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Do Mate Preferences Influence Actual Mating Decisions? Evidence From Computer Simulations and Three Studies of Mated Couples

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Evolutionary research continues to discover new features of human mate preferences, but the downstream consequences of these preferences for mate selection have been insufficiently explored. Some have inferred that stated preferences have few behavioral consequences given seemingly weak effects of preferences in predicting mating outcomes. Here we test this inference with data from simulated mating markets as well as from real-world couples. We generate a series of agent-based models in which preferences either do or do not drive mate selection. We compare these simulations with 3 empirical studies of real-world couples (Study 1, $n = 214$; Study 2, $n = 259$; Study 3, $n = 294$). Preference-driven agent based models produce several effects that emerge in real couples, but not within random simulations. These include low-magnitude correlations between stated preferences and the individual traits of chosen partners; the novel finding that people with high mate value leverage that value into securing partners with more desirable traits; and the finding that couples assort based on overall mate value. Moreover, real-world mate choices correspond strongly with preference-driven simulations, but not to simulations in which mate selection is random with respect to preferences. Finally, we provide evidence that these effects are due to the causal role of stated preferences, and are not better explained by people updating their mate preferences to match chosen mates. These results provide new evidence that stated mate preferences guide actual mate selections under real mating-market constraints.

Keywords: mate preferences, mate selection, mate value, agent-based models, evolutionary psychology

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Humans possess a set of universal, sex-differentiated mate preferences (Buss, 1989; Kenrick & Keefe, 1992; Lippa, 2007; Schmitt et al., 2003). These preferences are hypothesized to have evolved because they motivated ancestral humans to select mates with fitness-beneficial features. Yet some studies find only weak effects linking stated mate preferences to actual mating behavior, suggesting stated mate preferences may not be as relevant to mate choice as are other factors (e.g., Eastwick & Finkel, 2008; Todd, Penke, Fasolo, & Lenton, 2007). In this article, we propose that apparently weak effects of mate preferences on mating outcomes do not indicate that stated preferences are ineffective, but rather emerge due to the complex dynamics of real mating markets. Further, these dynamics render appropriate predictions about the relationship between stated mate preferences and actual mate choices difficult to intuit. We thus derive predictions about mate preferences from agent-based models of mate choice and then test these predictions in three samples of actual mated couples.

What Do People Prefer?

The centrality of mating to reproduction, the primary engine of evolution, makes the choice of a mate one of the most important decisions a sexually reproducing organism makes (Ryan, Akre, & Kirkpatrick, 2009). Thousands of species, from fruit flies to elephant seals have preferences that function to guide them toward beneficial mates (Alcock, 2013; Thornhill & Alcock, 1983). Humans are no exception to this biological principle: Ancestral humans who selected healthy, fertile, or investing mates would have reproduced more successfully than those who selected unhealthy, infertile, and selfish mates. A task analysis of the demands of mating—what makes a reproductively valuable mate, to whom, and under what circumstances—consequently provides researchers clear and numerous predictions about the nature of human desire (Buss, 1992).

Cumulative research over the past three decades has revealed multiple preferences for traits including age (younger for males, older for females; see Buss, 1989; Kenrick & Keefe, 1992; Pawlowski & Dunbar, 1999), kindness and generosity (Lukaszewski & Roney, 2010), symmetry (Grammer & Thornhill, 1994), waist-to-hip ratio (Jasienska, Ziomkiewicz, Ellison, Lipson, & Thune, 2004; Singh, 1993), shoulder-to-hip ratio (Dijkstra & Buunk, 2001), a particular lumbar curvature (Lewis, Al-Shawaf, & Buss, 2015), and cues to resource acquisition potential such as ambition, industriousness, and social status (e.g., Perusse, 1993; Townsend & Levy, 1990). Several of these mate preferences are universally sex-differentiated according to hypotheses anchored in evolutionary logic, with women more desiring of resources to compensate their substantial parenting costs and men more desiring of relative youth and physical attractiveness as indicators of otherwise obscure reproductive potential (Buss, 1989).

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What Do Mate Preferences Do?

Although mate preference research has been a large and successful research area, most work has focused more on stated desires than on actual mate choices. Studies that have attempted to bridge this gap have produced results that appear counter to mate preference theories. For instance, Kurzban and Weeden (2005) found that physical attributes alone predicted desirability in a speed dating environment despite the frequency of stated preferences for nonobservable preferences like resources, education, and kindness. Todd, Penke, Fasolo, and Lenton (2007) similarly found only low-magnitude correlations between speed daters' stated preferences and the corresponding trait levels of the partners they selected for all traits but physical appearance. Curiously, for men this correlation was even negative: Men who stated stronger preferences for physical appearance selected partners who were less physically attractive. Eastwick and Finkel (2008) found null effects relating stated ideal preferences to mate choices in another speed dating study.

There are several possible explanations for the weak effects of stated preferences on real mating outcomes (Li & Meltzer, 2015). Within speed-dating studies, the most common studies of actual mate choice, Li et al. (2013) argue that mixed findings are due in part to limitations of speed dating events themselves. Crucially, speed dating participants tend to show low variance on desired traits, constraining correlations between preferences and chosen partner traits. They show that experimentally increasing this variance does increase the power of preferences to predict the traits of chosen partners.

Fletcher, Simpson, Thomas, and Giles (1999) found that higher-order ideal preference factors can predict corresponding trait factors in long-term relationship partners. Their effects are stronger than commonly observed in speed-dating studies, but come only from abstracting away from individually stated preferences toward higher-order factors and are still only moderate in size. Campbell, Chin, and Stanton (2016) found that stated ideal preferences do significantly predict the corresponding traits of later selected partners, but the overall effect size was small. In general, the power of individual stated preferences to predict the traits of chosen partners appears to be modest at best.

The Many Complexities Inherent to Real Mate Selection

The seemingly weak relationships between stated preferences and choice have been taken to indicate that stated mate preferences are not relevant to actual mate selection (e.g., Eastwick, Luchies, Finkel, & Hunt, 2014). The rationale is intuitive: If stated mate preferences drive mate selection, it seems natural that the strength of preference for a trait would correlate with the value of that trait in selected partners. But mate choice in realistic mating markets is the outcome of several interacting dynamics (Lykken & Tellegen, 1993). We argue that the complexity of these markets must be carefully analyzed to render hypotheses about the causal links between mate preferences and mate choice.

For instance, successfully selecting a mate first requires navigating an environment in which potential mates have to be evaluated simultaneously on multiple dimensions. Second, a mate who actually embodies all of these desired qualities may not exist in the eligible mating pool. Third, mating is an inherently competitive endeavor: desirable mates are always in short supply compared with those vying for them (Symons, 1979). Fourth, in a mating system marked by mutual mate choice, each person must not only select their preferred mate, but also *be selected* by that mate.

Given the complex dynamics of real mating markets, it is possible that stated mate preferences do drive mating behavior, but that the effects of these preferences on mating outcomes are not intuitively obvious because they are subject to multiple constraints. For instance, weak correlations between stated preferences and the traits of chosen partners could indicate that stated preferences have no behavioral effect. But these weak correlations could also emerge simply because people do not have full power to fulfill their preferences. Further, fully assessing the role of mate preferences in mate selection requires assessing the many effects preferences can have on mating outcomes. For instance, relationships between desirability as a mate and mating outcomes may prove diagnostic of the importance of mate preferences. People who are intelligent and kind well-embody the mate preferences of their potential mates—they are high in "mate value" (Buss, 2003; Sugiyama, 2005). These high mate value people would have an easier time attracting their desired partners than their cruel and cognitively challenged competitors. Under this realistic constraint, correlations between stated preferences and choice might be stronger for desirable individuals and progressively decrease for those lower in mate value.

Desirable people, however, still must select among the mates available to them. This limitation may prevent high mate value people from strongly fulfilling their preferences, even if they can "leverage" their desirability into attracting partners with more desirable features. This mate value leveraging could further generate assortative mating for mate value: The most desirable people on the mating market have the most power to select desirable mates, so preference-driven mate selection could cause substantial correlations between partner mate values, even if preference fulfillment is low or modest on any single dimension.

Even causally efficacious mate preferences would thus be subject to multiple constraints and these constraints could in principle cause preferences to have effects that are not intuitively obvious. Evaluating whether real mate choices are driven by stated mate preferences requires methods that take into account these multiple potential constraints and allow researchers to link preferences to their many potential outcomes—critically preference fulfillment, mate value leveraging, and assortative mating for mate value.

Agent-Based Modeling as a Tool for Studying Mate Preferences

Agent-based modeling provides one potentially valuable tool for understanding the role of mate preferences in mating outcomes. Agent-based models are computer simulations in which simulated individuals, "agents," act and interact according to preprogrammed decision rules (Bonabeau, 2002; Smith & Conrey, 2007). Researchers have the power to manipulate the environments in which agents interact, qualities of the agents themselves, and the decision rules agents use to generate their behavior. Agent-based models thus allow researchers to create simulated environments that recreate important real-world dynamics and observe what behaviors emerge from these systems. Such models are increasingly employed in the study of human cooperation (e.g., Delton, Krasnow, Cosmides, & Tooby, 2011; Krasnow, Delton, Tooby, & Cosmides, 2013), but are only rarely are applied to study human mating (see Hills & Todd, 2008 for an exception).

Here we apply agent-based models to assess whether stated mate preferences plausibly drive human mate selection. We generate agents who possess mate preferences and corresponding traits and who attempt to form romantic couples with one another. These models capture many of the constraints of real mating markets: Agents must evaluate their potential mates on several dimensions; ideal mates may or may not exist within their environments; they must compete with same-sex agents to attract mates; and agents must not only select mates but also secure mutual attraction in order to form romantic couples.

These models allow us to observe the many potential effects mate preferences have on mating outcomes when preferences are subject to realistic constraints: That is, do agents strongly fulfill their preferences? Do higher mate value agents better fulfill their mate preferences? Do high mate value agents leverage their desirability into selecting partners with more desirable traits? And do agents tend to mate assortatively for mate value? Agent-based models thus allow us to derive and explore predictions about the effects of mate preferences while taking into account the constraints inherent in real mate selection.

Crucially, agent-based models additionally allow us to experimentally manipulate the role of mate preferences in mate selection. With agent-based modeling, we can generate simulated worlds in which we *know* that mate preferences causally guide mate selection and separate worlds where agents select mates randomly with respect to their preferences. This manipulation allows us to observe the effects of preferences when we know with certainty that they do or do not drive real mate choices. By comparing these simulated outcomes with data from real mated couples, we can generate principled inferences about the role of mate preferences in real human mate choice. If the effects of mate preferences in real couples are more comparable with those found in models wherein preferences drive mate selection, this suggests that mate choices are driven by stated mate preferences. Conversely, if human couples are more similar to agents from preference-random simulations, this implies that people's stated mate preferences are not important to their mate choices.

Present Research

Answering the question of whether stated mate preferences drive mate selection requires research designs that take into account the facts that (a) mate choice is the product of many interacting dynamics and that (b) mate preferences themselves can have a multiplicity of effects. Here we address these complexities by deriving predictions about mate preferences from agent-based models and testing these predictions in samples of real world couples. Across Studies 1 and 2, we compare the effects of mate preferences found within preference-driven and preference-random simulations with the corresponding effects in data from real mated couples. These comparisons provide tests of the role of stated mate preferences that take into account the broad array of dynamics involved in real mate selection. In Study 3 we use a separate set of agent-based models to assess whether the results of Studies 1 and 2 are better explained by a causal role of stated preferences or by post hoc updating of preferences to correspond to the traits of chosen partners.

Study 1: Newlywed Couples Compared With Computer Simulations

In Study 1, we compare relationships between stated mate preferences and mate choice found in simulations to those found in a sample of newlywed couples. Newlyweds provide an important sample for studying mate choice because of the relatively high-stakes nature of the relationship: Compared with relatively transient speed-dating or hookups, marriage is a high-commitment, high-cost form of mating that can have cascading consequences for years or decades. Moreover, dissolution of a marriage is costly, rendering initial mate selection crucial. If mate preferences drive actual mate selections, this linkage should be revealed in a newlywed sample; mate preferences effects observed in newlywed data should generally correspond with those derived from simulated preference-driven mating markets, but not random mating markets.

Method

Participants. Participants were 214 partners composing 107 heterosexual newlywed couples. Participants were recruited by mail from public marriage records in a large county in the Midwestern United States. All couples had been married for less than 1 year at the time of participation. The average age for male participants was 26.68 ($SD = 3.71$); females were 25.54 years old on average ($SD = 4.05$).

Measures.

Personality. We analyzed for each participant ratings on 40 7-point bipolar adjective pairs representing the five factors of personality. Adjective pairs were chosen as the highest-loading items from Goldberg's (1983) factor analysis. For each item, we analyzed a self-report, partner-report, and the report of two independent interviewers. Couples were interviewed together by pairs of interviewers, one male and one female. Interviewers asked a standard set of open-ended questions, beginning with how the couple first met and ending with how long they expected to be together. Interviews lasted 40–50 min. Immediately following each interview, each interviewer independently rated each member of the couple. Interviewer ratings were ipsatized by subtracting the interviewer's mean rating from each of their ratings and dividing by the standard deviation of their ratings. Ipsatized ratings were then standardized and averaged into composite personality scores along with self- and partner-ratings. Average interrater correlations ranged from poor ($r = .03$) to modest ($r = .39$) across traits and averaged ($r = .14$). However, results did not differ qualitatively when using self-reports alone or composite ratings (see supplemental materials), so we proceeded with composite ratings for all analyses.

Attractiveness, salary, height, relative age, and mate value. Independent interviewers rated each participant on a 7-point scale of overall physical attractiveness. These ratings were ipsatized and averaged into composite scores of physical attractiveness. Interviewer ratings of physical attractiveness correlated ($r = .63$) with one another. A composite resources score was formed by standardizing and averaging participant self-reports of current salary and anticipated salary 10 years in the future. These items were well-correlated with one another ($r = .60$). Height in inches was obtained from participant self-report. Relative age was calculated as the difference between self-reported age and partner self-reported age. Finally, each interviewer rated each member of the couple on "Overall attractiveness as a potential mate (market value to opposite sex)" using a 7-point scale that ranged from 1 (*extremely low*) to 7 (*extremely high*). For ratings, interviewers only had access to the couple's responses to the interviewer questions and their own observations during the course of the interview. These ratings were ipsatized and averaged to form composite scores of overall mate value. Interviewer ratings were well-correlated (r = .53).

Mate preferences. For personality preferences, participants rated their desired partner personality on the same 7-point bipolar adjective scale used for self-, partner-, and interviewer-report. Preferences were rated before participants were interviewed. Preference for physical attractiveness was calculated as the average of the standardized ratings of preference for a "good looking" and "physically attractive" partner, each on 5-point scales. Ratings on these two preference variables were correlated (r = .80). For resources, participants reported how much they desired a partner who was "wealthy" on a 5-point scale as well as the desirability of a "good earning capacity." These ratings were moderately well-correlated (r = .38); ratings were standardized and averaged into an overall preference for resources score. Preference for height was reported as ideal height in feet and inches; this item was converted into inches for analyses. Ideal age was self-reported on a 7-point bipolar item, with 1 (*younger than you are*) and 7 (*older than you are*).

Because participants reported their preferences while in ongoing relationships, we cannot be certain that participants' reported preferences were the same as prior to mate choice or whether participants had updated their preferences post hoc to better correspond to their partners' traits. We have no means within this dataset to assess whether participants' preferences changed to match their partners' traits over time. However, in Study 3 we explore the ability of this post hoc preference updating process to explain the results we observe.

Agent-based models using random and preference-driven mate selection. We conducted two agent-based models: one in which mate selection was random with respect to mate preferences and another in which mate selection was driven by mate preferences. Figure 1 shows the life cycle followed by each of these models. Models first generated simulated agents based on the real human data. These agents next computed how attracted they were to one another and then selected each other as mates based on these attractions. The model finally analyzed the simulated relationships and stored the results. This cycle was repeated 10,000 times for each model. All simulations were completed in R; script is available in the supplemental materials.

Agent generation. We generated 150 simulated agents for each cycle of the agent-based model. A population size of 150 was chosen to match Dunbar's number of maximum human social group size (Hill & Dunbar, 2003). However, modeling different population sizes did not qualitatively change the results (see supplemental materials). We generated agents by randomly sampling 75 males and 75 females from the sample of newlywed couples. Each agent took on the traits and preferences of one of the sampled newlyweds, excluding the preference for age difference as this was specific to relationships. Traits and preferences were standardized and a constant was added to each trait so that trait and preferences

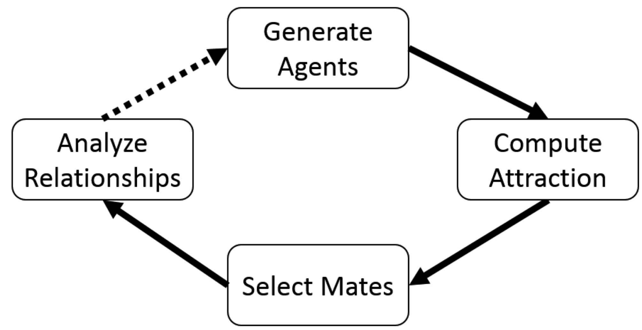

Figure 1. The life cycle followed by the agent-based models. Each model first generated agents by drawing from the human samples. The agents next computed how attracted they were to one another and then selected each other as mates based on these attractions. The model finally analyzed the simulated relationships and stored the results.

values were positive and on the same scale. Each agent thus had 43 traits and preferences that preserved whatever real correlational structures existed between preferences and traits. Results did not differ qualitatively when agents were generated randomly instead of drawn from the real human couples (see supplemental materials).

Compute attraction. After generation, agents computed how attracted they were to one another. Each agent calculated how attracted they were to all opposite sex agents.

In the preference-driven simulation, agents calculated their attraction to potential mates as the summed product of their preferences and each potential mate's traits: the agent multiplied each of their preference values by the potential mate's corresponding trait value and summed these products across the 43 traits. This attraction algorithm was selected to be consistent with models proposed in prior research (e.g., Buss & Schmitt, 1993; Eastwick & Hunt, 2014; Miller & Todd, 1998). Attraction was fully determined by agents' preferences and traits; simulations that included a random component to attraction did not produce qualitatively different results (see supplemental materials).

In the random simulation, each agent produced a random attraction value for each potential mate. These attraction values were arbitrarily constrained to fall between 500 and 1,500 and were drawn from a uniform distribution.

The result of the attraction process was two matrices for each simulation: one containing how attractive each male agent found each female agent and another containing how attractive each female agent found each male agent. These two matrices were multiplied element-wise to produce the mutual attraction matrix: how mutually attracted each possible couple would be.

Mate selection. After calculating attraction, the agents began the mate selection process. The model first selected the most mutually attracted possible couple in the population, paired the agents, and removed both from the mating market. This process iterated until all agents had a mate. Pairing based on mutual attraction provided for several realistic features, chiefly that mate selection was attraction-dependent but, like human mate choice, required attraction from both parties. An agent is not merely paired with the mate to whom they are most attracted or the mate most attracted to them. Rather, pairing occurs based on the strongest combination of attractions among still-available mates under the assumption that people will tend to pursue and mate guard mates to whom they are strongly attracted.

We ran an additional set of models in which agents were broken into random subgroups of $n = 30$ before selecting mates. The most mutually attracted agents within each group were paired with one another. This alternative model had two key features. First each agent interacted only with a subset of potential mates, rather than selecting from the entire population of opposite sex agents as in the reported models. Second, the most mutually attracted agents in the population were not guaranteed to pair first or even at all because they were not guaranteed to be within the same random subgroup. This model thus incorporated both limited mate search and randomness in mate selection beyond attraction. Results did not qualitatively differ between this grouping model and the reported models (see supplemental materials).

Data analysis. After all agents selected their mates, the model began to analyze their relationships. We stored for each couple the preferences, traits, and overall mate value of each partner. An agent's overall mate value was calculated as the average attractiveness of that agent to all opposite sex agents.

We used the agent-based model data as a theory-guiding tool. Our assumption was that if the effects of mate preferences found in the newlywed data matched those found in the preference-driven simulation, but not the random simulation, this would provide evidence that stated mate preferences drive actual mate selection. As such, analyses proceeded by first analyzing relationships between preferences, traits, and mate value in the simulated data. Because we hoped to observe the diagnostic effects of stated preferences that emerged under realistic constraints, we made no a priori predictions about the nature of the simulated data.

Once we established the magnitude of preference effects within the simulation data, we analyzed the newlywed data for the same effects and stored the resulting magnitudes. In comparing the simulation data with the newlywed data, we asked two questions for each effect: (a) is there a *qualitative* fit between the newlywed data and the random or preference-driven simulations? That is, do preference effects that emerge in the simulation data also emerge in the same direction in the newlywed data? And (b) are effects in the newlywed and simulated data comparable *quantitatively*—are the effects in the newlywed data significantly more similar to the preference-driven simulation or to the random simulation?

Results

We first present results bearing on the *qualitative* fit between the agent-based models and the newlywed data. That is, do preference effects in the agent-based models also emerge in the newlywed sample? If stated mate preferences do drive real human mate selection, preference effects within the newlywed sample should show qualitative fit with the preference-driven simulation and not the random simulation.

Preference fulfillment. We first analyzed the degree of preference fulfillment—the extent to which people's stated mate preferences correlate with their partner's corresponding traits. This metric is similar to that used in prior studies on the behavioral effects of stated mate preferences (e.g., Todd et al., 2007). To calculate preference fulfillment, we calculated the correlation between each mate preference and the corresponding traits across couples and then averaged across preferences. Higher preference fulfillment values indicate that people's stated preferences more strongly predict their chosen partner's corresponding trait values.

Preference fulfillment was zero in the random simulation for both males ($r = .00$, 95% CI [−.06, .06]) and females ($r = .00$, 95% CI [−.06, .06]), indicating that preferences did not predict partner traits. Preference fulfillment was surprisingly weak in the preference-driven simulation as well (males: $r = .20$, 95% CI [.14, .26]; females: .20, 95% CI [.15, .26]). Mate preferences did significantly predict the traits of chosen mates, but this effect was small in magnitude. Preference fulfillment correlations from the newlywed data were comparable with those found in the preference-driven simulation (males: $r = .16$, 95% CI [.10, .21]; females: $r = .21$. 95% CI [.16, .27]) and to effect sizes in previous research exploring the predictive power of stated mate preferences (e.g., Campbell, Chin, & Stanton, 2016).

Preference fulfillment as a function of mate value. We used regression analyses to determine whether preference fulfillment was stronger for people and agents who were higher in mate value. For each mate preference, we produced a regression model which used the interaction between a person or agent's mate value and their stated mate preference to predict the corresponding trait value of their chosen mate. We saved the beta weight of the interaction term from each regression and averaged beta weights across regressions. A beta weight higher than zero thus indicates that, across traits, higher mate value people were better able to fulfill their stated mate preferences.

Preference fulfillment did not interact with mate value in the random simulation for male agents ($b = .00$, 95% CI [−.00, .00]) or female agents ($b = .00$, 95% CI [−.00, .00]). Mate value also did not interact with preference fulfillment in the preference-driven simulation for agents of either sex (male: $b = .00$, 95% CI [−.00, .00]; female: $b = .00$, 95% CI [−.00, .00]). This interaction also did not emerge in the newlywed data for males ($b = .02$, 95% CI [−.07, .02]), or females ($b = .00$, 95% CI [−.05, .04]).

Mate value leveraging. We next analyzed the simulation data for mate value leveraging: the degree to which higher mate value people acquire partners with more consensually desirable traits. Because all traits were coded such that the higher end was the positive pole, we calculated mate value leveraging as the average correlation between mate value and partner traits. There was no mate value leveraging in the random simulation for males ($r = .00$, 95% CI [−.10, .10]), or females ($r = .00$, 95% CI [−.10, .10]). There was modest mate value leveraging in the preference driven simulation (males: $r = .27$, 95% CI [.18, .35]; females: $r = .28$, 95% CI [.18, .36]). Mate value leveraging in the newlywed data was similar to that of the preference-driven simulation for males ($r = .19$, 95% CI [.10, .26]), and females ($r = .18$, 95% CI [.11, .25]).

Assortative mating for mate value. Finally, given that higher mate value people and agents tend to select partners with more desirable traits, we next analyzed the simulation data to determine whether people and agents mated assortatively for overall mate value. There was no correlation between partner mate values in the random simulation ($r = .03$, 95% CI [−.20, .25]) whereas mate value was strongly correlated within the preference-driven simulation ($r = .62$, 95% CI [.42, .77]). The newlywed data showed correspondence with the preference-driven simulation: mate value was strongly correlated between partners (r = .63, 95% CI [.53, .71]).

Overall model comparison. We next compared the overall quantitative fit between the effect magnitudes found in each agent-based model and the effect magnitudes found in the newlywed sample. Figure 2 plots all effect magnitudes for each data source. We quantified overall model fit as the sum of the squared deviations between each model effect and the corresponding effect in the newlywed data. We calculated this sum of squared deviations within each iteration of each agent-based model. The reported sum of squared deviation for each model is the average deviation across model runs; 95% confidence intervals are the values that cut off the most extreme 5% of all iterations. The p value for comparing overall model similarity was the proportion of model runs in which the random simulation was more similar to the newlywed data than the preference-driven simulation.

The sum of the squared deviations between the random model and the newlywed data was SS = .52, 95% CI [.28, 84]. The sum of the squared deviations between the preference-driven model and the newlywed data was SS = .03, 95% CI [.01, .09]. The newlywed data was significantly more similar overall to the preference-driven simulation than to the random simulation, $p < .001$.

Discussion

The results of Study 1 suggest that stated mate preferences drive mate selection. In terms of qualitative fit, for all effects analyzed, whenever an effect was present in the preference-driven simulation, an effect in the same direction was also present in the newlywed data. The newlywed data showed no qualitative fit with the random simulation. The data showed strong quantitative fit with the preference-driven simulation relative to the random simulation; the effect magnitudes in the newlywed data were significantly more similar to those found in the preference-driven simulation overall.

Despite these results, the newlywed sample does have some important limitations for studying mate choice. The sample was drawn from just one county and may therefore be more homogenous in mate preferences and mate qualities than broader samples would be—limited trait variance is known to limit the observed effects of stated mate preferences (Li et al., 2013). More importantly, most of the preferences and qualities assayed here were personality variables. Variables analyzed in the newlywed sample such as height, resources, age, and physical attractiveness are among those traditionally hypothesized to be key to mate selection, but other variables such as "careful," "relaxed," or "fair" are not. For this reason, in Study 2 we sought to collect data from a more diverse sample with variables more concentrated on those known or theorized to be central to human mate choice.

Study 2: Comparing an Internet Sample of Long-Term Couples to Computer Simulations

Study 2 attempted to replicate the results of Study 1 with a study design and sample that addressed some of its limitations. In this study, we compared simulated data with an Internet sample of long-term couples expected to be more heterogeneous than the newlywed sample. Preference and trait measures in this study focused on a smaller set of traits more commonly employed and theorized about in mate preference research.

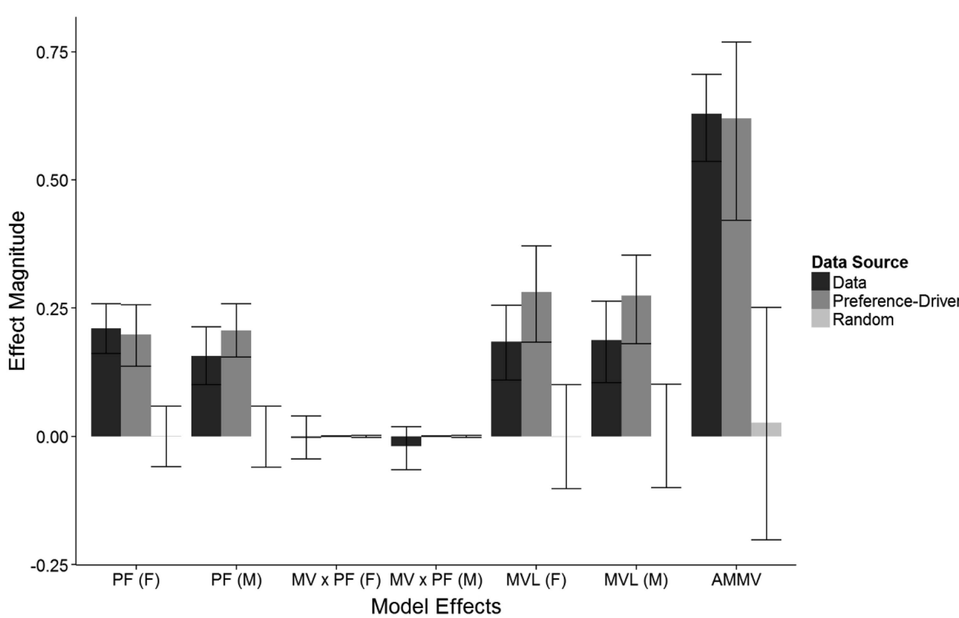

Figure 2. Effects in mate selection from the newlywed data, the preference driven simulation, and the random simulation from Study 1. Effects in the newlywed data were significantly more similar to the preference-driven simulation overall, $p < .001$. Error bars represent 95% confidence intervals. Preference fulfillment = PF; Preference fulfillment as a function of mate value = MV × PF; Mate value leveraging = MVL; Assortative mating for mate value = AMMV.

Method

Participants. Participants were 259 people (140 female) recruited using Amazon's Mechanical Turk. Participants were included only if they reported being in an ongoing, heterosexual, long-term committed romantic relationship. Of these participants, 148 specified that they were married, 88 reported dating exclusively, four reported being engaged, one reported "living together," and 22 reported "dating casually." Relationships were 90.65 months long on average ($SD = 105.85$). The average age for female participants was 35.22 ($SD = 11.38$); males were 34.34-years-old on average ($SD = 10.83$).

Measures. Participants completed the mate preference questionnaire from Buss (1989) with nine added dimensions: dominant, confident, intelligent, masculine, feminine, muscular, kind, mutually attracted, and preferred age difference. Participants rated the importance of these traits in a long-term partner on a 7-point scale from *irrelevant* to *indispensable* and separately rated the extent to which they agreed they and their partners possessed these traits using 7-point Likert scales ranging from *strongly disagree* to *strongly agree*. Finally, participants rated their own and their partner's long-term mate value, described as their actual or potential success on the long-term mating market, on a 7-point Likert scale ranging from *extremely low attractiveness* to *extremely high attractiveness*.

Simulations using random and preference-driven mate selection. As in Study 1, we conducted a preference-driven simulation in which mate selections were driven by mate preferences and a random simulation in which mate selection was random with respect to mate preferences. Simulations were identical to those used in Study 1 except that agents were generated by drawing samples randomly from the long-term couple participants rather than the newlywed sample. We additionally ran the same supplementary simulations as for Study 1; the results of these simulations did not qualitatively differ from the reported results (see supplemental materials).

Results

We first compared the qualitative fit between the agent-based models and the long-term couple data.

Preference fulfillment. There was no preference fulfillment in the random simulation for either males ($r = .00$, 95% CI [−.08, .08]) or females ($r = .00$, 95% CI [−.09, .09]). Preference fulfillment was again low in the preference-driven simulation (males: $r = .32$, 95% CI [.25, .38]; females: .34, 95% CI [.26, .43]). The long-term couples showed preference fulfillment slightly stronger than found in the preference-driven simulation (males: $r = .44$, 95% CI [.36, .52]; females: $r = .50$, [.43, .57]).

Preference fulfillment as a function of mate value. As in Study 1, preference fulfillment did not interact with mate value in the random simulation for agents of either sex (male: $b = .00$, 95% CI [−.00, .00]; female: $b = .00$, 95% CI [−.00, .00]). Mate value again did not interact with preference fulfillment in the preference-driven simulation for agents of either sex (male: $b = .00$, 95% CI [−.00, .00]; female: $b = .00$, 95% CI [−.00, .00]). This interaction did not emerge in the long-term couple data for males ($b = .04$, 95% CI [−.14, .04]), or females ($b = .06$, 95% CI [−.02, .12]).

Mate value leveraging. There was no mate value leveraging in the random simulation for males ($r = .00$, 95% CI [−.12, .12]), or females ($r = .00$, 95% CI [−.14, .14]). There was moderate mate value leveraging in the preference driven simulation (males: $r = .41$, 95% CI [.34, .48]; females: $r = .46$, 95% CI [.38, .54]). Mate value leveraging in the long-term couple data was present but weaker than was found in the preference-driven simulation for males ($r = .23$, 95% CI [.12, .33]), and females ($r = .22$, 95% CI [.12, .31]).

Assortative mating for mate value. Partner mate values were not correlated in the random simulation ($r = .03$, 95% CI [−.20, .25]). Partner mate values were strongly correlated within the preference-driven simulation ($r = .78$, 95% CI [.68, .86]). Within the long-term couples, mate value was moderately correlated between partners ($r = .55$, 95% CI [.43, .65]).

Overall model comparison. Figure 3 shows the average effect magnitudes for the random simulation, preference-driven simulation, and the long-term couple data. The long-term couple data was more similar overall to the preference-driven simulation than the random simulation, $p < .001$. The sum of the squared deviations between the long-term couple data and the random simulation was $SS = .85$, 95% CI [.59, 1.16]. The sum of the squared deviations between the long-term couple data and the preference-driven simulation was $SS = .20$, 95% CI [.12, .28].

Discussion

Study 2 closely replicated the results of Study 1. Mating data from long-term couples showed a perfect qualitative fit with simulated data where mate choice was driven by mate preferences and no qualitative fit with random simulation data. Effects that emerged within the preference-driven simulation also emerged in the long-term couple data. In terms of quantitative fit, the long-term couple data was again significantly more similar overall to the preference-driven simulation than to the random simulation.

These findings do suggest that mate selection is driven by stated mate preferences, but an important alternative explanation remains. Some evidence suggests that people in long-term, committed relationships are motivated to bias perceptions of their relationships in relationship-sustaining ways (Neff & Karney, 2003). For at least some preferences, this bias appears to manifest in people slightly adjusting their ideal preferences to better match their partners (Fletcher, Simpson, & Thomas, 2000). The correspondence observed between data from mated couples and preference-driven simulations thus *could* be because mate preferences drive actual mate selections. However, the preference effects observed within samples of real human couples could also emerge because people update their stated preferences post hoc in order to better match the traits of their chosen mates. Studies 1 and 2 cannot adjudicate between these two possibilities. We conducted Study 3 in order to attempt to determine the direction of causality underlying the correspondence between our samples of mated couples and the preference-driven simulations: Do people select their mates based on their stated preferences or alter their preferences based on their selected mates?

Study 3: Comparing Preference-Driven Mate Selection and Post Hoc Preference Updating

We conducted Study 3 in order to determine the direction of causality underlying the correspondence between real mated data

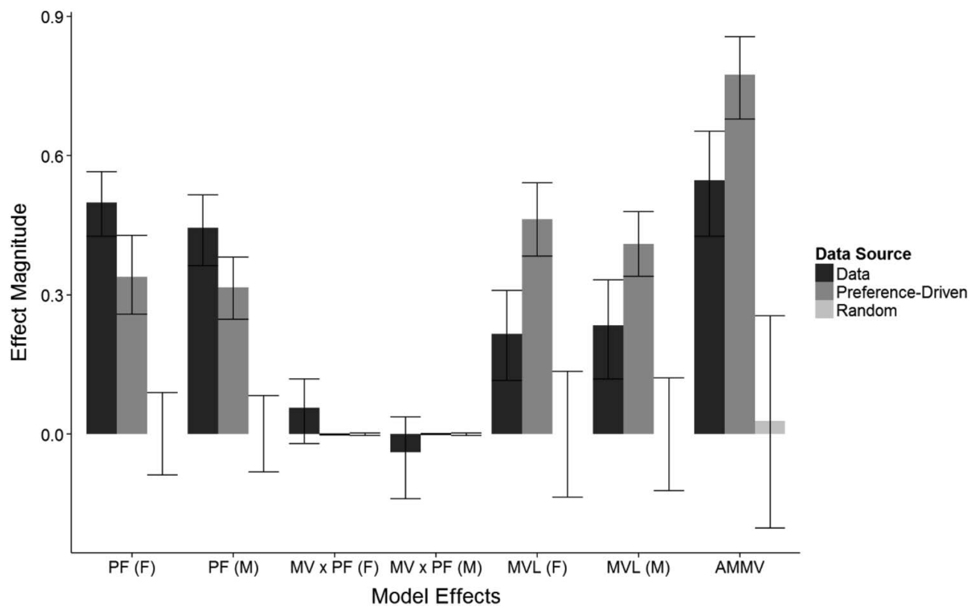

Figure 3. Effects in mate selection from the long-term couple data, the preference driven simulation, and the random simulation from Study 2. Effects in the long-term couple data were significantly more similar to the preference-driven simulation overall, $p < .001$. Error bars represent 95% confidence intervals. Preference fulfillment = PF; Preference fulfillment as a function of mate value = MV × PF; Mate value leveraging = MVL; Assortative mating for mate value = AMMV.

and simulated mate choice data. Studies 1 and 2 both found that data from real mated couples showed much stronger correspondence to simulated mating markets wherein mate selection is preference-driven than to markets that are random with respect to mate preferences. These results suggest that people select partners who match their preferences; but nonetheless it is also possible that people select their partners for other reasons (e.g., availability, proximity) and determine their stated preferences afterward. This post hoc updating process could potentially explain the correspondence we observe between preference effects within our real couple data and simulations.

Each explanation for the correspondence between real mating data and preference-driven simulations implies a distinct mating market: one market in which mates are selected independently of mate preferences, which are then altered to better match chosen mates and another market in which mate preferences drive mate selection but are perhaps still malleable to some degree. These distinct implied mating markets may make distinct predictions about the effects of stated preferences.

Agent-based models consequently provide a method for determining the most probable cause of the results of Studies 1 and 2. In Study 3, we compare a series of simulated mating markets with a third sample of long-term couples in order to determine whether post hoc preference updating can explain the preference effects observed in real human data and preference-driven simulations. In half of all of Study 3's simulations, mate selection is random with respect to mate preferences; in the other half, mate preferences drive mate selection. In each simulation, agents update their mate preferences to make them some degree closer to the traits of the partner they selected. If real mating data corresponds with preference-driven simulations merely because of post hoc preference updating, models that include preference-random mate selection and post hoc updating should be able to produce the same effects observed within preference-driven simulations and real human couples: preference fulfillment, mate value leveraging, and assortative mating for mate value. If actual mate selection is preference-driven, preference-random models should fail to reproduce real preference effects regardless of the extent of post hoc updating.

Method

Participants. Participants were 294 individuals (129 female) in long-term romantic relationships. Participants were recruited using Amazon's Mechanical Turk. Female participants were 32.88 (SD = 11.38) years old on average; males, 35.04 (SD = 10.83). All participants were heterosexual. Relationships were 68.99 months long on average (SD = 86.30).

Measures. Participants completed the same measures as in Study 2.

Models. Models proceeded exactly as in Study 2 with the addition of the post hoc updating process. After agents selected one another as mates, they were allowed to update each of their preferences to be more similar to their selected partner's corresponding trait value by some whole number percentage. Agents updated their preferences by adding to each preference value the difference between (a) their partner's trait and (b) their own corresponding preference value, multiplied by the desired percentage of preference updating. The degree of post hoc updating varied across simulations in 1% increments ranging from 0% updating (preferences were unchanged) to 100% updating (preferences matched partner traits perfectly). All agents within a simulation updated their preferences to the same degree. The result was 202 models: 101 preference-random models that varied in post hoc updating from 0% to 100% and 101 preference-driven models that varied in post hoc updating from 0% to 100%. Agent mate values and all model effects were calculated after the preference updating process completed. We ran each of these 202 models for 1,000 iterations each.

Results

We first ran the same analyses as in Studies 1 and 2 for the simulations with 0% preference updating. Figure 4 shows that the same preference effects emerge within the simulations and long-term couples as in Studies 1 and 2. Effects were generally stronger within the preference-driven simulation than in the long-term couple data. But the long-term couple data again showed perfect qualitative fit with the preference-driven simulation but not the random simulation. The long-term couple data was also significantly more similar quantitatively to the preference-driven simulation ($SS = .32$, 95% CI [.17, .45]) than to the random simulation ($SS = .62$, 95% CI [.40, .90]), $p = .01$.

Thus, with 0% *post* hoc updating, the models of Study 3 replicate the findings of Studies 1 and 2. But can these findings be explained by post hoc updating? Figure 5 plots the overall quantitative fit between the long-term couple sample and the simulations across degrees of preference updating. The model with the absolute best quantitative fit to the long-term couple data was a model in which mate selection was random and stated preferences were updated post hoc to be 30% closer to chosen mates. However, this model was not a significantly better fit to the long-term couple data overall than the preference-driven model with 0% preference updating, $p = .37$.

The quantitative fit analysis thus cannot adjudicate between preference-driven mate selection and post hoc updating as explanations for the effects observed in the long-term couple data. What about the qualitative fit between the long-term couple data and simulations? Figure 6 plots the relationship between each preference effect and degree of post hoc preference updating within the preference-random and preference-driven simulations. Of the four effects analyzed, only preference fulfillment was related to the degree of preference updating. Preference fulfillment increased with the degree of preference updating in both preference-driven and preference-random models. Preference fulfillment as a function of mate value, mate value leveraging, and assortative mating for mate value had no relationship with post hoc preference updating in either the preference-random or preference-driven simulations.

Consequently, within the preference-random simulations, no amount of post hoc preference updating was able to reproduce the assortative mating for mate value or the mate value leveraging observed within the long-term couple data. On the other hand, all three effects found in the long-term couple data—preference fulfillment, mate value leveraging, and assortative mating for mate value—emerged within the preference-driven simulations regardless of the degree of post hoc updating.

Discussion

The results of Study 3 suggest that the correspondence between real mating data and the preference-driven agent-based models is produced by the guiding effects of stated mate preferences and not post hoc updating of mate preferences alone. Preference-random models with post hoc updating had good quantitative fit with the long-term couple data but poor qualitative fit. Preference updating

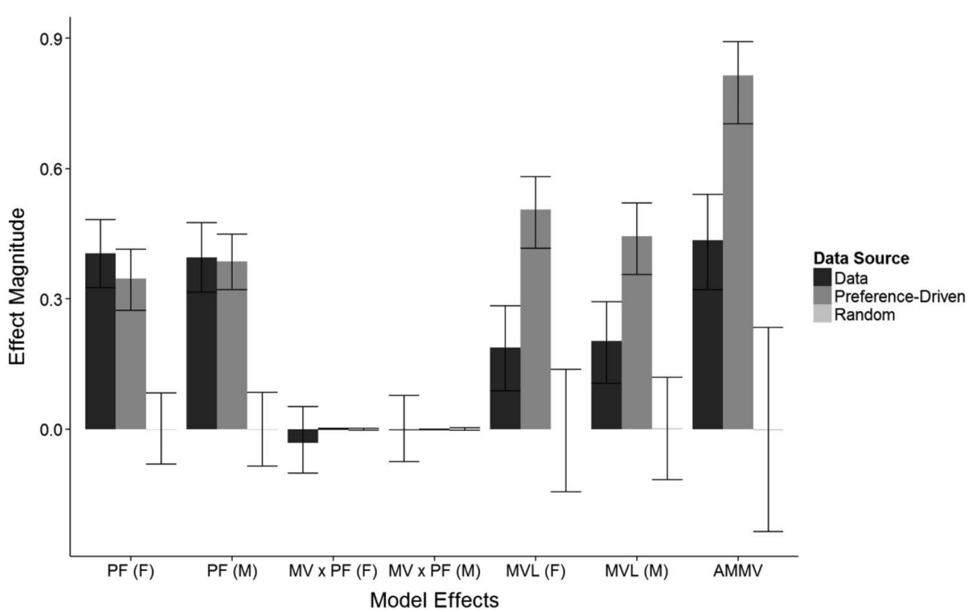

Figure 4. Effects in mate selection from the long-term couple data, the preference driven simulation, and the random simulation from Study 3 with 0% post hoc preference updating. Effects in the long-term couple data were significantly more similar to the preference-driven simulation overall, $p < .001$. Error bars represent 95% confidence intervals. Preference fulfillment = PF; Preference fulfillment as a function of mate value = MV × PF; Mate value leveraging = MVL; Assortative mating for mate value = AMMV.

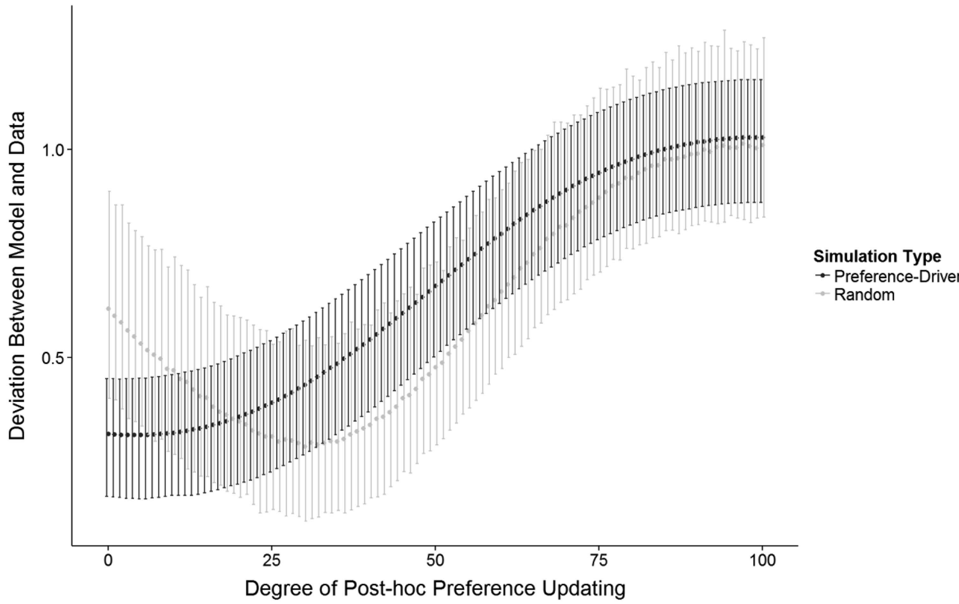

Figure 5. Sum of the squared deviations between simulation effects and long-term couple effects from Study 3 across degrees of post hoc preference updating. The least deviant simulation was one in which mate choice was preference-random, but mate preferences were updated to be 30% closer to the traits of chosen partners. However, this simulation did not fit the long-term data significantly better than the preference-driven model with 0% preference updating. Error bars represent 95% confidence intervals.

could produce realistic degrees of preference fulfillment but could not produce the mate value leveraging and assortative mating for mate value effects observed in Studies 1, 2, and 3. In contrast, only preference-driven simulations were able to produce good quantitative *and* qualitative fit with the long-term data: The best-fit preference-driven simulation produced the same preference fulfillment, mate value leveraging, and assortative mating for mate value effects observed in the long-term couple data. Therefore, preference-driven mate selection is overall the more parsimonious model of mate choice given that it is able to explain the emergence of all effects observed within the long-term couples data. Preference updating alone, without preference-driven mate selection, is an untenable explanation for real mating data.

We must stress that these results speak to the explanatory power of post hoc preference updating, but do not speak to the degree of preference updating that actually occurs in human mate selection.

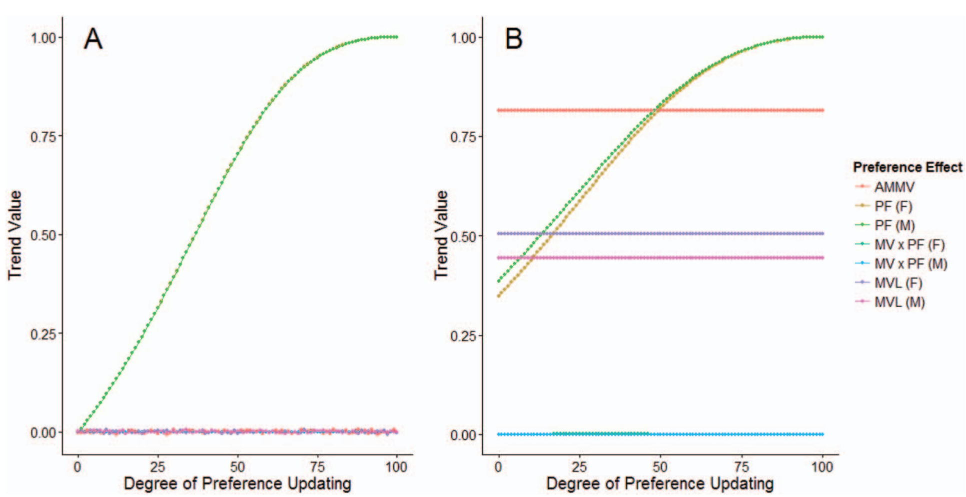

Figure 6. Preference effects across degrees of preference updating for the preference-random (A) and preference-driven (B) simulations from Study 3. Preference updating is able to produce realistic degrees of preference fulfillment, but cannot reproduce assortative mating for mate value or mate value leveraging. See the online article for the color version of this figure.

Some degree of preference updating may occur in real mate choice. The preference fulfillment observed within our long-term couple data could be the result of a combination of preference-driven mate selection and preference updating, as suggested by previous research (e.g., Fletcher, Simpson, Thomas, & Giles, 1999). Disentangling these effects with agent-based models is difficult because the precise degree of post hoc updating that is most plausible depends heavily on the assumptions made by the model. Samples that contain data on stated preferences from before and after mate selections, such as in speed-dating contexts, would be ideal to determine the relative contributions of mate selection and preference updating to preference fulfillment. What our models do suggest is that however much preference updating does occur in real mate choice, it cannot substantially explain the correspondence between real mating data and the preference-driven simulations. This is because preference updating can only adjust the degree of preference fulfillment observed and cannot account for mate value leveraging and assortative mating for mate value. The best explanation for the effects observed in data from real mated couples appears to be that mate selection is driven by stated mate preferences, perhaps in addition to some degree of post hoc preference updating.

General Discussion

Do stated mate preferences influence mate selection in humans? Some studies have challenged this hypothesis on the basis of low-magnitude correlations between stated preferences and the qualities of chosen partners. We argue that assessing the role of mate preferences on mate selection requires taking into account the realistic dynamics of mating markets where mate selection is constrained by (a) the fact that individuals must choose mates based on collections of qualities rather than single qualities, (b) the availability of fulfilling partners, (c) the presence of intrasexual competitors, and (d) the requirement of mutual mate choice. Further, appraising the role of stated preferences in mate choice requires assessing the many potential effects preferences have on mating outcomes including preference fulfillment, mate value leveraging, and assortative mating for mate value.

Across three studies, we find strong correspondence between the effects of stated preferences observed in three samples of real couples and the same effects within simulated mating markets where mate selection is governed by mate preferences. No such correspondence exists between data from real couples and mating markets that are random with respect to mate preferences. Finally, the correspondence between data from real mated couples and preference-driven simulations is better explained by a causal role of mate preferences than by post hoc updating of mate preferences alone. Overall, the similarity of real-world data to preference-driven simulations provides evidence that stated mate preferences influence actual mate selections.

The high level of correspondence between the real-world mating data and the simulation data is rendered impressive by the fact that the simulation produced both known and conceptually expected features of real mate choice. Assortative mating for mate value, for instance, is a commonly hypothesized feature of mating markets: people who are consensually more desirable overall should be better able to acquire more desirable partners, causing overall desirability to be correlated across partners (e.g., Buss & Barnes, 1986). Our simulation provides the first theoretical evidence that this assortative mating effect emerges from the guiding effects of mate preferences among the full set of dynamics and constraints of realistic mating markets.

That assortative mating for mate value was fairly strong in simulations and samples of real couples also suggests the importance of mate preferences in actual mate selections. Strong correlations between partner mate values indicate that high mate value people experience substantially greater power of choice than low mate value people—enough power to increase their odds of securing the most desirable mates available. For assortative mating in mate value to emerge, two conditions must hold. First, high mate value people must act on their stated preferences in selectively seeking partners who fulfill their preferences. Second, others must act on their preferences in selectively pursuing high mate value people. These two conditions afford high mate value people the power of choice necessary for them to reliably acquire the most desirable partners in the mating market. The existence of assortative mating for mate value is thus key evidence for the impact of stated mate preferences on actual mate selection.

Another key novel finding of our studies was that the same low-to-moderate preference fulfillment correlations found in the mate selection literature (e.g., Campbell, Chin, & Stanton, 2016; Todd et al., 2007) were produced by our preference-driven simulations where mate selection was entirely driven by stated mate preferences. The emergence of these correlations in data from real couples and the preference-driven simulations suggests that low preference fulfillment correlations do not indicate that stated preferences play little role in mate selection. People are motivated by their stated preferences, but these preferences acting in the context of larger mating markets produce several constraints on mate choice. People must select their mates from among restricted pools where ideal partners may not exist. Critically, each potential mate represents a collection of traits, and so fulfilling one preference often requires relaxing another. Mating markets are populated not only with potential mates but also with competitors; the fulfillment of one person's preferences can mean the obstruction of another's. Finally, mating markets offer no guarantees of reciprocity: A person's preferences may drive them toward a potential mate just as much as that potential mate's preferences drive them away.

Each of these market dynamics would act to limit the correlation between individual preferences and the individual traits of chosen partners when considered singly. Determining the relative contributions of each these processes is a worthwhile goal for future research. But regardless of their relative contributions, the dynamics of real mating markets would not exist if mate preferences were unimportant to mate selection and they therefore create an irony: Correlations between individual preferences and partner traits are constrained precisely *because* preferences are important in driving real mate choices.

Our simulations, combined with three samples of actual couples, provide novel evidence that suggests that stated mate preferences are important in driving mate selection behavior. However, despite the strong correspondence between the preference-driven simulation and actual couples, there were some important differences. Particularly in Study 3, effects within the preference-driven simulation were generally stronger than the corresponding effects observed within the samples of real human couples. Discovering the reasons for these differences, in the face of otherwise large correspondence, is an important issue for future research.

One potential source of difference between the actual mate choice data and the simulated data was the algorithm used to determine attraction and mate value. Within the agent-based models, we used only a simple summed-product model for calculating attraction and mate value from mate preferences. This could approximate real-life mate choice algorithms, but other models have been proposed, including satisficing models (Miller & Todd, 1998) or more pop-cultural notions of selecting mates based on "types." Simulated mating markets employing different attraction algorithms could be used to adjudicate among these models empirically. Simulated attraction algorithms that produce attraction and mate choice data most similar to human data are likely to be closest to the algorithms employed by our mate selection psychology.

Our agent-based models also excluded several processes that influence mate choice in real mating markets. Agents in our model were able to perfectly assess the mate value of their potential mates, whereas in the real world traits will vary in their observability (Vazire, 2010). Mate choice within the models was also entirely the decision of the agents, free from realistic outside influence from third parties such as kin (e.g., Apostolou, 2013; Perilloux, Fleischman, & Buss, 2011). Our models also did not include other individual differences such as status and dominance which may influence mate choice independent of attraction. Incorporating these and other realistic processes into models of mate choice would allow researchers to weigh their relative contributions to human mate choice and give psychologists a more complete picture of the nature of human mating markets.

Our models also did not simulate the actual mate search process. We were concerned with how stated preferences relate to mate choices in mating markets with realistic constraints, including potential mates who represent imperfect fits to preferences, the presence of competitors, the demands of mutual mate selection, and necessary tradeoffs between preferences. We were not interested in the role of preferences in lower-level search processes involved in mate selection, such as searching environments for potential mates, interacting with and assessing these mates, and making decisions in real time. But humans of course do not instantly pair with the best available potential mate in their environment as the agents within our models do. Future models that incorporate search processes described in previous research (e.g., Hills & Todd, 2008; Simão & Todd, 2002) in addition to modeling preferences, attraction, and mate selection in realistic mating markets might further clarify the relationships between stated preferences and real mating outcomes.

Finally, the results of Study 3 do suggest that preference-driven mate selection is a better explanation of mate selection data than post hoc preference updating alone. However, there are other processes that could explain some effects within the real mating data in addition to or instead of preference-driven selection and preference updating. For instance, it is possible that some degree of assortative mating for mate value could be accounted for by partners becoming more similar in their traits over time (although evidence is mixed that this process occurs, e.g., Caspi, Herbener, & Ozer, 1992). Furthermore, our models assumed that all people update their preferences to match their chosen partners to the same degree. But it is possible that individuals differ in their tendency to adjust their preferences. Perhaps, for example, higher mate value people update their preferences less given that their partners are more desirable overall. Future research can continue to use agent-based models and studies of real couples to explore the many mate selection and relational processes that contribute to observed effects of mate preferences.

Conclusions

Although mate preferences have been a cornerstone of evolutionary mating research, the precise ways in which stated preferences relate to actual mate selection has been unclear. Speculations that mate choice occurs independent of stated mate preferences have been based largely on empirical findings suggesting low-magnitude links between stated preferences and the traits of selected mates (e.g., Eastwick & Finkel, 2008; Kurzban & Weeden, 2005; Todd et al., 2007). However, such conclusions fail to account for the complexities of mate choice, including the fact that mate selection is based on multiple dimensions, is constrained by partner availability and the actions of competitors, and requires reciprocal selection for a successful outcome. These inferences also do not take into account the multiplicity of effects preferences have on real mating outcomes, including the leveraging of mate value and assortative mating. Our simulated mating markets show that simulated preference-driven mating markets produce mate preference effects that are comparable with those found in the mate choices of real couples. Overall, these findings provide evidence that stated mate preferences are centrally involved in the selection of long-term mates and provide new understanding, new questions, and new methods for exploring the nature of human mate preferences and human mate selection.

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