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Original Article

What predicts romantic relationship satisfaction and mate retention intensity: mate preference fulfillment or mate value discrepancies?

Daniel Conroy-Beam [a,*], Cari D. Goetz [b], David M. Buss [a]

[a] Department of Psychology, University of Texas, 1 University Station, A8000, Austin, TX 78712, USA
[b] Department of Psychology, California State University, San Bernardino, 5500 University Parkway, San Bernardino, CA 92407, USA

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ABSTRACT

We test a novel evolutionary hypothesis predicting that mate value discrepancies, but not mate preference fulfillment, will regulate relationship satisfaction. Across Study 1 ($n = 259$) and Study 2 ($n = 300$), we employed new Euclidean measures able to capture preference fulfillment and compute estimates of mate value discrepancies. Relationship satisfaction was not related to how well mates fulfilled their partner's preferences. Mate value discrepancies, in contrast, interacted to predict relationship satisfaction: relationship satisfaction declined for participants whose mates were less desirable than their alternatives, but only for participants who were higher in mate value than their mates. Additionally, these satisfaction differences mediated a relationship between mate value discrepancies and mate retention behavior. This mediation pathway is unique to satisfaction; the same pathway was not observed through trust, a functionally distinct relationship affective state. Study 3 ($n = 301$) addressed a methodological limitation of Studies 1 and 2. We replicated the mate value discrepancy interaction to predict relationship satisfaction, but found an effect of ideal preference fulfillment on relationship satisfaction. These results provide evidence that mate preferences have important, functionally specific effects on within-relationship processes through contributing to two independent discrepancy variables: partner–self and partner-potential mate value discrepancies. They also largely contravene the hypothesis that mate preference fulfillment is the key to relationship satisfaction.

1. Introduction

Researchers have dedicated considerable attention to the psychology of mate selection, including universal sex differences in mate preferences (Buss, 1989), subtle contextual effects on desire (Haselton & Gangestad, 2006), and continual discovery of novel mate preferences (e.g. cues to exploitability, Goetz, Easton, Lewis, & Buss, 2012). But little research examines the role of mate preference psychology after mate selection—for instance, in guiding behaviors and affective states within relationships and their downstream consequences. In particular, what happens when our mates do not match our preferences? We address this void by applying new multivariate measures to explore novel evolutionary hypotheses about the relationships between mate preferences and relationship satisfaction. In implementing this approach we address (1) how a person's ideal mate preferences should theoretically influence relationship satisfaction in an existing relationship and (2) how relationship satisfaction influences behavior within relationships.

1.1. Ideal partner preferences and relationship satisfaction

Mate preferences evolve to guide sexually reproducing organisms, including humans, toward fitness-promoting mate choices (Sugiyama, 2005). Ancestral humans would have faced an array of potential mates who varied on qualities such as intelligence, health, cooperativeness, fertility, resource holding, and status. Which mates a person chose would have directly impacted their own health, their status and resources, the number and quality of offspring they produced, the provisioning and parenting their children received, and ultimately, their reproductive success. Modern humans are the descendants of prior people who were attracted to healthy, fertile, and kind mates and not their peers who were attracted to mates who were infectious, infertile, and inconsiderate.

Despite what people desire in a mate, they cannot always get what they want. Mate preferences function to motivate people to pursue fitness-promoting mates. However, our ability to acquire these mates depends on numerous factors, including ideal mates existing in the local environment, ideal mates being available to mate, and ideal mates being reciprocally attracted to those who choose them. A key consequence of these multiple mating dynamics is that some people inevitably end up with mates who do not wholly satisfy their ideal mate preferences.

* Corresponding author. Tel.: +1 210 857 0146.
E-mail address: dconroybeam@utexas.edu (D. Conroy-Beam).

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Precisely how these preference–partner mismatches influence long-term relationships is unclear. One intuitive hypothesis is that natural selection would design our psychology to motivate us to abandon mateships that fall short of our adaptive standards. Fletcher, Simpson, Thomas, and Giles (1999) captured this hypothesis in their study of relationship ideals. They proposed that a mismatch between ideal standards and perceptions of partners would cause a decrease in satisfaction with the relationship as a means of motivating either leaving or altering one's relationship.

Although others have provided some support for this hypothesis (e.g., Meltzer, McNulty, Jackson, & Karney, 2014), the ideal standards model has two limitations. The first is a theoretical issue: a satisfaction mechanism linked directly to mate preferences would have important design flaws (Conroy-Beam, Goetz, & Buss, 2015). Critically, a satisfaction adaptation that responds solely to mate preference fulfillment would not account for important information about mate replaceability. Abandoning a partner who does not fit one's mate preferences would be counterproductive if that required ultimately settling for a partner who was an even poorer fit. A condition-dependent satisfaction adaptation responsive to cues to the probability of finding a better mateship if one's current mateship dissolved would be better designed than one not containing this feature.

One potential input to assessing mate replaceability is the discrepancy between partner mate value—roughly, a person's overall desirability to their pool of potential mates—and own mate value. Partners higher in mate value than oneself are, more or less by definition, difficult to replace. Alternative mates who are also higher in mate value can afford to be more selective in mate choice and will be difficult to attract. A person who abandoned a partner higher in mate value than themselves would risk having to settle for an alternative mate who is a worse fit to their preferences. Higher mate value mates are also more likely to be lured away by mate poachers (Schmitt, 2004; Schmitt & Buss, 2001), and therefore require more investment to hold on to. Conversely, leaving a partner who is lower in mate value than oneself affords the opportunity to attract a mate who better fulfills one's mate preferences. Satisfaction adaptations that motivate defection from partners lower in mate value would be favored over those lacking this important design feature.

In addition to partner differences in mate value, mate replaceability is a function of the pool of alternative mates. Abandoning a partner who is a poor fit to preferences would be imprudent from an evolutionary perspective if there were no better potential partners available. Conversely, holding on to even a good partner might not be the most beneficial decision if available obtainable alternatives are better still. A well-designed satisfaction adaptation would down-regulate satisfaction in response to mate value discrepancies between actual partner and potential partners, but not in the face of mere mismatch between mate preferences and partner traits.

1.2. Measuring preference fulfillment

The second limitation of existing research relating ideal preferences to relationship satisfaction is methodological. Preference fulfillment in extant research is measured exclusively in univariate terms—often as bivariate correlations between stated preferences and corresponding partner qualities. However, potential mates do not come à la carte: each potential mate offers a collection of qualities that must be accepted or rejected as a whole. A potential mate satisfying all of a person's preferences is rare. Most people on the mating market have a choice between an array of imperfect matches, each of whom satisfies and fails to satisfy different subsets of their mate preferences. For the majority of people, mate selection necessarily entails tradeoffs and compromises—sacrificing some preferences so that other preferences may be fulfilled. Univariate measures of preference fulfillment can miss the forest for the trees. Careful balancing across multiple mate preferences can guide us to long-term mates who match our mate preferences overall even if they fail to fulfill any particular preference.

We have developed a multivariate method that is more able to capture overall preference fulfillment: Euclidean distances between mate preferences and partner qualities. A person's preferences and their partner's actual qualities can be represented as a location in a multidimensional preference space, with each axis in this space representing a preference dimension and location representing standing on that trait. The distance between a person's preference-point and their partner's qualities point is a quantitative, multidimensional measure of preference fulfillment that captures the fact that mate selection requires matching collections of preferences with collections of traits. As such, Euclidean distances provide a more appropriate measure of matches between preferences and partners than matches on single dimensions alone. Importantly, this measure can also be calculated for the traits of actual partners or potential partners and with regard to the preferences of single people or whole groups. Euclidean distances can be used to calculate both preference fulfillment and the two mate value discrepancies we predict to be conceptually related to relationship satisfaction.

1.3. Current Studies

We predicted that satisfaction mechanisms would not track preference fulfillment but instead would track two mate value discrepancies: discrepancies between partner and self and discrepancies between partner and potential partners. Here we tested these predictions across two studies using our new Euclidean measure of preference fulfillment. We calculated (1) Euclidean estimates of participants' preference fulfillment, (2) mate value discrepancies between participants' potential partners and their current partners, and (3) mate value discrepancies between participants' partners and themselves.

In Study 1, we predicted that relationship satisfaction would (1) decrease when potential partners fulfilled mate preferences more than actual partners (partner-potential mate value discrepancies), (2) increase when partner–mate value exceeded self-mate value (partner–self mate value discrepancies), and (3) not be related to the degree to which mates fulfilled mate preferences (preference fulfillment). In Study 2, we sought to (1) replicate the effects of Study 1, (2) test the prediction that discrepancy-related differences in satisfaction in turn predict relationship behaviors, (3) and demonstrate that these effects were specific to relationship satisfaction and not attributable to relationship evaluations in general. Study 3 replicated the findings of Studies 1 and 2 with a modified methodology designed to address a limitation in the earlier studies.

2. Study 1: Mate Value Discrepancies, Preference Fulfillment, and Relationship Satisfaction

Study 1 explored the relationships between preference fulfillment, mate value discrepancies, and relationship satisfaction. We calculated preference fulfillment and mate value discrepancies using our new multivariate method. We expected that satisfaction would be higher among participants mated to partners higher in mate value than themselves and among participants whose actual partners matched their preferences better than alternative partners.

2.1. Method

2.1.1. Participants

Participants were 259 people (140 female) recruited from Amazon's Mechanical Turk. The posting was titled “Complete a Psychological Survey on Attraction” and described the study as “A very brief (<15 min) survey on what you desire in a mate as well as your relationship history.” All participants reported being in an ongoing, heterosexual, long-term relationship. Of these participants, 148 were married, 88

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reported dating exclusively, 22 dating casually, 4 "engaged," and 1 reported "living together." Participants had been in their relationships for 90.65 months on average ($SD = 105.85$; $Mdn = 48$). Neither gender nor relationship length moderated any reported results. The average age for female participants was 35.22 ($SD = 11.38$); males were 34.34 years old on average ($SD = 10.83$).

2.1.2. Measures

2.1.2.1. Mate preferences. Participants completed the mate preference questionnaire from Hill (1945) and Buss (1989) with some modifications. Participants completed the questionnaire with the original 18 dimensions as well as nine added dimensions common to mating research: dominant, confident, intelligent, masculine, feminine, muscular, kind, mutually attracted, and age difference. Participants separately rated the importance of these traits in their ideal-long term partner 7-point Likert scales ranging from "Irrelevant" to "Indispensable." We did not define "ideal" to participants, but rather left "ideal" to the participants' interpretation. We expected that participants would interpret "ideal long-term mate" to mean the mate they would most desire as a long-term mate. These ideal preferences are assumed to, and show evidence of, reflecting features that would have been fitness-promoting throughout human evolutionary history (Buss, 1989).

Additionally, participants rated the extent to which they felt these traits described their actual long-term mate using 7-point Likert scales ranging from "Strongly Disagree" to "Strongly Agree." Participants reported the actual age difference between themselves and their partners in years. Finally, participants self-rated their own standing on the mate preference dimensions on the same 7-point agreement Likert scales, excluding relationship-specific dimensions such as age difference, mutual love, and mutual attraction.

A small subset of the larger sample ($n = 19$) appeared to misunderstand the question asking for ideal age difference between themselves and their partners as asking for ideal age of partner. This resulted in, for instance, 25-year-old participants stating that they ideally preferred partners 20 years younger than themselves. Participants separately reported their ideal minimum and ideal maximum partner ages; we identified all participants who stated an ideal age difference outside of their ideal range as having misunderstood the age difference question. These participants were eliminated from the sample and excluded from all analyses.

2.1.2.2. Relationship satisfaction. Participants reported their relationship satisfaction using the Quality Marriage Index (QMI; Norton, 1983). The QMI asks participants to rate their agreement with five statements such as "We have a good relationship" on a 7-point Likert scale ranging from "Strongly Disagree" to "Strongly Agree." Participants also reported their happiness in their relationship, everything considered, on a 10-point scale ranging from "Extremely unhappy" to "Extremely happy." Ratings on each question were standardized before averaging into a composite QMI score.

2.1.3. Data analysis

Preference fulfillment was calculated as the Euclidean distance between a person's ideal mate preferences and their partner's corresponding traits. For each preference dimension, we calculated the difference between each participant's stated ideal and their partner's actual trait standing. We squared and summed these differences and calculated the square root of this sum for each participant. The result is the straight-line distance between a person's ideal mate and their actual mate through the multidimensional preference space. A large preference fulfillment value indicates poor fit to preferences whereas a small preference fulfillment value indicates close fit.

We calculated partner-potential mate value discrepancies by comparing each participant's actual long-term mate to the mates of all other participants in the sample. For each participant, we first calculated the Euclidean distance between their ideal mate preferences and (1) their actual chosen mate and (2) each other mate reported by all other same-sex participants. The partner-potential mate value discrepancy for each participant was calculated as the proportion of other participants' mates who would have a shorter Euclidean distance from that participant's preferences than the participant's actual long-term mate. A larger partner-potential discrepancy value indicates that more alternative partners would fulfill the participant's preferences better than their actual mate, a smaller partner-potential discrepancy value indicates fewer alternative partners would fulfill the participant's preferences better than their actual mate.

Partner–self mate value discrepancies were calculated in a three-step process. First, we computed the average male and female preference for each dimension. Average preferences excluded relationship-specific dimensions because these could not be collected for self-ratings. We next calculated the Euclidean distance between (1) each participant's traits and the average preferences of the participant's opposite sex and (2) each participant's mate's traits and the average preferences of the participant's same sex. These distances served as estimates of the mate value of each participant and their mate. Finally, we subtracted each participant's mate value from their partner's mate value for a partner–self mate value discrepancy. A positive value for this variable indicates that the participant's mate is higher in mate value to the opposite sex than the participant is.

2.2. Results

Table 1 presents the correlation between preference fulfillment, mate value discrepancies, and relationship satisfaction.

We first conducted a linear regression predicting relationship satisfaction from the main effects of preference fulfillment, partner-potential mate value discrepancies, and partner–self mate value discrepancies. The overall model was significant, $F(3, 252) = 30.31$, $p < .001$. Variance inflation factor values were good for all predictors (maximum $VIF = 1.99$). Consistent with predictions, preference fulfillment was not a significant predictor of relationship satisfaction in this model, $\beta = .06$, $p = .41$. Partner-potential mate value discrepancies significantly negatively predicted relationship satisfaction, $\beta = -.53$, $p < .001$. People whose mates fulfilled their preferences less than alternative mates were less satisfied with their relationships. Partner–Self mate value discrepancy marginally significantly predicted relationship satisfaction ($\beta = .11$, $p = .05$). Participants were more satisfied with partners higher in mate value than themselves.

We next conducted an exploratory AIC-guided bidirectional stepwise regression (for validation of this model selection procedure, see Yamashita, Yamashita, & Kamimura, 2007). This regression began with a null model and extended in scope to the full three-way interaction. The final model was significant, $F(3, 252) = 38.35$, $p < .001$, and retained only the mate value discrepancy variables and their interaction (Table 2). Variance inflation factor values were good for all predictors (maximum $VIF = 1.75$). This model explained 31.34% of the variance in relationship satisfaction.

The interaction between partner–self and partner-potential discrepancies was significant in predicting relationship satisfaction, $\beta = .21$, $p < .001$. Participants lower in mate value than their partners were generally satisfied regardless of the pool of potential mates; participants higher in mate value than their partners became increasingly

Table 1
Zero-order correlations between relationship satisfaction, preference fulfillment, and mate value discrepancies.

	1	2	3	4
1. Relationship satisfaction				
2. Preference fulfillment	−.32			
3. Partner-potential MVD	−.50	.70		
4. Partner–Self MVD	.20	−.14	−.18	

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Table 2
Regression coefficients for predicting relationship satisfaction from mate value discrepancies.

Predictor	*b*	*SE b*	*β*	*p*
Partner-potential MVD	−1.49	.22	−.41	<.001
Partner–Self MVD	−.95	1.21	.10	.43
Partner-potential MVD × Partner–Self MVD	16.33	3.80	.21	<.001

dissatisfied with their relationships as better alternative partners became available (Fig. 1).

2.3. Discussion

The findings of Study 1 are consistent with our hypotheses. Mate preference fulfillment does not directly affect relationship satisfaction, but instead mate preferences exert influence through their role in more complex and subtle mate value discrepancy variables. Although we did not explicitly predict the mate value discrepancy variables would interact, their interaction is consistent with our predictions. Participants mated to relatively high-value partners, who would be difficult to replace, remained satisfied regardless of the pool of alternatives. However, participants mated to relative low-value mates were satisfied only if they would be unable to find more suitable alternative mates.

3. Study 2: Mate Value Discrepancies and Mate Retention Behavior

Study 2 examined mate preferences, mate value discrepancies, and relationship satisfaction in order to replicate the findings of Study 1 but included two new variables: mate retention behavior and relationship trust. We hypothesized that the function of experiencing changes in relationship satisfaction is to motivate relationship maintenance or termination behaviors. High relationship satisfaction has been hypothesized to motivate increased investment in romantic relationships whereas low satisfaction motivates either alteration of or defection from relationships (Conroy-Beam et al., 2015; Fletcher et al., 1999). This hypothesis predicts a mediational pathway: high partner–self mate value discrepancies and low partner-potential discrepancies will increase relationship satisfaction which will in turn increase relationship-investing behaviors. In Study 2, we collected reports of mate retention behaviors: behaviors that range from vigilance to violence and function to prevent partner infidelity or defection (Buss & Shackelford, 1997). These behaviors are potentially costly but function to maintain current relationships. We predicted that mate retention behaviors would be positively related to relationship satisfaction. Additionally, to show that this mediational pathway was a specific, functional property of relationship satisfaction, we also included reports of trust in long-term partners. Trust is a relationship evaluation independent from relationship satisfaction that is also important to close relationships (e.g. see Rempel, Holmes, & Zanna, 1985). Mate preferences and mate value discrepancies should provide unique input to mechanisms producing relationship satisfaction, but should not influence all relationship evaluations in the same way. We made no *a priori* predictions about the relationships between mate value discrepancies, trust, and mate retention; we simply expected that this mediational pathway would differ from that of relationship satisfaction. As in Study 1, we predicted that mere match between preferences and partner traits, mate preference fulfillment, would not be related to relationship satisfaction or mate retention behavior.

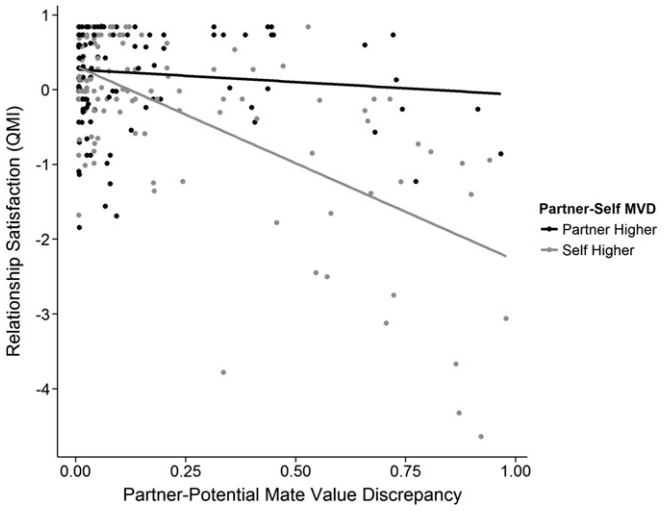

Fig. 1. The interaction between partner-potential and partner–self mate value discrepancies in predicting relationship satisfaction. Partner–self mate value discrepancies are dichotomized for presentation. The availability of more preference fulfilling partners decreases satisfaction, but less so for people mated to relatively high mate value partners.

3.1. Method

3.1.1. Participants

Participants were 300 people (132 female) recruited from Amazon's Mechanical Turk using identical posting as for study 1. Female participants were 32.88 years old on average ($SD = 10.03$); males were 35.04 years old on average ($SD = 10.71$). All participants reported being in ongoing long-term, heterosexual relationships; of these 17 reported dating casually, 72 dating exclusively, 31 engaged, 171 married, and 3 reporting "other" relationship statuses: "separated", "living together", and "long-term partnership." Participants had been in their relationships for $M = 68.99$ months on average ($SD = 86.30$; $Mdn = 36$). Neither gender nor relationship length moderated the reported results.

3.1.2. Measures

3.1.2.1. Ideal mate preferences. Participants completed the same ratings of ideal preferences, partner qualities, and own qualities as in Study 1. A small subset of participants ($n = 6$) misunderstood the question asking for ideal age difference as asking for ideal age of partner. Because few participants misunderstood this question, we were able to identify these participants by relying on well-established trends in age difference preferences across age and sex (Kenrick & Keefe, 1992; Campos, Otta, & Siqueira, 2002). We used a linear regression to predict age difference preferences from participant age, sex, and the interaction between age and sex and calculated standardized residuals for each participant. Participants with standardized residuals greater than 4 were identified as having misunderstood the question and were excluded from all analyses.

3.1.2.2. Relationship evaluations. As in Study 1, participants completed the QMI as a measure of relationship satisfaction. As a measure of trust, participants completed the Dyadic Trust Scale (Larzelere & Huston, 1980). This asked participants to rate their agreement with statements like "My partner is truly sincere in their promises" on 7-point Likert scales ranging from "Strongly Disagree" to "Strongly Agree."

3.1.2.3. Mate retention behavior. Participants completed the short form of the Mate Retention Inventory (MRI-SF; Buss, Shackelford, & McKibbin, 2008). Participants reported how often they performed each of 38 mate retention tactics in the past year on a 4-point scale ranging from "Never performed this act" to "Often performed this act". We analyzed mate retention as the average rating across all acts. Results did not change when we analyzed mate retention using the 5 subgroupings of the MRI from Shackelford, Goetz, and Buss (2005).

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3.2. Results

First, we replicated the results of Study 1. We created a model predicting relationship satisfaction from preference fulfillment and the interaction of partner–self and partner-potential mate value discrepancies. The overall model was significant, $F(4, 286) = 24.28$, $p < .001$. Variance inflation factors were again acceptable for this model (maximum $VIF = 3.67$). Partner–Self and partner-potential mate value discrepancies significantly interacted to predict relationship satisfaction, $\beta = .28$, $p < .001$ (Fig. 2). As in Study 1, participants mated to higher mate value partners were satisfied regardless of available alternatives. Participants higher in mate value than their partners were satisfied only in the absence of more desirable alternatives. Preference fulfillment was not a significant predictor of relationship satisfaction in the presence of the mate value discrepancy interaction, $\beta = -.06$, $p = .49$. Excluding preference fulfillment, this model explained 25.22% of the variance in relationship satisfaction.

Next, we tested our mediational predictions using path modeling. Table 3 presents the zero-order correlation matrix between mate value discrepancies, preference fulfillment, trust, relationship satisfaction, and mate guarding.

Fig. 3 presents the final path model based on standardized data. The model showed good overall fit to the data, $\chi^2(3) = 1.862$, $p = .601$, RMSEA < .001 95% CI [.00, .08], CFI = 1.00. All paths in the model from preference fulfillment were fixed to zero. Consistent with the regression, the interaction between partner–self and partner-potential mate value discrepancies significantly predicted relationship satisfaction. The interaction between mate value discrepancies also significantly predicted relationship trust. The interaction between discrepancy variables in predicting trust was qualitatively similar to that of the interaction predicting relationship satisfaction: trust declined with increasing partner-potential mate value discrepancies for participants higher in mate value than their partners. However, trust slightly increased with partner-potential mate value discrepancies for participants lower in mate value than their partners. Relationship satisfaction showed a significant positive relationship with mate retention behavior; relationship trust showed a significant negative relationship with mate retention behavior.

The indirect path from the mate value discrepancy interaction to mate retention through relationship satisfaction was significant, $p = .01$. This indicates a mediational path whereby mate value discrepancies interact to predict increased relationship satisfaction, which in turn predicts increased mate retention behavior. The effects for relationship trust were opposite those of relationship satisfaction. The indirect path from the mate value discrepancy interaction through relationship trust was significant, $p = .001$, but increased relationship trust predicted a decrease in mate retention behavior. Table 4 presents all parameter estimates.

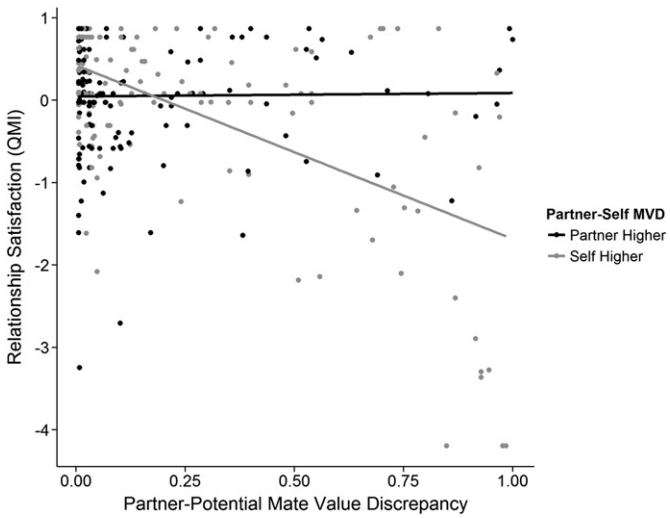

Fig. 2. The interaction between partner-potential and partner–self mate value discrepancies in predicting relationship satisfaction in Study 2. Participants with partners higher in mate value than themselves are satisfied regardless of the availability of alternatives; participants higher in mate value than their partners are satisfied only in the absence of more desirable alternatives.

Table 3
Zero-order correlations between relationship satisfaction, preference fulfillment, and mate value discrepancies.

	1	2	3	4	5	6
1. Relationship satisfaction						
2. Trust	.55					
3. Mate guarding	.09	−.20				
4. Preference fulfillment	−.29	−.17	−.09			
5. Partner-potential MVD	−.39	−.22	−.12	.82		
6. Partner–Self MVD	.17	.10	.13	.16	−.30	

3.3. Discussion

Study 2 replicated the results of Study 1: partner-potential and partner–self mate value discrepancies interacted to predict relationship satisfaction. Participants mated to partners higher in mate value were satisfied regardless of whether their partners matched their preferences. Participants with mates lower in mate value were satisfied only if their actual mates satisfied their mate preferences better than alternative mates.

In addition to replicating Study 1, Study 2 also extended the effects of mate value discrepancies to mate retention behaviors. Relationship satisfaction mediated a relationship between mate value discrepancies and mate retention tactics such that when peoples' partners were difficult to replace, they were more satisfied with their relationships and consequently devoted more effort to mate retention. Importantly, the mediated effects of mate value discrepancies on mate retention behavior were specific to relationship satisfaction: relationship trust has the opposite effect on mate retention behavior. Mate value discrepancies thus do not have a domain-general effect on relationship affects or relationship behaviors. Rather, as predicted by our evolutionary hypothesis, mate value discrepancies have specific effects on relationship satisfaction, functionally designed to motivate relationship maintenance or termination in response to cues of mate replaceability.

However, Studies 1 and 2 both suffered an important methodological limitation concerning the scales on which participants rated their ideal preferences and their actual mates. In both studies, we asked participants to rate how indispensible traits like intelligence were in an ideal partner; yet for actual partners, participants rated the extent to which they agreed their partners were intelligent. Because these are slightly different scales, it is possible that a participant may, for example, (1) ideally desire an intelligent partner, (2) be mated to an intelligent partner, but (3) not find their ideal partner's intelligence indispensible relative to other qualities (e.g. kindness, physical attractiveness). Because we asked about importance of traits like intelligence and not ideal value of intelligence, our Euclidean analyses would treat this situation as though there were a discrepancy between partner and ideal even though this participant's preferences were perfectly fulfilled. We conducted Study 3 to address this limitation by asking participants to rate themselves, their ideal partners, and their actual partners on the same scale.

4. Study 3: Replicating the Effects of Mate Value Discrepancies on Relationship Satisfaction Using Identical Item Formats

Study 3 attempted to replicate the central relationship satisfaction finding of Studies 1 and 2 while correcting the key methodological limitation that ideal partners, actual partners, and participants were rated on different rating scales. In Study 3, we calculate Euclidean measures

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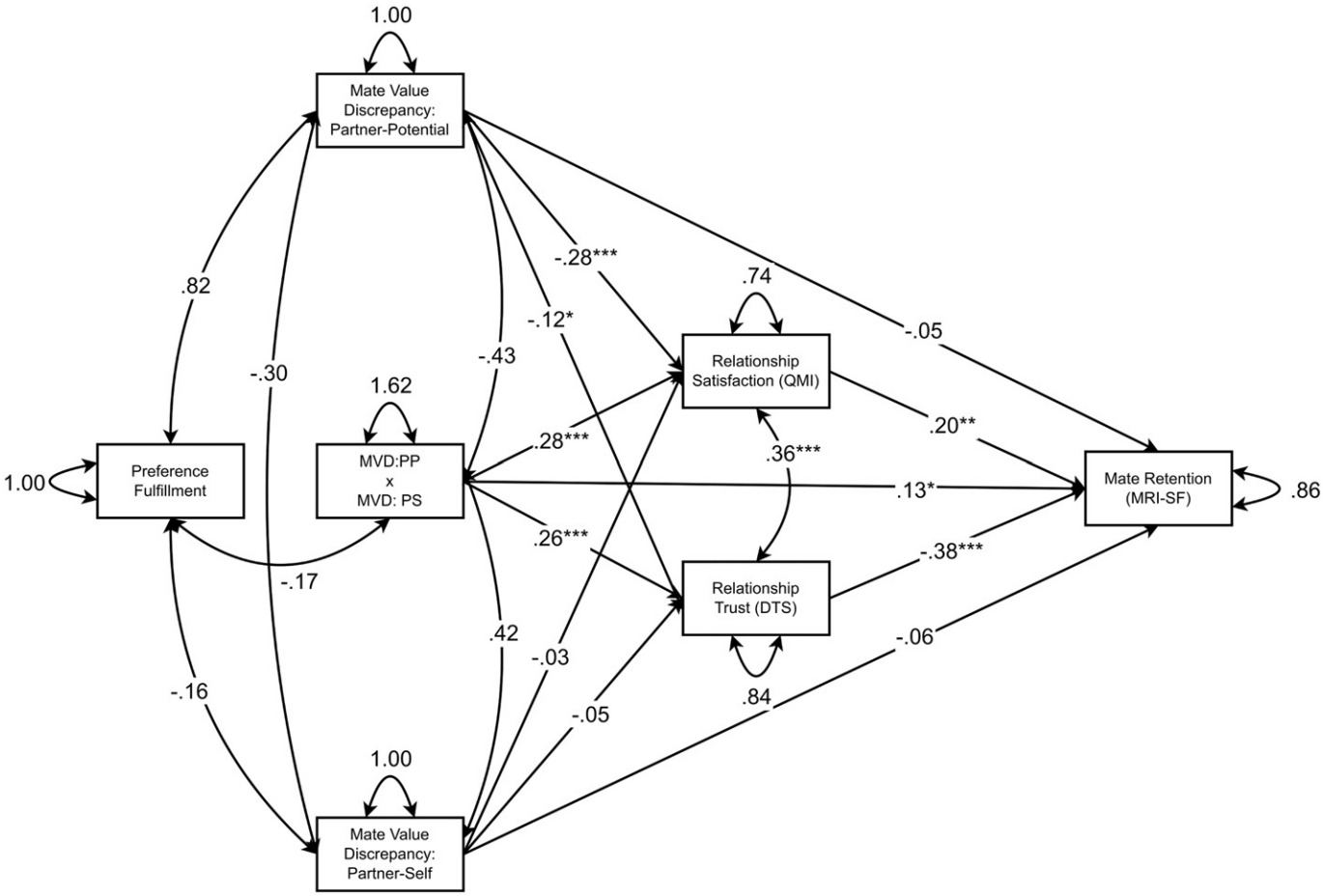

Fig. 3. Path model relating mate value discrepancies, satisfaction, trust, and mate retention. Relationship satisfaction predicts increased mate retention in response to mate irreplaceability. Relationship trust has the opposite effect: increased trust predicts decreased mate retention behavior. All paths from preference fulfillment were fixed to zero and are not presented in this model. Note: * $p < .05$; ** $p < .01$, *** $p < .001$.

of preference fulfillment, mate value, and mate value discrepancies based on ratings of identical items and item formats for self, partner, and ideal long-term mate.

4.1. Method

4.1.1. Participants

Participants were 301 people (150 female) recruited from Amazon's Mechanical Turk. Participants are the subset of mated people recruited for a larger study on attraction using the same posting as for Studies 1 and 2. Female participants were 34.43 years old on average (SD = 10.43); male participants were 33.42 years old on average (SD = 33.42, SD = 10.23). Participants were all in ongoing, long-term committed relationships. Of these, 19 reported dating casually, 88 dating exclusively, 29 engaged, 156 married, and 8 "other": 4 described cohabitating, 2 reported long-term partners, 1 reported being divorced with a long-term boyfriend, and 1 reported being in a polyamorous relationship. Relationships were M = 85.98 months long on average (SD = 103.97; Mdn = 48). Neither gender nor relationship length moderated the reported results.

Table 4
Path model parameter estimates.

Variable	Estimate	SE	p
Trust			
Mate value discrepancy: partner-potential (MVDPP)	−.12	.06	.03
Mate value discrepancy: partner–self (MVDPS)	−.05	.06	.42
MVDPP × MVDPS interaction	.27	.05	<.001
Satisfaction			
Mate value discrepancy: partner-potential (MVDPP)	−.28	.06	<.001
Mate value discrepancy: partner–self (MVDPS)	−.03	.06	.56
MVDPP × MVDPS interaction	.28	.04	<.001
Mate retention behavior			
Relationship satisfaction	.20	.07	.004
Relationship trust	−.39	.07	<.001
Mate value discrepancy: partner-potential (MVDPP)	−.05	.06	.41
Mate value discrepancy: partner–self (MVDPS)	.06	.06	.291
MVDPP × MVDPS interaction	.131	.04	.01
Indirect paths			
Satisfaction	.06	.02	.009
Trust	−.10	.04	<.001

4.1.2. Measures

4.1.2.1. Ideal mate preferences. Participants rated their ideal preferences, partner qualities, and own qualities on a modified version of the mate preference instrument from Studies 1 and 2. The modified scale contained 23 bipolar adjective pairs rated on a 7-point scale from, for example, "Very undependable" to "Very dependable." The modified instrument had the same items as the scales from studies 1 and 2, but excluded all relationship-specific items (e.g. "similar political views"). The modified instrument also included several new dimensions: "loving", "religious", and an age item ranging from "Young Adult" to "Elderly." Participants rated, in random order, what they ideally desired in a long-term, where they thought their actual long-term mate fell on each dimension, and where the participants thought they themselves fell on each dimension. Ratings of ideal preferences, actual mates, and

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self were thus completed on identical rating scales representing perceived trait value across the 23 dimensions.

4.1.2.2. Relationship Satisfaction. Participants rated their satisfaction with their ongoing long-term relationships using the QMI as in Studies 1 and 2.

4.2. Results

We again created a regression model predicting relationship satisfaction from preference fulfillment and the interaction of partner–self and partner-potential mate value discrepancies. The overall model was significant, $F(4, 296) = 18.67$, $p < .001$. Variance inflation factors were acceptable for all predictors (maximum $VIF = 4.50$). Mate value discrepancies once again interacted to predict relationship satisfaction, $\beta = -.20$, $p < .001$. Just as in Studies 1 and 2, participants mated to higher mate value partners were relatively satisfied regardless of how their mate compared to alternatives. Participants mated to lower mate value partners were only satisfied if their mates were closer to their preferences than most alternatives (Fig. 4).

In contrast to Studies 1 and 2, preference fulfillment was a significant predictor of relationship satisfaction, $\beta = -.20$, $p = .04$. Even when controlling for mate value discrepancies, participants mated to partners further from their ideal long-term mate preferences were less satisfied with their relationships.

4.3. Discussion

Study 3 replicated the relationship between mate value discrepancies and relationship satisfaction found in Studies 1 and 2. Participants were satisfied with mates who were irreplaceable: either higher in mate value than participants or higher in mate value than alternative mates. This replication is crucial given that Study 3 addressed an important methodological limitation of Studies 2 and 3: participants rated their ideal mates, actual mates, and themselves on identical rating scales, allowing Euclidean distances to be interpreted more straightforwardly. This suggests that the predictive power of Euclidean mate value discrepancies found in Studies 1, 2, and 3 emerges from the ability of these measures to approximate realistic internal regulatory variables and not merely from methodological error.

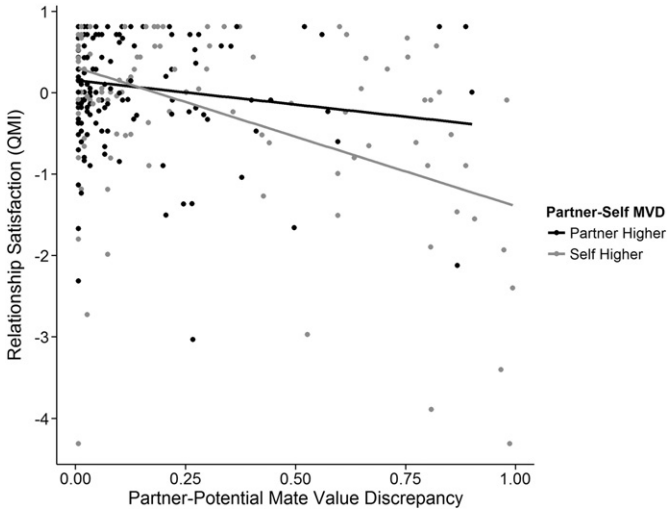

Fig. 4. The interaction between partner-potential and partner–self mate value discrepancies in predicting relationship satisfaction in Study 3. Participants with partners higher in mate value than themselves are relatively satisfied regardless of the availability of alternatives; participants higher in mate value than their partners are satisfied only in the absence of more desirable alternatives.

Curiously, though, Study 3 produced a result not found in Studies 1 and 2: preference fulfillment did significantly predict relationship satisfaction when controlling for mate value discrepancies. Participants were more satisfied with mates who better fulfilled their mate preferences, a surprising finding counter to our predictions. That this effect emerged in just one of our three studies could indicate that Study 3's result was a type I error. However, this effect could also indicate that preference fulfillment is related to relationship satisfaction, but that its effect is weak, unreliable, or moderated by other variables that varied across our samples. Altogether, mate value discrepancies appear to have a clear and theoretically consistent effect on relationship satisfaction but mate preference fulfillment does not. Further research is necessary to elucidate the relationship between mate preference fulfillment and relationship satisfaction.

5. General Discussion

Our findings provide new evidence of conceptually and predictively important roles for mate preferences in ongoing relationships. Cues to mate replaceability—specifically mate value discrepancies—appear to have important and reliable effects on relationship satisfaction. The availability of partners who better fulfill one's preferences decreases relationship satisfaction, especially for people mated to partners lower in mate value than themselves. Mate preference fulfillment alone, despite its important role in mate selection, showed only mixed evidence of regulating affects or behaviors within relationships after their formation.

These novel findings are also consistent with extant research on exposure to attractive alternatives (e.g. Miller, 1997). Exposure to attractive alternatives is known to decrease commitment to relationships (Johnson & Rusbult, 1989) and attention to these alternatives can predict relationship dissolution (Miller, 1997). Our new findings reveal the specific inputs activating relationship satisfaction mechanisms that undergird these attractive alternative effects. Mere exposure to attractive alternatives presumably influences relationship satisfaction by altering perceptions of mate replaceability, specifically through changing estimates of partner-potential mate value discrepancies. Future research could determine whether the effects of exposure to attractive alternatives are moderated by partner–self mate value discrepancies as partner-potential mate value discrepancies are here.

The efficacy of our discrepancy variables in predicting relationship satisfaction suggests great utility in using these variables and other multivariate analyses of mate preferences in future research on the downstream consequences of mate preferences. Mate value discrepancies have been predicted to mediate important within-relationship processes such as jealousy (Buss, 2000) and intimate partner violence (Buss & Duntley, 2011) but empirical tests of these predictions have been stymied by the lack of a sound operationalization of these key discrepancies. The Euclidean method applied here can address this empirical gap by providing an objective, quantitative estimate of these previously elusive variables. Additionally, the Euclidean method can be used to calculate not only these discrepancy variables, but also other potentially important variables including a person's mate value to the opposite sex in general as well as their mate value in particular contexts, to particular groups, or individual people. Continued application of our Euclidean discrepancy variables promises to greatly expand understanding of mate preferences and their effects on behavior in mate selection, romantic relationships, and beyond.

The predictive power of our Euclidean mate value discrepancy variables is particularly impressive given that they were calculated mathematically from participants' reports and did not depend on participants' subjective perceptions of these discrepancies. We did not ask participants at any point to compare their actual mate to their ideal mates or to other potential mates. Instead, we are able to derive these discrepancies from objective, mathematical comparisons of participants' perceptions of themselves, their mates, and their ideals. This

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suggests that our Euclidean mate value discrepancies have predictive power because they are able to approximate comparisons human mating psychology actually computes. Future research could explore this possibility by examining the relationship between objectively computed Euclidean mate value discrepancies and participants' subjective perceptions of these discrepancies.

Nonetheless, the Euclidean analysis we applied here has limitations that future research could address. Most importantly, our Euclidean distances assume that all mate preferences are equally important in that all preference dimensions were weighted equally in determining Euclidean distances between mates and preferences. This is an unrealistic assumption given that people across cultures are known to weigh preference dimensions differently (e.g. Buss, 1989). Future research could address this limitation by asking participants to report by their ideal mate's trait value (e.g., "I would like my mate to be a 5/7 on intelligence") on each dimension as well as how important it is to the participant that a potential mate matches their ideal on each dimension (e.g., "My mate's intelligence is 7/7 important to me").

Furthermore, the mate value discrepancy variables we estimated likely underestimate the magnitudes of these effects given limitations of our samples. For instance, we estimated partner-potential mate value discrepancies for each participant using the mates of other participants within the sample. The assumption underlying this choice was that our participants, being drawn from the same population, would have had exposure to and selected their mates from roughly similar pools of potential mates as one another. However, the participants in our samples were drawn from a national population and are virtually guaranteed to not know one another. Samples drawn from specific locations would likely allow better estimates of the partner-potential discrepancy participants experience because they would be derived from the pool of potential mates participants actually encounter. Similarly, a better estimate of a person's mate value would come from the mate preferences of their local pools of potential mates.

Beyond linking mate preferences to behavioral outcomes, these findings advance our understanding of relationship satisfaction as an emotional adaptation. Evolutionary psychologists have proposed that emotions are best understood as coordinating programs, designed to activate or deactivate other adaptations as necessary to solve complex adaptive problems (Al-Shawaf, Conroy-Beam, Asao, & Buss, 2016; Tooby & Cosmides, 2008). Satisfaction is hypothesized to be an emotion designed to solve the adaptive problem of maintaining valuable relationships after their initial formation. Solving this problem requires tracking numerous qualitatively different relationship threats and opportunities and mobilizing behaviors targeted to neutralize or take advantage of each. This hypothesis depicts relationship satisfaction as a richly textured psychological system with multiple, but predictable inputs and principled outputs. Mate value discrepancies are just two of many informational inputs the coordinating program hypothesis predicts will regulate satisfaction (Conroy-Beam et al., 2015). FurtheR testing of this hypothesis is a promising direction for future research.

Two findings from our studies suggest that additional explorations of the relationship between mate value discrepancies and relationship emotions will be worthwhile. First, trust and relationship satisfaction did not fully mediate the relationship between mate value discrepancies and mate guarding in Study 2. This implies that mate value discrepancies serve as inputs to other cognitive or emotional mechanisms that help to regulate mate guarding. Second, our results suggest that mate value discrepancies have a complicated relationship with trust. The relationship between mate value discrepancies and trust was very similar to that of relationship satisfaction, with the exception that partner-potential mate value discrepancies appeared to increase trust for people lower in mate value than their partners. We did not predict this finding *a priori*, so future research should attempt to replicate and explain it. One possible explanation is that people are more willing to tolerate selfishness and unreliability from partners whom they cannot replace because the costs of these behaviors are outweighed by the benefits of having a relatively valuable partner.

Another peculiar finding related to trust was that the mediational path to mate guarding through trust fully opposed the mediational path through relationship satisfaction. However, trust itself is an amalgam of several other functional emotions: for instance, the trust that one's partner will be a reliable co-parent or resource provider differs from the trust that one's partner will be sexually and emotionally faithful. Trust in each sense may have distinct links with mate value, mate retention behavior, and other emotions like satisfaction and jealousy. Consistent with this possibility, all items in the Dyadic Trust Scale were modestly correlated with the mate value discrepancy interaction (average $r = .11$). On the other hand, only three of the items were correlated with mate retention behavior (average $r = -.14$). These three items were the items that referred to partners being unjust, rather than unreliable. The mediational pathway from mate value discrepancies through trust therefore appears to represent two distinct effects: one in which irreplaceable partners are perceived as modestly more trustworthy in general and a separate effect in which unjust partners are mate guarded more heavily. Further research is necessary to disentangle these effects and advance understanding of mate value, emotions, and relationships.

The psychological and evolutionary importance of preferences and satisfaction underscores the value of understanding the links between mate preferences, mate value discrepancies, and relationship psychology demonstrated here. Few decisions impact fitness more than mate selection, and so preferences for mates are both a central target and driver of biological evolution. This evolutionary importance is matched in psychological salience: people spend considerable amounts of time, energy, and money pursuing mates they desire. Satisfaction with selected mates is directly relevant to wellbeing within relationships and we show that it predicts mate retention behaviors. These behaviors range from mild compliments to more extreme, potentially cost-inflicting behaviors such as attempts to conceal partners from others. The novel links documented in the current three studies between preferences, mate value discrepancies, and relationship evaluations highlight the importance in applying evolutionary functional models to understanding the complexities of human relationship psychology.

References

Al-Shawaf, L., Conroy-Beam, D., Asao, K., & Buss, D. M. (2016). Human emotions: An evolutionary psychological perspective. *Emotion Review*, *8*(2), 173–186.

Buss, D. M. (1989). Sex differences in human mate preferences: Evolutionary hypotheses tested in 37 cultures. *Behavioral and Brain Sciences*, *12*(01), 1–14.

Buss, D. M., & Shackelford, T. K. (1997). From vigilance to violence: Mate retention tactics in married couples. *Journal of Personality and Social Psychology*, *72*(2), 346.

Buss, D. M. (2000). *The dangerous passion: Why jealousy is as necessary as love and sex.* New York: The Free Press.

Buss, D. M., & Duntley, J. D. (2011). The evolution of intimate partner violence. *Aggression and Violent Behavior*, *16*(5), 411–419.

Buss, D. M., Shackelford, T. K., & McKibbin, W. F. (2008). The mate retention inventory-short form (MRI-SF). *Personality and Individual Differences*, *44*(1), 322–334.

Campos, L. S., Otta, E., & Siqueira, J. O. (2002). Sex differences in mate selection strategies: content analyses and responses to personal advertisements in Brazil. *Evolution and Human Behavior*, *23*, 395–406.

Conroy-Beam, D., Goetz, C. D., & Buss, D. M. (2015). Why do humans form long-term mateships? An evolutionary game-theoretic model. *Advances in Experimental Social Psychology*, *51*, 1–39.

Fletcher, G. J., Simpson, J. A., Thomas, G., & Giles, L. (1999). Ideals in intimate relationships. *Journal of Personality and Social Psychology*, *76*(1), 72.

Goetz, C. D., Easton, J. A., Lewis, D. M., & Buss, D. M. (2012). Sexual exploitability: Observable cues and their link to sexual attraction. *Evolution and Human Behavior*, *33*(4), 417–426.

Haselton, M. G., & Gangestad, S. W. (2006). Conditional expression of women's desires and men's mate guarding across the ovulatory cycle. *Hormones and Behavior*, *49*(4), 509–518.

Hill, R. (1945). Campus values in mate selection. *Journal of Home Economics*, *37*(554), 269.

Johnson, D. J., & Rusbult, C. E. (1989). Resisting temptation: Devaluation of alternative partners as a means of maintaining commitment in close relationships. *Journal of Personality and Social Psychology*, *57*(6), 967.

Kenrick, D. T., & Keefe, R. C. (1992). Age preferences in mates reflect sex differences in reproductive strategies. *Behavioral and Brain Sciences*, *15*, 75–133.

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Larzelere, R. E., & Huston, T. L. (1980). The dyadic trust scale: Toward understanding interpersonal trust in close relationships. *Journal of Marriage and the Family*, 595–604.
Meltzer, A. L., McNulty, J. K., Jackson, G. L., & Karney, B. R. (2014). Sex differences in the implications of partner physical attractiveness for the trajectory of marital satisfaction. *Journal of Personality and Social Psychology*, *106*(3), 418.
Miller, R. S. (1997). Inattentive and contented: Relationship commitment and attention to alternatives. *Journal of Personality and Social Psychology*, *73*(4), 758.
Norton, R. (1983). Measuring marital quality: A critical look at the dependent variable. *Journal of Marriage and the Family*, 141–151.
Rempel, J. K., Holmes, J. G., & Zanna, M. P. (1985). Trust in close relationships. *Journal of Personality and Social Psychology*, *49*(1), 95.
Schmitt, D. P. (2004). Patterns and universals of mate poaching across 53 nations: The effects of sex, culture, and personality on romantically attracting another person's partner. *Journal of Personality and Social Psychology*, *86*(4), 560.
Schmitt, D. P., & Buss, D. M. (2001). Human mate poaching: Tactics and temptations for infiltrating existing mateships. *Journal of Personality and Social Psychology*, *80*(6), 894.
Shackelford, T. K., Goetz, A. T., & Buss, D. M. (2005). Mate retention in marriage: Further evidence of the reliability of the Mate Retention Inventory. *Personality and Individual Differences*, *39*(2), 415–425.
Sugiyama, L. S. (2005). Physical attractiveness in adaptationist perspective. *The Handbook of Evolutionary Psychology*, *1*, 292–343.
Tooby, J., & Cosmides, L. (2008). The evolutionary psychology of the emotions and their relationship to internal regulatory variables. In M. Lewis, J. M. Haviland-Jones, & L. F. Barrett (Eds.), *Handbook of Emotions* (pp. 114–137) (3rd ed.). NY: Guilford.
Yamashita, T., Yamashita, K., & Kamimura, R. (2007). A stepwise AIC method for variable selection in linear regression. *Communications in Statistics—Theory and Methods*, *36*(13), 2395–2403.

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