think. *Psychological bulletin*, *111*(2), 304.	Physical Attractiveness & Mental Ability (+) (meta-analytic)	NO
Figueredo, A. J., et al. (2014). A psychometric assessment of human life history strategy: A meta-analytic construct validation. *Evolutionary Behavioral Sciences (8)*, 148-185.	GFP & Intelligence (g-factor) (+) (meta-analytic)	YES

Figueredo, A. J., et al. (2014). A psychometric assessment of human life history strategy: A meta-analytic construct validation. *Evolutionary Behavioral Sciences (8)*, 148-185.	GFP & emotional intelligence (+) (meta-analytic)	YES
Figueredo, A. J., et al. (2014). A psychometric assessment of human life history strategy: A meta-analytic construct validation. *Evolutionary Behavioral Sciences (8)*, 148-185.	GFP & Cooperativeness (+) (meta-analytic)	YES
Figueredo, A. J., et al. (2014). A psychometric assessment of human life history strategy: A meta-analytic construct validation. *Evolutionary Behavioral Sciences (8)*, 148-185.	GFP & Antagonism (-) (meta-analytic)	YES
Figueredo, A. J., et al. (2014). A psychometric assessment of human life history strategy: A meta-analytic construct validation. *Evolutionary Behavioral Sciences (8)*, 148-185.	Intelligence (g-factor) & emotional intelligence (+) (meta-analytic)	YES
Figueredo, A. J., et al. (2014). A psychometric assessment of human life history strategy: A meta-analytic construct validation. *Evolutionary Behavioral Sciences (8)*, 148-185.	Intelligence (g-factor) & Antagonism (-) (meta-analytic)	YES
Figueredo, A. J., et al. (2014). A psychometric assessment of human life history strategy: A meta-analytic construct validation. *Evolutionary Behavioral Sciences (8)*, 148-185.	Intelligence (g-factor) & Cooperativeness (+) (meta-analytic)	YES
Fink, B., et al. (2005). Facial symmetry and the 'big five' personality factors. *Personality and Individual Differences (39),* 523-529.	Facial symmetry & Extraversion (+)	YES
Fink, B., et al. (2005). Facial symmetry and the 'big five' personality factors. *Personality and Individual Differences (39),* 523-529.	Facial symmetry & Neuroticism (-)	YES
Fink, B., et al. (2016). Handgrip strength and the big five personality factors in men and women. *Personality and Individual Differences (88),* 175-177.	Physical strength & Extraversion (+)	YES
Fink, B., et al. (2016). Handgrip strength and the big five personality factors in men and women. *Personality and Individual Differences (88),* 175-177.	Physical strength & Neuroticism (-)	YES
Gurven, M., et al. (2013). How universal is the Big Five? Testing the five factor model among forager-farmers in the Bolivian Amazon. *Journal of Personality and Social Psychology (104)*, 354-370.	Prosocial personality & Industriousness (+)	YES
Humphreys, L. G., et al. (1985). Longitudinal correlation analysis of standing height and intelligence. *Child Development (56)*, 1465-1478.	Intelligence (g-factor) & Height (+)	YES
Judge, T. A. & Cable, D. M. (2004). The effect of physical height on workplace success and income: preliminary test of a theoretical model. *Journal of Applied Psychology (89)*, 428-441.	Height & Occupational Advancement (+) (meta-analytic)	YES
Judge, T. A. & Cable, D. M. (2004). The effect of physical height on workplace success and income: preliminary test of a theoretical model. *Journal of Applied Psychology (89)*, 428-441.	Height & Income (+) (meta-analytic)	YES

Judge, T. A., et al. (2009). Does it pay to be smart, attractive, or confident (or all three)? *Journal of Applied Psychology (93)*, 742-755.	Intelligence (g-factor) & Physical attractiveness (+)	YES
Judge, T. A., et al. (2009). Does it pay to be smart, attractive, or confident (or all three)? *Journal of Applied Psychology (93)*, 742-755.	Physical attractiveness & Income (+)	YES
Judge, T. A., et al. (2009). Does it pay to be smart, attractive, or confident (or all three)? *Journal of Applied Psychology (93)*, 742-755.	Intelligence (g-factor) & Income (+)	YES
Judge, T. A., et al. (2009). Does it pay to be smart, attractive, or confident (or all three)? *Journal of Applied Psychology (93)*, 742-755.	Intelligence (g-factor) & Level of education (+)	YES
Keller, M. C., et al. (2013). The genetic correlation between height and IQ: shared genes or assortative mating? *PLoS Genetics (9)*, e1003451.	Intelligence (g-factor) & Height (+)	YES
Kerry, N. & Murray, D. R. (2018). Strong personalities: investigating the relationships between grip strength, self-perceived formidability, and the Big Five personality traits. *Personality and Individual Differences (131),* 216-221.	Physical strength & Neuroticism (-)	YES
Kerry, N. & Murray, D. R. (2018). Strong personalities: investigating the relationships between grip strength, self-perceived formidability, and the Big Five personality traits. *Personality and Individual Differences (131),* 216-221.	Physical strength & Extraversion (+ in one sample; null in another)	MIXED
Lukaszewski, A. W. & Roney, J. R. (2011). The origins of extraversion: joint effects of facultative calibration and genetic polymorphism. *Personality and Social Psychology Bulletin (37)*, 409-421.	Physical strength & Physical attractiveness (+)	YES
Lukaszewski, A. W. & Roney, J. R. (2011). The origins of extraversion: joint effects of facultative calibration and genetic polymorphism. *Personality and Social Psychology Bulletin (37)*, 409-421.	Physical attractiveness & Extraversion (+)	YES
Lukaszewski, A. W. & Roney, J. R. (2011). The origins of extraversion: joint effects of facultative calibration and genetic polymorphism. *Personality and Social Psychology Bulletin (37)*, 409-421.	Physical strength & Extraversion (+)	YES
Lukaszewski, A. W. (2013). Testing an adaptationist theory of trait covariation: relative bargaining power as a common calibrator of an interpersonal syndrome. *European Journal of Personality (27)*, 319-410.	Physical strength & Physical attractiveness	YES
Lukaszewski, A. W. (2013). Testing an adaptationist theory of trait covariation: relative bargaining power as a common calibrator of an interpersonal syndrome. *European Journal of Personality (27)*, 319-410.	Physical attractiveness & Extraversion (+)	YES
Lukaszewski, A. W. (2013). Testing an adaptationist theory of trait covariation: relative bargaining power as a common calibrator of an interpersonal syndrome. *European Journal of Personality (27)*, 319-410.	Physical attractiveness & Negative emotionality (-)	YES

Lukaszewski, A. W. (2013). Testing an adaptationist theory of trait covariation: relative bargaining power as a common calibrator of an interpersonal syndrome. *European Journal of Personality (27)*, 319-410.	Physical attractiveness & Secure attachment (+)	YES
Lukaszewski, A. W. (2013). Testing an adaptationist theory of trait covariation: relative bargaining power as a common calibrator of an interpersonal syndrome. *European Journal of Personality (27)*, 319-410.	Physical attractiveness & Attachment anxiety (-)	YES
Lukaszewski, A. W. (2013). Testing an adaptationist theory of trait covariation: relative bargaining power as a common calibrator of an interpersonal syndrome. *European Journal of Personality (27)*, 319-410.	Physical attractiveness & Interpersonal trust (+)	YES
Lukaszewski, A. W. (2013). Testing an adaptationist theory of trait covariation: relative bargaining power as a common calibrator of an interpersonal syndrome. *European Journal of Personality (27)*, 319-410.	Physical strength & Extraversion (+)	YES
Lukaszewski, A. W. (2013). Testing an adaptationist theory of trait covariation: relative bargaining power as a common calibrator of an interpersonal syndrome. *European Journal of Personality (27)*, 319-410.	Physical strength & Negative emotionality (-)	YES
Lukaszewski, A. W. (2013). Testing an adaptationist theory of trait covariation: relative bargaining power as a common calibrator of an interpersonal syndrome. *European Journal of Personality (27)*, 319-410.	Physical strength & Secure attachment (+)	YES
Lukaszewski, A. W. (2013). Testing an adaptationist theory of trait covariation: relative bargaining power as a common calibrator of an interpersonal syndrome. *European Journal of Personality (27)*, 319-410.	Physical strength & Attachment anxiety (-)	YES
Lukaszewski, A. W. (2013). Testing an adaptationist theory of trait covariation: relative bargaining power as a common calibrator of an interpersonal syndrome. *European Journal of Personality (27)*, 319-410.	Physical strength & Interpersonal trust (+)	YES
Manson, J. H. (2015). Life history strategy and the HEXACO personality dimensions. *Evolutionary Psychology (13)*, 48-66.	Extraversion & Investment in kin (+)	YES
Manson, J. H. (2015). Life history strategy and the HEXACO personality dimensions. *Evolutionary Psychology (13)*, 48-66.	Agreeableness & Investment in kin (+)	YES
Manson, J. H. (2015). Life history strategy and the HEXACO personality dimensions. *Evolutionary Psychology (13)*, 48-66.	Altruism & Extraversion (+)	YES
Manson, J. H. (2015). Life history strategy and the HEXACO personality dimensions. *Evolutionary Psychology (13)*, 48-66.	Altruism & Honesty-Humility (+)	YES
Manson, J. H. (2015). Life history strategy and the HEXACO personality dimensions. *Evolutionary Psychology (13)*, 48-66.	Altruism & Conscientiousness (+)	YES

Mathes, E. W. & Kahn, A. (1975). Physical attractiveness, happiness, neuroticism, and self-esteem. *The Journal of Psychology (90)*, 27-30.	Physical attractiveness & Neuroticism (-)	YES
Mathes, E. W. & Kahn, A. (1975). Physical attractiveness, happiness, neuroticism, and self-esteem. *The Journal of Psychology (90)*, 27-30.	Physical attractiveness & self-esteem (+)	YES
Meier, B. P., et al. (2010). Are sociable people more beautiful? A zero-acquaintance analysis of agreeableness, extraversion, and attractiveness. *Journal of Research in Personality (44)*, 293-296.	Physical attractiveness & Agreeableness (+)	YES
Meier, B. P., et al. (2010). Are sociable people more beautiful? A zero-acquaintance analysis of agreeableness, extraversion, and attractiveness. *Journal of Research in Personality (44)*, 293-296.	Physical attractiveness & Extraversion (+)	YES
Meier, B. P., et al. (2010). Are sociable people more beautiful? A zero-acquaintance analysis of agreeableness, extraversion, and attractiveness. *Journal of Research in Personality (44)*, 293-296.	Agreeableness & Extraversion (+)	YES
Mitchem, D. G., et al. (2014). No relationship between intelligence and facial attractiveness in a large, genetically informative sample. *Evolution and Human Behavior (36),* 240-247.	Intelligence & Facial attractiveness (+)	NO
Morgan, A. B., & Lillenfeld, S. O. (2000). A meta-analytic review of the relationship between antisocial behavior and measures of executive function. *Clinical Psychology Review (20)*, 113-126.	Executive functioning & Antisocial behavior (-) (meta-analytic)	YES
Ormel, J., et al. (1994). Common mental disorders and disability across cultures. *Journal of the American Medical Association (272)*, 1741-1748	Overall physical health & Absence of ICD psychiatric disorders (+)	YES
Ormel, J., et al. (1994). Common mental disorders and disability across cultures. *Journal of the American Medical Association (272)*, 1741-1748	Absence of physical disabilities & Absence of ICD psychiatric disorders (+)	YES
Phalane, K.G., et al. (2017). Facial appearance reveals immunity in African men. *Scientific Reports (7)*, 7443.	Immune function (cytokine response) & Facial attractiveness (+)	YES
Prokosch, M. D., et al. (2005). Intelligence tests with higher g-loadings show higher correlations with body symmetry: Evidence for a general fitness factor mediated by developmental stability. *Intelligence (33)*, 203-213.	Intelligence (g-factor) & overall bilateral bodily symmetry (+)	YES
Rantala, M. J., et al. (2012). Adiposity, compared with masculinity, serves as a more valid cue to immunocompetence in human mate choice. *Proceedings of the Royal Society of London B (280)*, 20122495.	Immune function (antibody response) & Physical attractiveness (+)	YES
Roberts, B. W., et al. (2007). The power of personality: The comparative validity of personality traits, socioeconomic status, and cognitive ability for predicting important life outcomes. *Perspectives on Psychological Science (2)*, 313-345.	Intelligence & Age at death (+) (meta-analytic)	YES
Roberts, B. W., et al. (2007). The power of personality: The comparative validity of personality traits, socioeconomic status, and cognitive ability for predicting important life outcomes. *Perspectives on Psychological Science (2)*, 313-345.	Conscientiousness & Age at death (+) (meta-analytic)	YES

Roberts, B. W., et al. (2007). The power of personality: The comparative validity of personality traits, socioeconomic status, and cognitive ability for predicting important life outcomes. *Perspectives on Psychological Science (2)*, 313-345.	Neuroticism & Age at death (-) (meta-analytic)	YES
Roberts, B. W., et al. (2007). The power of personality: The comparative validity of personality traits, socioeconomic status, and cognitive ability for predicting important life outcomes. *Perspectives on Psychological Science (2)*, 313-345.	Intelligence & Occupational success (+) (meta-analytic)	YES
Roberts, B. W., et al. (2007). The power of personality: The comparative validity of personality traits, socioeconomic status, and cognitive ability for predicting important life outcomes. *Perspectives on Psychological Science (2)*, 313-345.	Positive personality traits & Occupational success (+) (meta-analytic)	YES
Schermer, J. A. & Vernon, P. A. (2010). The correlation between general intelligence (g), a general factor of personality (GFP), and social desirability. *Personality and Individual Differences (48)*, 187-189.	General factor of personality (GFP; substantive correlations among the socially desirable big five personality traits) (all +)	YES
Schermer, J. A. & Vernon, P. A. (2010). The correlation between general intelligence (g), a general factor of personality (GFP), and social desirability. *Personality and Individual Differences (48)*, 187-189.	General factor of personality (GFP) & Intelligence (g-factor) (+)	YES
Schulte, M. J. (2004). Emotional intelligence: not much more than g and personality. *Personality and Individual Differences (37)*. 1059-1068.	Intelligence (g-factor) & Emotional intelligence (+)	YES
Schulte, M. J. (2004). Emotional intelligence: not much more than g and personality. *Personality and Individual Differences (37)*. 1059-1068.	Intelligence (g-factor) & Neuroticism (-)	YES
Schulte, M. J. (2004). Emotional intelligence: not much more than g and personality. *Personality and Individual Differences (37)*. 1059-1068.	Emotional intelligence & Agreeableness (+)	YES
Sell, A., et al. (2017). Cues of upper body strength account for most of the variance in men's bodily attractiveness. Proceedings of the Royal Society of London B (284), 20171819.	Physical strength & Physical (bodily) attractiveness (+)	YES
Shackelford, T.K. & Larsen, R. J. (1999). Facial attractiveness and physical health. *Evolution and Human Behavior (20)*, 71-76.	Cardiovascular health & Facial attractiveness (+)	YES
Shackelford, T.K. & Larsen, R. J. (1999). Facial attractiveness and physical health. *Evolution and Human Behavior (20)*, 71-76.	Respiratory health & Facial attractiveness (+)	YES
Shamosh, N. A. & Gray, J. R. (2008). Delay discounting and intelligenge: a meta-analysis. *Intelligence (36),* 289-305.	Intelligence (g-factor) & delay discounting (i.e. future orientation) (+) (meta-analytic)	YES
Shoup, M. L. & Gallup, G. G., jr. (2008). Men's faces convey information about their bodies and their behavior: what you see is what you get. *Evolutionary Psychology (6)*, 469-479.	Grip strength & Facial attractiveness (+)	YES
Silventionen, K., et al. (2006). Genetic contributions to the association between height and intelligence: evidence from Dutch twin data from childhood to	Intelligence (g-factor) & Height (+)	YES

middle age. *Genes, Brain, & Behavior (5)*, 585-595.		
Sturgis, P., et al. (2010). Does intelligence foster generalized trust? An empirical test using the UK birth cohort studies. *Intelligence (38),* 45-54.	Intelligence & Interpersonal trust (+)	YES
Sutin, A. R., et al. (2009). Personality and career success: concurrent and longitudinal relations. *European Journal of Personality (23)*, 71-84.	Emotional stability & Income (+)	YES
Sutin, A. R., et al. (2009). Personality and career success: concurrent and longitudinal relations. *European Journal of Personality (23)*, 71-84.	Conscientiousness & Income (+)	YES
Van der Linden, D., et al. (2010). The General Factor of Personality: A meta-analysis of Big Five intercorrelations and a criterion-related validity study. *Journal of Research in Personality (44)*, 315-327.	General factor of personality (GFP; substantive correlations among the socially desirable big five personality traits) (all +) (meta-analytic)	YES
Van der Linden, D., et al. (2012). Overlap between general factors of personality in the big five, giant three, and trait emotional intelligence. *Personality and Individual Differences (53),* 175-179.	General factor of personality (GFP; substantive correlations among the socially desirable big five personality traits) (all +)	YES
Van der Linden, D., et al. (2012). Overlap between general factors of personality in the big five, giant three, and trait emotional intelligence. *Personality and Individual Differences (53),* 175-179.	General factor of personality (GFP) & Emotional intelligence (+)	YES
Von Rueden, C. R. et al. (2015). Adaptive personality calibration in a human society: Effects of embodied capital on prosocial traits. *Behavioral Ecology (26)*, 1071-1082.	Physical strength & Prosocial leadership orientation (+)	YES
Von Rueden, C. R. et al. (2015). Adaptive personality calibration in a human society: Effects of embodied capital on prosocial traits. *Behavioral Ecology (26)*, 1071-1082.	Education level & prosocial leadership orientation (+)	YES
Von Rueden, C. R. et al. (2015). Adaptive personality calibration in a human society: Effects of embodied capital on prosocial traits. *Behavioral Ecology (26)*, 1071-1082.	Physical strength & Education level (+)	YES
Weeden, J. & Sabini, J. (2005). Physical attractiveness and health in western societies: a review. *Psychological Bulletin (131)*, 635-653.	Female Physical attractiveness & Female Health (+)	YES
Weeden, J. & Sabini, J. (2005). Physical attractiveness and health in western societies: a review. *Psychological Bulletin (131)*, 635-653.	Male Physical attractiveness & Male Health (+)	NO
Weege, B., et al. (2015). Women's attractiveness perceptions of men's dance movements in relation to self-reported and perceived personality. *Evolutionary Psychological Science (1),* 223-27.	Dancing ability & Extraversion (+)	YES
Weege, B., et al. (2015). Women's attractiveness perceptions of men's dance movements in relation to self-reported and perceived personality. *Evolutionary Psychological Science (1),* 223-27.	Dancing ability & Neuroticism (-)	YES
Zebrowitz, L. A., et al. (2002). Looking smart and looking good: Facial cues to intelligence and their origins. *Personality and Social Psychology Bulletin (28)*, 238-249.	Intelligence & Facial attractiveness (+)	YES
Zebrowitz, L. A., et al. (2002). Looking smart and looking good: Facial cues to intelligence and their origins.	Intelligence & Facial symmetry (+)	YES

	Personality and Social Psychology Bulletin (28), 238-249.

Table S2

Correlations between traits and desirabilities in cross-cultural sample

	1	2	3	4	5	6	7	8	9	10
1. Intelligence (T)		0.36	0.31	0.45	0.35	0.70	0.20	0.20	0.32	0.06
2. Kindness (T)	0.39		0.34	0.31	0.25	0.24	0.66	0.25	0.22	0.08
3. Health (T)	0.35	0.39		0.39	0.29	0.19	0.23	0.75	0.28	0.10
4. Phys. Att. (T)	0.45	0.34	0.46		0.44	0.30	0.20	0.28	0.80	0.12
5. Resources (T)	0.37	0.26	0.29	0.42		0.22	0.17	0.22	0.33	0.38
6. Intelligence (D)	0.72	0.29	0.24	0.30	0.27		0.26	0.23	0.36	0.20
7. Kindness (D)	0.27	0.80	0.30	0.26	0.22	0.34		0.29	0.26	0.19
8. Health (D)	0.26	0.30	0.80	0.35	0.24	0.29	0.33		0.31	0.20
9. Phys. Att. (D)	0.25	0.20	0.29	0.63	0.27	0.35	0.28	0.36		0.26
10. Resources (D)	0.19	0.14	0.17	0.23	0.64	0.29	0.20	0.25	0.36	

Note: Data from male participants is below the diagonal; female participants are above the diagonal. T: absolute trait value; D: desirability.