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The Function of Love: Assessing Commitment Device and Relationship Maintenance Hypotheses of Romantic Love

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Abstract

Human long-term pair-bonding is cross-culturally pervasive but zoologically unusual. Although romantic love is central to these bonds, its function and evolved design are surprisingly mysterious. One popular hypothesis for the function of love is that love serves as a “commitment device.” In this view, feelings of love improve relationship stability by motivating those in love to ignore romantic alternatives. Here, we test this commitment device hypothesis against a proposed alternative: the relationship maintenance hypothesis. According to the relationship maintenance hypothesis, the function of love is to motivate investment in ongoing relationships, and love is calibrated by the availability of romantic alternatives. Across 5 studies (total $N = 12,349$), we find stronger support for the relationship maintenance hypothesis compared to the commitment device hypothesis. In Studies 1 and 2, we find that the quality of one’s partner relative to alternatives, rather than being ignored, predicts feelings of love, and this relationship is mediated in part through feelings of relationship satisfaction. In Studies 3 and 4, we cast doubt on the possibility that these effects are explained by idealizing one’s romantic partner among those in love. In Study 5, we replicate the relationship between the quality of one’s partner relative to alternatives and love across 44 countries, suggesting cross-cultural regularities in romantic love’s functional design. These results highlight the need for further investigation and point to the possibility that love, despite potentially enhancing commitment, may not act as a *commitment device*.

Keywords: close relationships, romantic love, quality of alternatives, commitment device, evolutionary psychology

The Function of Love: Assessing Commitment Device and Relationship Maintenance

Hypotheses of Romantic Love

Unlike most mammals and all other great apes, humans engage in long-term pair bonding, remaining with the same mate for years or decades at a time (Gavrilets, 2012). Romantic love clearly plays an important role in the proximate development and experience of long-term romantic relationships, and it has likely done so both across cultures and throughout recorded history (Gotschall & Nordlund, 2006; Jankowiak & Fisher, 1992). Yet, despite its clear relevance to human pair-bonding, the question of love's specific ultimate function has been surprisingly neglected. The adaptive problems posed by long-term mating have left fingerprints on our physiology (e.g., testosterone decreases as men enter relationships and become fathers; Gettler et al., 2011) as well as our psychology (e.g., in the form of mate preferences specialized for long-term partners; Buss, 1989; Kenrick et al., 1990). However, the evolved function of love remains unclear. What adaptive problems, if any, was romantic love designed to solve, and how has this function shaped its design?

To date, the psychological literature on the evolved function of love has been dominated by just one hypothesis: the commitment device hypothesis (Frank, 1988; Gonzaga et al., 2008; Campbell & Loving, 2016; Buss, 2019). According to this hypothesis, the evolved function of love is to motivate foreclosure on romantic alternatives. Despite the popularity of this hypothesis, empirical tests remain relatively scant, and well-established phenomena surrounding relationship satisfaction give reason to doubt its core predictions. For these reasons, here we contrast the commitment device hypothesis with an alternative hypothesis called the relationship maintenance hypothesis. We begin by offering a summary of the commitment device hypothesis and the corresponding evidence for and against it. We then articulate the details of a relationship

maintenance account of romantic love and suggest that love, in contrast with the commitment device hypothesis, is functionally sensitive to the presence of romantic alternatives.

The Commitment Device Hypothesis

According to the commitment device hypothesis, love is an adaptation designed for motivating foreclosure on romantic alternatives (Frank, 1988; Campbell & Loving, 2016). Frank (1988) motivated this hypothesis with an analogy to a rental market. In renting an apartment, tenants have some number of apartments available to them which vary, for instance, in their quality and price. Similarly, property owners have some number of prospective tenants varying, among other ways, in the amount they can pay. If each party pursued their self-interest and could search the market optimally, making rental decisions would be relatively easy: Each prospective tenant would choose to rent from the best available property owner who considers them the best in return. Thus, each would be content in the knowledge that they have no better alternatives to the partner they have chosen.

In the real world, however, search is constrained. Enticing new tenants and apartments may enter the market at any moment, prices may change, and the desirability of any given option may shift over time. These constraints on search open the door to trust issues because property owners and tenants have non-overlapping interests. For example, it is in the property owner's best interest, all else equal, to rent their apartment to the highest-paying tenant available—and to evict their current tenant once a sufficiently higher-paying offer comes along. Similarly, it is in a tenant's best interest, all else equal, to find the cheapest apartment which meets their standards—and to move once a sufficiently lower-cost option becomes available.

Yet, a property owner motivated by self-interest would be undesirable to tenants, and a tenant motivated by self-interest would be undesirable to property owners. For instance, a

prospective tenant, knowing that they may find themselves on the street as soon as someone offers to pay more in rent, would be disinclined to rent from a property owner whom they knew to be economically self-interested. Similarly, a property owner, knowing that they may find themselves without a source of income as soon as a cheaper apartment is placed on the market, would be wary of renting to a self-interested tenant. These conditions create a *commitment problem*: A rental market in which everyone doggedly pursued their own self-interest would ultimately collapse because neither tenants nor property owners could trust one another to commit to rental relationships likely to last over time.

This crisis is averted by the rental lease. Upon finding a suitable match, the property owner and tenant sign a mutually binding contract locking them into a rental relationship at a fixed price and for a fixed duration. In a perfect world, the lease would be unnecessary; each party would know the other had chosen the best option available to them, so contractually specifying a duration and price would be superfluous. But in a constrained reality, the rental lease allows for the trust required to establish a rental relationship: The tenant becomes more desirable to the property owner because that tenant will remain in the apartment even if a cheaper apartment becomes available. The property owner becomes more desirable to the tenant because that property owner will not evict them (or increase their rent) even if they are offered a higher alternative bid. In this way, the lease acts as a *commitment device*, locking the tenant and property owner into a course of action regardless of whether they later learn that the agreement in-question is not ideal. Although in signing a lease each party risks committing to a suboptimal rental relationship, each is spared the more serious consequence of not being chosen in the first place—a consequence which could very easily arise when insisting upon optimal outcomes. The

benefits of pursuing a guaranteed but potentially suboptimal relationship are greater than the benefits of pursuing potentially optimal but unstable relationships.

What does any of this have to do with love? According to Frank (1988), rental markets and mating markets pose similar challenges. On the mating market, each person must choose from a number of potential mates who vary in quality as romantic partners. If markets were static and search were optimal, selecting a mate would be relatively easy. In this case each person would choose the best partner who would have them in return, and both would be content in knowing they have entered the best relationship available to each of them.

Real mate choice, however, faces several constraints: partners change in mate value; new, previously unavailable partners enter the market (e.g., through migration, maturation to mating age, divorce); and evaluations of partner quality are imperfect. When attempting to maximize partner quality, it is in each person's self-interest to remain with a partner only so long as they appear to be the highest quality partner available to them. An optimal agent would dissolve their relationship each and every time a sufficiently better and mutually interested alternative became available. Yet, people in a market full of self-interested partners would be rationally disinclined to taking on the risks inherent in starting a relationship because they could not trust their partner to commit long enough to make these risks worthwhile (Murray, Holmes, & Collins, 2006). In this way, mating markets, like rental markets, would likely collapse in the absence of a commitment device locking partners together regardless of whether their relationship turned out to be optimal.

According to Frank (1988), love is this commitment device. In this view, love acts like a rental lease, motivating people to foreclose on romantic alternatives and remain committed to their relationship even if more appealing outside options become available. By hypothesis, a

prospective partner motivated by love should be more desirable, all else equal, than a partner motivated by self-interest because a lovestruck partner can be trusted to remain committed *even in the face of temptation from alternatives*. That is, an individual who commits solely because their partner is marginally more attractive than their next best alternative cannot be trusted to remain committed across time. But an individual who commits independent of how their partner compares to alternatives is likely to remain committed even if their partner's desirability changes. This trust that a potential partner will remain makes paying the costs associated with establishing a romantic relationship worthwhile. Just as with a rental lease, those who let themselves be guided by love rather than pure self-interest risk committing to less-than-optimal relationships, but they are spared the greater costs of failing to attract a partner in the first place.

We must emphasize that love could increase commitment without acting as a *commitment device* in Frank (1988)'s original sense. For an arrangement to qualify as a commitment device, an individual must inflate the "price" of some choices over others, forcing themselves to forgo alternatives that would otherwise have served their immediate self-interests in the absence of such a device (Bryan, Karlan, & Nelson, 2010). Many things can have the effect of increasing commitment without being commitment devices *per se*.

As a simple example, imagine a tenant who decides to paint the walls of their apartment a more attractive color. This change in color makes them happier with the unit, and because of this, they are less interested in searching for alternative apartments and more willing to renew their lease. In this case, painting does increase the tenant's commitment to their apartment. However, painting is not acting as a commitment device *per se* because its primary function is home improvement; instead, painting increases commitment only as a byproduct of the tenant's greater living conditions.

On the other hand, imagine a second tenant who is tired of moving but knows their future self might fall prey to wanderlust. To prevent this, they intentionally mix a unique and interesting color that they know will be challenging to reproduce later should they decide to move. The irreproducibility of their wall color forces them to stick to their current apartment even as they get the itch to explore other options. In this case, painting both increases commitment and acts as a commitment device because the function of wall painting is to restrict the tenant's ability to pursue their future self-interest.

Cutting up a credit card, locking one's fridge (and leaving the key in a hard-to-reach location), or going to the library to finish an assignment are other well-known examples of commitment devices. In each of these scenarios, the individual takes on an action to prevent their future selves from making undesirable choices, such as consuming junk food or procrastinating on work. These restrictions on one's ability to pursue alternatives ensure long-term commitment to a desired outcome.

For love to qualify as a commitment device, it, too, must do more than simply increase one's commitment to one's partner. Instead, love itself must restrict one's ability to pursue outside options, such as by making them appear less enticing, even when they would better serve the individual's self-interest. In economic terms, the commitment device must artificially raise the "price" of pursuing romantic alternatives to a level beyond what would otherwise be acceptable.

Although initially an economic hypothesis, the commitment device hypothesis has been imported by psychologists as a model for the evolved function of romantic love (Buss, 2019). In a test of the commitment device hypothesis, Gonzaga et al. (2008) found that participants primed with feelings of romantic love more successfully suppressed thoughts of an attractive alternative

than control participants. In a similar vein, Maner, Rouby, & Gonzaga (2008) found that participants primed with feelings of love also showed reductions in attention to attractive, opposite-sex photographs in a visual dot-probe task. Other research has shown that partnered heterosexual participants rate opposite-sex others as less attractive than single participants (Simpson, Gangestad, & Lerma, 1990). And in studies of “love acts,” Buss (1988) found that people nominated behaviors such as “*She gave up going out with other guys,*” “*He resisted the sexual opportunity he had with another woman,*” and “*She remained faithful to him while he was away*” as central to, and indicative of, someone being in love.

These lines of work lend some support to the commitment device hypothesis. Nonetheless, several lines of evidence cast doubt on the possibility that romantic love—as operationalized by psychologists—really represents a commitment device in Frank (1988)’s original sense. In the first place, arrangements involving multiple long-term partners are common, and evidence suggests that such relationships are not devoid of romantic feelings, such as love. For example, in a large survey of polyamorous participants, Balzarini et al. (2019) found high levels of passionate and companionate love in relation to both primary and secondary partners. If love acts as a commitment device motivating foreclosure on romantic alternatives, it is unclear why it might extend to secondary partners.

Second, longitudinal and cross-sectional evidence suggests that passionate love (Tucker & Aron, 1993) and companionate love (Hatfield, Traupmann, & Sprecher, 1984) often decline over time in long-term relationships. Indeed, many prominent theories of love predict gradual decreases in passionate love over the course of a relationship (e.g., Sternberg, 1986). If love serves as a commitment device, designed for preserving long-term relationship commitment in the face of ever-changing alternatives, it is unclear why its influence should diminish over time.

By analogy, rental leases are equally binding from the time they are signed to the time they terminate. The binary nature of the agreement—in which a lease is either in effect or not—is essential to its function: mutual certainty about a rental lease’s duration and terms serves as the basis for establishing trust between tenants and property owners. If romantic love serves a function similar to a rental lease, why would it not also remain equally binding across time?

Alternatives and Relationship (Dis)satisfaction

A final and critical line of evidence casting doubt on the commitment device hypothesis is the large body of literature examining the relationship between the quality of alternatives and relationship satisfaction. Relationship satisfaction shows robust negative correlations with perceptions of the relative quality of alternatives: Those with higher quality alternatives report lower satisfaction in their relationships (Rusbult, Martz, & Agnew, 1998; Le & Agnew, 2003; Conroy-Beam, Goetz, & Buss, 2016). Importantly, low levels of relationship satisfaction also appear to motivate the pursuit of these alternatives, predicting infidelity (Shackelford, Besser, & Goetz, 2008), flirtation with others (O’Farrell, Rosenthal, & O’Neal, 2003), and decreased self-reported commitment (Le & Agnew, 2003). Put differently, as romantic alternatives become more appealing, people become both less satisfied with their relationships and more willing to abandon them.

On its face, this collection of facts suggests a potential contradiction: Whereas the commitment device hypothesis predicts foreclosure on romantic alternatives to sustain commitment, existing research suggests that high-quality alternatives *reduce* commitment by lowering relationship satisfaction. Understanding the state of the commitment device hypothesis, and the function of romantic love, requires resolving this apparent contradiction.

Love, Alternatives, and Satisfaction: Resolving the Contradiction

Here, we consider two hypotheses which could potentially resolve the discrepancy between the commitment device hypothesis of romantic love and the literature on satisfaction and romantic alternatives. One, a moderation account, salvages the commitment device hypothesis. The other, a mediation account, suggests that love is not a commitment device at all, but rather that love functions to motivate investment in relationships to which one is already committed.

The Commitment Device Moderation Hypothesis

One possible explanation for these findings, consistent with the commitment device hypothesis, is that the known relationship between the quality of alternatives and relationship satisfaction is moderated by romantic love. Existing research suggests that the presence of high-quality alternatives reduces relationship satisfaction, and relationship dissatisfaction motivates efforts to attract these alternatives. If love is designed to motivate foreclosure on these alternatives, it could act as a commitment device by attenuating the link between the relative quality of alternatives and relationship satisfaction. That is, if love is a commitment device as described by Frank (1988), it should “shield” relationship satisfaction and commitment against the psychological allure of high-quality alternatives. Thus, any relationship between the presence of high-quality alternatives and relationship dissatisfaction—and, by extension, the pursuit of those alternatives—should be attenuated by romantic love.

Love as a Relationship Maintenance Mechanism

A more radical alternative is that love—at least as understood by psychologists—is not a commitment device at all. The commitment problem Frank (1988) identifies likely exists to some degree. Nonetheless, it is possible that other psychological mechanisms—for instance, feelings of attraction—function to solve this problem, whereas love serves other functions in regulating

romantic relationships. What might those other functions be? Once one initiates a romantic relationship, they encounter an array of new problems distinct from those encountered in partner choice: preventing poachers from luring one's partner (Schmitt & Buss, 2001), preventing one's partner from engaging in self-interested behavior (Sell, Tooby, & Cosmides, 2009), supporting and soliciting support from one's partner (Gable & Reis, 2010), preventing a partner's diversion of sex and resources to others outside the relationship (Buss, 2016), and so on. Each of these challenges is cued by different contexts, requires different solutions, and likely engages distinct psychological systems. Jealousy, for example, appears well-designed for preventing infidelity, defection, and mate poaching by motivating mate retention behaviors¹ (Buss, 2013; Valentova, de Moraes, & Varella, 2020), but it may not be well-designed for eliciting support. A possibility emerges, then, that love is just one member of this broader suite of relationship maintenance emotions, designed not to act as a commitment device but to solve relationship maintenance problems.

A corollary of this hypothesis is the existence of a meta-problem: deciding when to engage which relationship maintenance systems. All relationship maintenance behavior carries opportunity costs; time, energy, and resources invested in relationship maintenance cannot be devoted to other pursuits. A relationship maintenance system should only be activated to the extent that its benefits offset these costs given the relationship context.

The functional systems involved in relationship maintenance likely possess somewhat distinct eliciting cues—for instance, the scent of a stranger's perfume on a partner is likely an

¹ Here, we conceptualize relationship maintenance behavior as a higher-order category encompassing not only mate retention behavior but many other classes of behavior which benefit a relationship, such as partner support and welfare tradeoff ratio recalibration (see Figure 1). Thus, although we consider all mate retention behaviors to also be relationship maintenance behaviors, we do not consider all relationship maintenance behaviors to be mate retention behaviors. For instance, explaining to a partner that they are treating you unfairly in an effort to change their behavior toward you or performing a favor for that partner to free up their resources may improve the quality of that relationship without (necessarily) increasing the probability of retaining that partner.

input cue to jealousy systems but not to love systems. Nonetheless, these distinct systems are likely to share one critical modulating input in common: the extent to which a relationship is worth maintaining in the first place. If maintaining a relationship is not preferable to pursuing outside options, there is little value in engaging psychological systems designed for relationship maintenance.

It is here that the relationship maintenance hypothesis diverges from the commitment device hypothesis. If romantic love functions to motivate relationship maintenance behavior, and part of what makes a relationship worth maintaining is the absence of appealing alternatives, the relationship maintenance hypothesis suggests that alternatives—rather than being ignored—may *calibrate* the intensity or frequency of love that one experiences. Thus, according to the relationship maintenance hypothesis, feelings of love should be most extreme among those whose partners are high in quality relative to alternatives. For these individuals, the benefits of engaging relationship maintenance systems such as love far outweigh the costs.

Satisfaction and the Relationship Maintenance Hypothesis

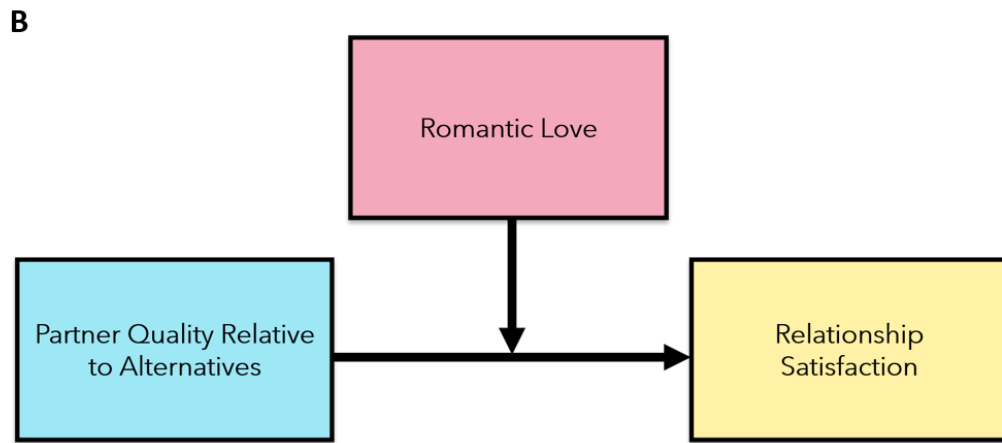
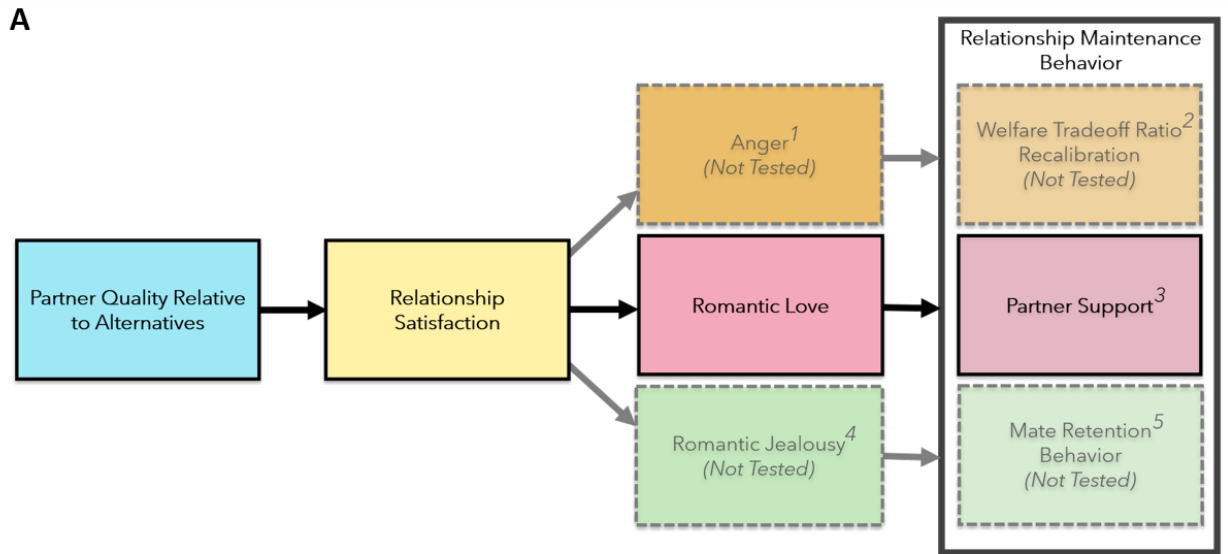
In addition to making predictions concerning the role of alternatives in love and relationship maintenance, the relationship maintenance hypothesis makes additional predictions about the role of relationship satisfaction. Theoretical accounts of relationship satisfaction suggest that it acts as an internal regulatory variable (Conroy-Beam, Goetz, & Buss, 2015). Internal regulatory variables are psychological processes reflecting summary assessments of relevant stimuli, conveying information to other mechanisms in the service of behavioral calibration (Tooby & Cosmides, 2008). Just as our bodies possess internal regulatory mechanisms designed for regulating homeostasis (such as mechanisms involved in registering blood glucose levels and relaying this information to neural mechanisms involved in hunger), the

mind has been hypothesized to possess internal regulatory variables designed for regulating behavior. Relationship satisfaction has been hypothesized to reflect an internal regulatory variable which summarizes information about the quality of one's relationship and regulates downstream cognitions, behavior, and emotions, including feelings of romantic love (Conroy-Beam et al., 2015; Buss et al., 2017).

If relationship satisfaction is an internal regulatory variable that regulates other relationship beliefs, behaviors, and emotions, it may act as a mediator of the hypothesized positive relationship between the relative quality of alternatives and romantic love. That is, the relative quality of alternatives may regulate relationship satisfaction, and relationship satisfaction, in turn, may regulate proneness to emotions such as love. Both the relationship maintenance hypothesis and the commitment device moderation hypothesis are depicted in Figure 1.

Figure 1

The Commitment Device and Relationship Maintenance Models of Love



Note. Predictions from the relationship maintenance mediation model (A) and the commitment device moderation model (B). Superscripts refer to prior evidence for proposed relationships: (1) Ellis & Malamuth (2000). (2) Sell, Tooby, & Cosmides (2009). (3) Collins et al. (2014). (4) Dandurand & Lafontaine (2014). (5) Buss (2013).

The Present Studies

Here, we use measures of partner quality relative to alternatives, relationship satisfaction, and romantic love to compare the commitment device and relationship maintenance hypotheses for the function of romantic love. The commitment device hypothesis predicts a moderation

relationship, wherein romantic love moderates the relationship between the relative quality of alternatives and relationship satisfaction. In contrast, the relationship maintenance hypothesis predicts a mediation account, in which relationship satisfaction mediates a relationship between the relative quality of alternatives and romantic love.

In Studies 1 and 2, we compared the commitment device and relationship maintenance hypotheses among undergraduate students and Amazon Mechanical Turk workers, respectively. In Studies 3 and 4, we compared these hypotheses in two large samples of romantic dyads. In Study 5, we examined the generalizability of the relationship between alternatives and romantic love by examining participants across 44 countries around the world.

Study 1

Study 1 compared the commitment device moderation hypothesis and the relationship maintenance hypothesis in an undergraduate sample.

Method

Participants

Participants were $n = 101$ undergraduate students involved in committed, heterosexual, romantic relationships. This gives us 80% power to detect a correlation of $r = .27$. Participants were $M = 19.3$ years old on average ($SD = 3.67$), and 82% were female. Participants were in their relationships for $Mdn = 19$ months at the time of participation. Participants who failed either of two attention checks were excluded from all analyses.

Materials

Participants completed a survey battery designed to measure their mate preferences, self and partner mate value, and feelings of relationship satisfaction and romantic love. The order of survey materials was randomized across participants.

Mate preferences. Participants completed a 23-item mate preference questionnaire from Conroy-Beam, Goetz, and Buss (2016). Participants used this questionnaire to rate their ideal partner (e.g., “How much should your ideal partner like kids?”), themselves (e.g., “How much do you like kids?”), and their actual romantic partner (e.g., “How much does your romantic partner like kids?”). The complete questionnaire can be accessed at https://osf.io/gfeqr/?view_only=16ef6d1cdb5a4dd2bf32d33114830b48.

Relationship evaluation. To assess satisfaction, participants completed the Quality Marriage Index (Norton, 1983), a 6-item measure of relationship quality ($\alpha = .89$). To assess romantic love, participants completed a version of the Triangular Love Scale (Sternberg, 1997), a measure assessing three dimensions of romantic love: passion (e.g., “I cannot imagine another person making me as happy as ____ does.”), intimacy (e.g., “I feel emotionally close to ____.”), and commitment (e.g., “I could not let anything get in the way of my commitment to ____”). While reading, participants are asked to imagine their partner’s name in place of each blank. Due to a clerical error, we administered the 36-item version of the Triangular Love Scale ($\alpha = .97$; Sternberg, 1997; see Study 1), rather than the 45-item version (Sternberg, 1997; see Study 2).

In addition to these focal measures, participants also rated the relative importance of each of the 23 mate preference dimensions on a 7-point scale and completed the Revised Sociosexual Orientation Inventory; these are not analyzed here.

Data Processing

Each participant rated their partner across a variety of traits, allowing us to identify the relative mate value of every partner in the sample. To quantify the quality of one's partner relative to alternatives, we used these ratings to compute partner-potential mate value discrepancies (MVDPP; Conroy-Beam, Goetz, and Buss 2015, Conroy-Beam, Goetz, & Buss, 2016). MVDPP provides an estimate of the quality of one's partner relative to alternatives by estimating the proportion of potential mates in the sample who fulfill a given person's preferences less effectively than their actual partner. Thus, a high MVDPP value indicates that one's partner is a better match to their preferences than most other partners in the sample. Previous research has demonstrated that those with higher MVDPPs report higher levels of relationship satisfaction (Conroy-Beam, Goetz, & Buss, 2016).

To compute MVDPPs, we first calculated the degree to which each participant's actual partner fulfilled their ideal mate preferences using a Euclidean distance function, in keeping with previous research (for details, see Conroy-Beam, Goetz, & Buss, 2016). The ratings of an ideal partner and the ratings of one's actual partner were each represented as a point in a multidimensional space, with axes representing each trait dimension. Mate preference fulfillment is then calculated as the straight-line distance between one's ideal and actual partners in a 23-dimensional space, corresponding to the 23 trait dimensions on which they were rated (Conroy-Beam, Goetz, & Buss, 2016).

We next computed the same distance between each participant's ideal preferences and every other same-sex participant's actual partner. MVDPPs were then calculated as the proportion of these alternative partners that were further from the participant's ideal preferences in multidimensional space than the participant's actual mate. Larger values indicate that a partner

is higher in quality than most alternative partners in the sample.

Data Analysis

To test the relationship maintenance hypothesis, we constructed a saturated path model examining the effect of MVDPP on love through relationship satisfaction. To test the commitment device hypothesis, we entered love, MVDPP, and their interaction in a linear regression model as predictors of relationship satisfaction. In all models, MVDPP, love, and relationship satisfaction were standardized prior to running analyses. Data analysis for all studies was performed in R. The analysis script, data, and materials for all studies can be found on the Open Science Framework:

https://osf.io/gfeqr/?view_only=16ef6d1cdb5a4dd2bf32d33114830b48.

Results

Table 1 presents the zero-order correlation matrix between love, MVDPP, and relationship satisfaction. The relationship maintenance mediation model is depicted in Figure 2; Tables 2 and 3 present all parameter estimates for both models. Because all variables were standardized prior to analyses, coefficient estimates can be interpreted comparably to standardized effect sizes.

Contrary to the prediction of the commitment device hypothesis, in the commitment device model, the interaction between MVDPP and romantic love did not significantly predict relationship satisfaction, $b = -.11$, $t(97) = -1.56$, $p = .122$. However, a significant main effect of love emerged, $b = .36$, $t(97) = 3.79$, $p < .001$. Those in love reported significantly greater relationship satisfaction.

In the relationship maintenance model, MVDPP significantly predicted love, $p = .036$ (see Figure 2). The indirect path from MVDPP to love through relationship satisfaction was also

significant, $p = .045$. This suggests that MVDPP predicts romantic love, and this relationship is partially mediated through feelings of relationship satisfaction.

Table 1

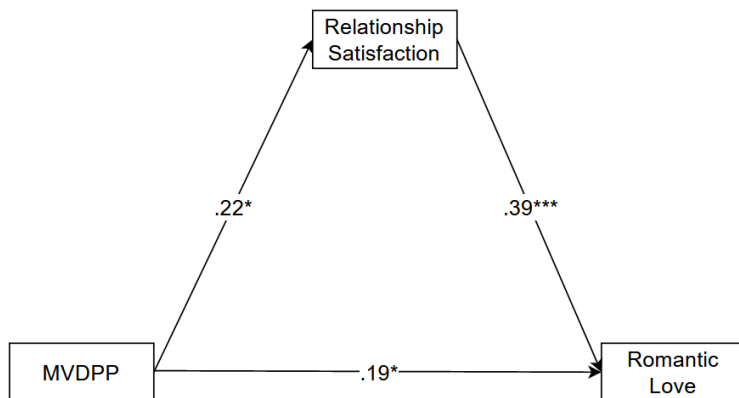
Zero-order correlations of the three variables used in the commitment device and relationship maintenance models of love.

	1	2	3
1. Love			
2. MVDPP	.274**		
3. Relationship Satisfaction	.428***	.220*	

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

Figure 2

Relationship Maintenance Mediation Model in Study 1



Note. Path diagram of the relationship maintenance mediation model tested in Study 1.

Table 2

Path model estimates in Study 1 for the relationship maintenance mediation model.

Variable	Estimate	SE	p
<i>Love</i>			
Relationship satisfaction	.39	.09	< .001
Mate value discrepancy: partner-potential (MVDPP)	.19	.09	.036
<i>Relationship Satisfaction</i>			
Mate value discrepancy: partner-potential (MVDPP)	.22	.10	.024

Discussion

In keeping with the predictions of the relationship maintenance hypothesis, MVDPP was positively associated with romantic love, and this relationship was mediated by relationship satisfaction. Those with a partner higher in quality relative to alternatives felt more satisfied in their relationship, and this satisfaction was associated with stronger feelings of love for one's partner. Not only were these relationships not predicted by the commitment device hypothesis, but the relationship between MVDPP and relationship satisfaction was not moderated by romantic love—in direct contrast with the predictions of the commitment device hypothesis.

Additionally, the positive correlation between MVDPP and love is difficult to explain under a commitment device account of love. Those participants experiencing high MVDPP (that is, possessing few superior alternatives relative to their current partner) are the *least* in need of a commitment device, yet these are the very participants reporting the *highest* amount of romantic love. Conversely, those participants with low MVDPP, who would theoretically be most in need of a commitment device, reported the *lowest* levels of romantic love. If love is, in fact, a commitment device designed to motivate foreclosure on alternatives, it's unclear why it would decrease precisely when it would be needed most urgently.

Although the relationship maintenance mediation model was supported over the commitment device model in Study 1, the sample size was relatively small, and all participants were undergraduate students. We conducted Study 2 to replicate these effects in a larger and more diverse sample of participants.

Study 2

Method

Participants

Participants were $n = 2,017$ Amazon Mechanical Turkers (49% female) involved in committed, romantic, heterosexual relationships. Participants were $M = 34$ years old on average ($SD = 10.2$) and were in their relationships for $Mdn = 48$ months at the time of participation.² Participants who failed either of two attention checks were excluded from all analyses.

Materials

As in Study 1, participants completed a survey battery designed to measure their mate preferences, self and partner mate value, and feelings of relationship satisfaction and romantic love. The order of survey materials was randomized across participants. All materials were the same as those used in Study 1. Cronbach's α for the Quality Marriage Index was .96.

Cronbach's α for the Triangular Love Scale was .98.

Data Processing

Preference fulfillment and MVDPP values were calculated using a Euclidean distance function in accordance with the data processing procedures described in Study 1.

Data Analysis

As in Study 1, data were analyzed using path modeling and multiple linear regression analyses, and all variables were standardized prior to running analyses. See Study 1 for details.

Results

The zero-order correlation matrix between love, MVDPP, and relationship satisfaction is presented in Table 3. The relationship maintenance mediation model is presented in Figure 5.

Tables 5 and 6 present all parameter estimates for the two models. Because all variables were standardized prior to analyses, coefficient estimates can be interpreted comparably to

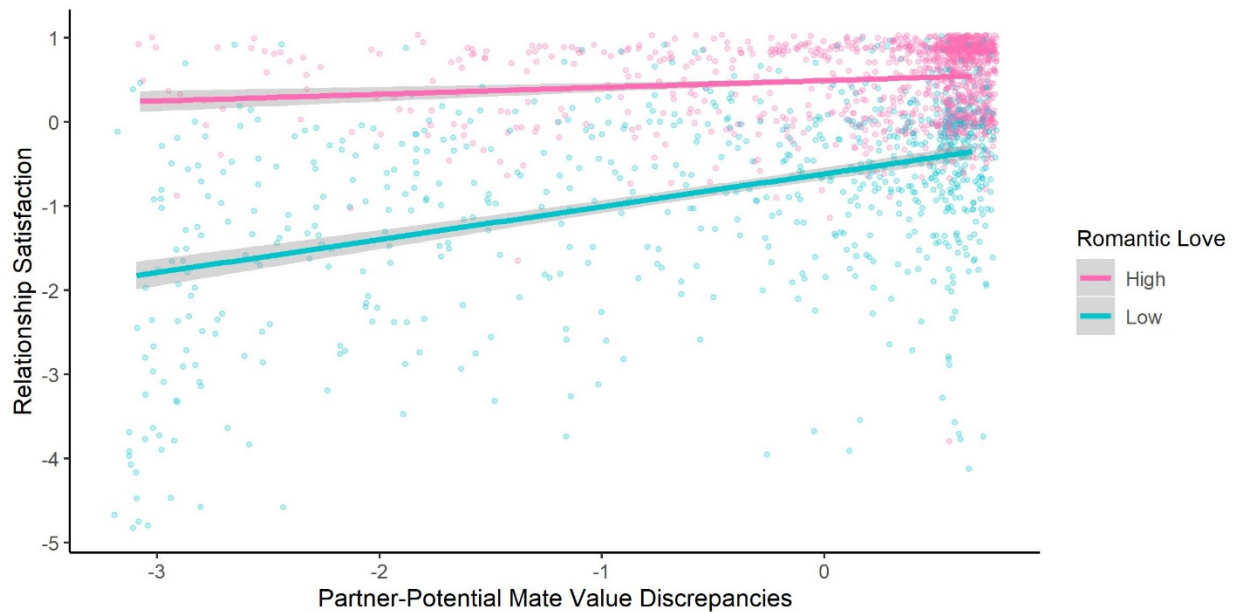
² Although we asked about relationship length in months, some participants appear to have written their answer in years. To assess the median relationship length in months, we removed participants who included any text in their answer (e.g., "12 years" or "5 and a half months") and computed the median using the remaining values. However, because some participants appear to have misread the question, this value should be regarded with some caution.

standardized effect sizes. The high correlation between romantic and love and satisfaction might give cause for concern that these are not truly distinct constructs. However, confirmatory factor analysis confirms that the scale items used to measure satisfaction and love in this sample are best treated as measuring two distinct latent variables corresponding to love and satisfaction rather than one combined latent variable (see supplementary materials). For this reason, we continued to treat love and satisfaction as distinct constructs in this and all following samples.

In the commitment device model, consistent with the predictions of the commitment device hypothesis, MVDPP and romantic love significantly interacted to predict relationship satisfaction, $b = -.06$, $t(2013) = -6.82$, $p < .001$. Participants with lower MVDPPs reported lower relationship satisfaction; however, this relationship was attenuated for participants who reported high levels of romantic love (Figure 3). Nonetheless, inspection of Figure 3 and Table 3 suggest that some caution is warranted in interpreting this interaction. Few participants simultaneously experienced low MVDPP and high levels of romantic love because MVDPP and love were themselves strongly and positively correlated. For example, only 19% of participants reporting above-mean levels of love reported below-mean levels of MVDPP. Thus, the apparent interaction between love and MVDPP in predicting satisfaction could reflect a restriction of range in MVDPP as a function of romantic love owing to the strong relationship between them: among those high in romantic love, MVDPP may not be able to predict relationship satisfaction simply because there is insufficient variation in MVDPP. Moreover, the positive correlation between MVDPP and romantic love is perplexing under a commitment device account, as it implies that those most in need of a commitment device actually experience lower levels of romantic love.

Figure 3

Love, Satisfaction, and Partner-Potential Mate Value Discrepancies (MVDPP)



Note. Relationship satisfaction as a function of partner-potential mate value discrepancies (MVDPP) and romantic love in the commitment device hypothesis. Responses above the mean are shown in pink, and responses below the mean are shown in blue. Love moderated the relationship between MVDPP and satisfaction such that the strength of this relationship was attenuated among those higher in romantic love.

In the relationship maintenance model, following from this pattern of correlations, MVDPP significantly positively predicted love, $p < .001$. MVDPP also significantly and positively predicted relationship satisfaction, $p < .001$. In keeping with the predictions of the relationship maintenance hypothesis, the indirect path from MVDPP to love through relationship satisfaction was also significant, $p < .001$ (Table 4). This demonstrates a mediational path in which higher MVDPP predicts greater relationship satisfaction, and greater relationship satisfaction predicts more romantic love.

Table 3

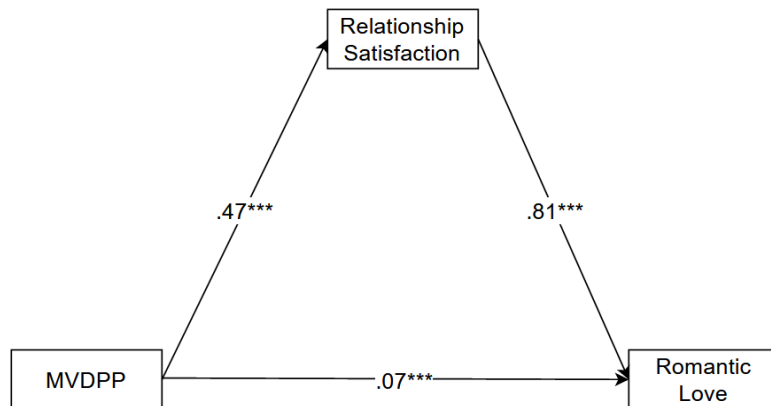
Zero-order correlations of the three variables used in the commitment device and relationship maintenance models of love.

	1	2	3
1. Love			
2. MVDPP	.447***		
3. Relationship Satisfaction	.841***	.466***	

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

Figure 4

Relationship Maintenance Mediation Model in Study 2



Note. Path diagram of the mediation model tested in Study 2.

Table 4

Path model estimates in Study 2 for the relationship maintenance mediation model.

Variable	Estimate	SE	<i>p</i>
<i>Love</i>			
Relationship satisfaction	.81	.01	< .001
Mate value discrepancy: partner-potential (MVDPP)	.07	.01	<.001

<i>Relationship Satisfaction</i>			
Mate value	.47	.02	<.001
discrepancy: partner-potential (MVDPP)			

Discussion

As in Study 1, MVDPP was significantly and positively associated with romantic love, and the relationship between MVDPP and romantic love was mediated by relationship satisfaction. However, in contrast with the findings from Study 1, some support for the commitment device moderation model was also found. As predicted by the commitment device hypothesis, the interaction between MVDPP and romantic love significantly predicted relationship satisfaction; specifically, the effect of MVDPP on relationship satisfaction was weaker among those more in love with their partner. Put differently, love appeared to “shield” satisfaction from the negative effects of high-quality alternatives. However, because MVDPP and love were strongly correlated (as predicted by the relationship maintenance hypothesis, but not the commitment device hypothesis), few participants high in love were also low in MVDPP. Thus, it is unclear whether the observed interaction reflects a true moderation effect or a byproduct of restrictions in range.

Nonetheless, because some support was found for the commitment device moderation model, we attempted to replicate these results using a dyadic sample in Study 3. The dyadic nature of Study 3 also allowed us to rule out a potential alternative explanation for the relationships between MVDPP, satisfaction, and love predicted by the relationship maintenance hypothesis. Moreover, participants in Study 3 also completed a measure of relationship maintenance behavior, allowing us to examine the hypothesized link between love and relationship maintenance behavior.

Study 3

In Study 3, we used a dyadic sample to rule out the potentially confounding effect of partner idealization. Participants in Studies 1 and 2 rated the extent to which each of 23 traits were preferred in an ideal partner and rated their actual partner's standing on each trait. To compute MVDPP, a measure of partner quality relative to alternatives, we then compared each participant's actual partner to every other partner rated in the sample. Because these calculations depend on self-ratings of love *and* self-ratings of a partner's standing on each trait, one possible explanation for the relationship between MVDPP and romantic love observed in Studies 1 and 2 is that those in love idealize their partner, rating them more favorably across traits (Murray, Holmes, & Griffin, 1996). This idealization could result in a significant relationship emerging between MVDPP and romantic love due to an effect of love on perceptions of a partner's traits, rather than a calibrating effect of MVDPP on feelings of love.

To address this limitation, Study 3 examined the relationship maintenance hypothesis in two ways. First, we examined the effects of MVDPP on relationship satisfaction and love when averaging between self and partner ratings of a partner's traits. Second, we examined the effects of MVDPP on relationship satisfaction and love when relying exclusively on *partners' ratings* of partner traits. If the relationship between MVDPP and love remains when relying exclusively on a partner's own ratings of the traits they possess, this provides some support for the view that MVDPP calibrates feelings of love—rather than the other way around.

Study 3 also included measures of relationship maintenance behavior, allowing us to test the relationship maintenance hypothesis more completely. Although the positive relationship between love and relationship maintenance behavior is well-established (for a review, see Ogolsky & Bowers, 2013), we sought to replicate this relationship in the present study.

Method

Participants

Participants were $n = 382$ people who were members of $k = 191$ committed, romantic, heterosexual dyads. Participants were $M = 49.86$ years old on average ($SD = 14.48$) and had been in their relationships for $Mdn = 13$ years at the time of participation. These data were used previously in Conroy-Beam (2021).

Materials

Mate Preferences. Participants completed a 20-item version of the mate preference questionnaire used in Studies 1 and 2.³ Participants answered questions regarding their ideal partner on a 7-point scale with bipolar adjectives at each endpoint (e.g., “Very Unkind” and “Very Kind”). As in previous studies, these questions were repeated for one’s actual partner and for one’s own self. The complete questionnaire is included on the OSF project page.

Relationship Quality. As measures of relationship satisfaction, participants completed the Quality Marriage Index and the satisfaction subscale of the Perceived Relationship Quality Components questionnaire. These scales were averaged together to create a composite measure of relationship satisfaction ($\alpha = .96$). Additionally, participants completed the 36-item version of the Triangular Love Inventory as a measure of romantic love ($\alpha = .99$).

Relationship Maintenance Behavior. As a measure of relationship maintenance behavior, participants completed the Routine and Strategic Relationship Maintenance Behaviors Scale (Stafford, Dainton, & Haas, 2000). Participants indicated how frequently they performed a variety of relationship maintenance behaviors (e.g., “I show him/her how much he/she means to

³ In this version of the questionnaire, cooking ability and pleasantness of personality were not included, and masculinity and femininity were combined into a single item. Thus, the questionnaire is 20 items, rather than 23-items.

me”) on a 7-point scale ranging from “Very rarely” to “Very often.” Relationship maintenance was measured as the mean of all behavior frequencies reported on this scale ($\alpha = .96$).

Data Processing

Preference fulfillment and MVDPP values were calculated using a Euclidean distance function, as in Study 1. However, because both members of the dyad rated their own traits and their partner’s traits, we computed these values by averaging self and partner ratings of a partner’s traits. To address the possible confounding effect of idealization on perceptions of one’s partner, we also re-fit the relationship maintenance model when computing MVDPP exclusively on the basis of a partner’s own ratings of their traits.

Data Analysis

Like the models used in Studies 1 and 2, the predictions of the relationship maintenance hypothesis were tested using a path model. However, given the dyadic nature of the data, these models were re-specified as saturated actor-partner interdependence models. Because we had no predictions regarding sex differences, we constrained men and women's coefficients to be equivalent across paths.

The predictions of the commitment device were tested using multilevel models, with participants nested within dyads. This multilevel model predicted relationship satisfaction from MVDPP, love, and their interaction, with a random intercept term. All variables were standardized prior to running analyses.

Results

Descriptive statistics and correlation coefficients are shown in Table 5. Among both males and females, self-ratings of love and self-ratings of relationship satisfaction were highly correlated. Nearly all other variables showed smaller but statistically significant positive

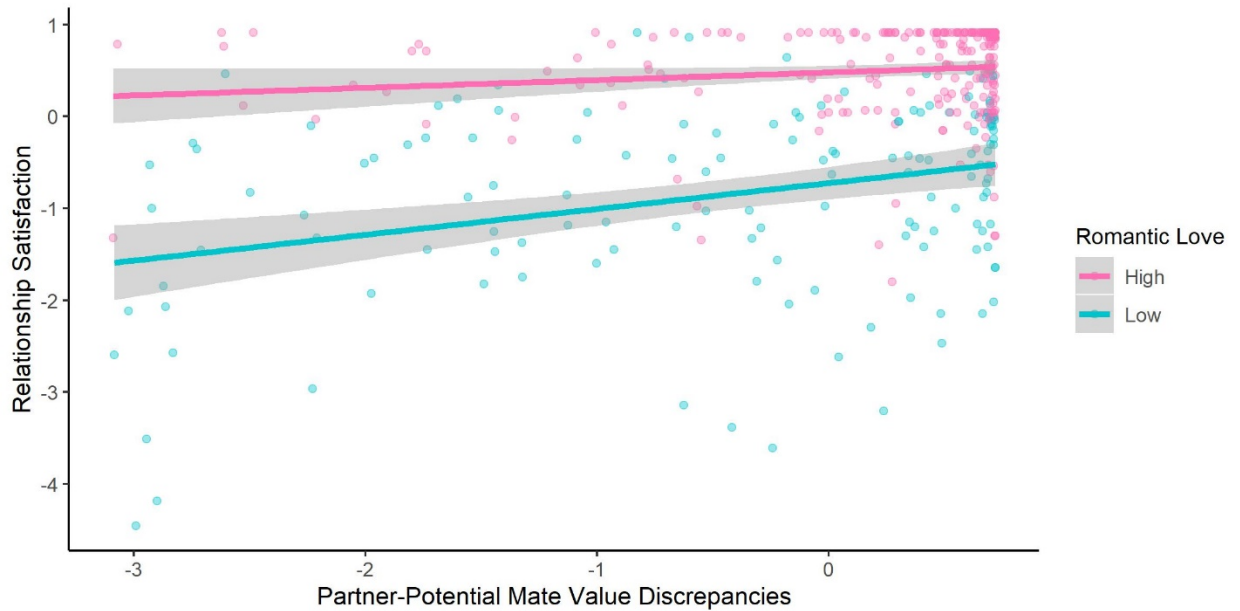
correlations; however, the positive correlation between female MVDPP and male relationship satisfaction was not significant. Because all variables were standardized prior to analyses, coefficient estimates can be interpreted comparably to standardized effect sizes.

In the commitment device model, love and MVDPP interacted to predict feelings of relationship satisfaction, $b = -.06$, $SE = .02$, $p = .013$. In keeping with Study 2, love significantly attenuated the relationship between MVDPP and relationship satisfaction. As in Study 2, however, a visual inspection of Figure 5 suggested that few participants experienced both high levels of romantic love and low levels of MVDPP simultaneously. Only 19% of participants reporting above-mean levels of love also reported below-mean levels of MVDPP. Thus, as in Study 2, MVDPP may be unable to predict relationship satisfaction because insufficient variation is present in MVDPP among those high in love.

In the relationship maintenance model, MVDPP was a positive predictor of relationship satisfaction, $b = .35$; $p < .001$, and relationship satisfaction was a positive predictor of romantic love, $b = .76$; $p < .001$. The direct effect of MVDPP on romantic love was marginally significant, $b = .06$; $p = .050$. The indirect effect of MVDPP on love through relationship satisfaction was significant, $b = .26$, $SE = .04$, $p < .001$, suggesting significant mediation. Also in keeping with the predictions of the relationship maintenance hypothesis, love was a significant predictor of relationship maintenance behavior ($b = .61$; $p < .001$), but relationship satisfaction was not ($b = -.002$; $p = .973$). The complete results of the actor-partner interdependence model are summarized in Table 6.

Figure 5

Love, Relationship Satisfaction, and Partner-Potential Mate Value Discrepancies (MVDPP)



Note. Relationship satisfaction as a function of partner-potential mate value discrepancies (MVDPP) and romantic love in the commitment device hypothesis. Responses above the mean are shown in pink, and responses below the mean are shown in blue. As in Study 2, love moderated the relationship between MVDPP and satisfaction such that the strength of this relationship was attenuated among those higher in romantic love.

The above analyses relied on a measure of MVDPP which averaged self and partner ratings of a partner's traits. To rule out the possibility that the relationship between love and MVDPP is attributable to love distorting perceptions of one's partner, we re-examined this relationship when computing MVDPP using only the partner's own ratings of their traits. Once again, MVDPP positively predicted romantic love, $b = .07$, $SE = .03$, $p = .024$, and the indirect effect of MVDPP on romantic love through relationship satisfaction was significant, $b = .29$, $SE = .04$, $p < .001$. Thus, these results suggest that the effects of MVDPP on relationship satisfaction and romantic love are unlikely to be attributable to a blinding effect of love on perceptions of partner quality. We also used partners' ratings of MVDPP to re-examine the commitment device

model. In contrast with the original model, love did not significantly interact with MVDPP to predict feelings of relationship satisfaction when MVDPP was based on partner ratings, $b = -.04$, $SE = .02$, $p = .087$.

Table 5*Descriptive Analyses and Correlations*

	M	SD	Skewness	Kurtosis	1	2	3	4	5	6	7	8
1. Male Relationship Maintenance	-.04	.99	-.41	.36								
2. Male Love	.06	.93	-1.34	1.53	.65***							
3. Male Relationship Satisfaction	.04	.99	-1.54	2.48	.53***	.83***						
4. Male MVDPP	-.04	1.04	-1.53	1.23	.27***	.40***	.42***					
5. Female Relationship Maintenance	.04	1.02	-.70	.46	.55***	.61***	.56***	.34***				
6. Female Love	-.06	1.06	-1.22	.86	.46***	.67***	.61***	.38***	.74***			
7. Female Relationship Satisfaction	-.04	1.01	-1.47	2.50	.48***	.67***	.69***	.35***	.68***	.86***		
8. Female MVDPP	.04	.96	-1.72	2.16	.18*	.19**	.17*	.32***	.21**	.40***	.37***	

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

Table 6*Path model estimates in Study 3 for the Relationship Maintenance Mediation Model.*

Effect	Estimate	SE	p
<i>Regressions</i>			
Male Satisfaction			
Male MVDPP	.35	.04	<.001
Female MVDPP	.16	.04	<.001
Female Satisfaction			

Female MVDPP	.35	.04	<.001
Male MVDPP	.16	.04	<.001
Male Love			
Male MVDPP	.06	.03	.050
Male Satisfaction	.76	.04	<.001
Female MVDPP	.05	.03	.114
Female Satisfaction	.08	.04	.033
Female Love			
Female MVDPP	.06	.03	.050
Female Satisfaction	.76	.04	<.001
Male MVDPP	.05	.03	.114
Male Satisfaction	.08	.04	.033
Male Relationship Maintenance Behavior			
Male MVDPP	-.06	.04	.166
Male Satisfaction	-.002	.07	.973
Male Love	.61	.07	<.001
Female MVDPP	.04	.04	.359
Female Satisfaction	.07	.07	.369
Female Love	.08	.07	.256
Female Relationship Maintenance Behavior			
Female MVDPP	-.06	.04	.166
Female Satisfaction	-.002	.07	.973
Female Love	.61	.07	<.001
Male MVDPP	.04	.04	.359
Male Satisfaction	.07	.07	.369
Male Love	.08	.07	.256
<i>Covariances</i>			
Male MVDPP			
Female MVDPP	.32	.08	<.001
Male Love			
Female Love	.07	.02	<.001
Male Satisfaction			
Female Satisfaction	.54	.07	<.001
Male Relationship Maintenance			
Female Relationship Maintenance	.14	.04	<.001

Note. The results are represented in a table, rather than a figure, due to the number of terms. Both models are depicted without actor and partner effects in Figure 1.

Discussion

In Study 3, in keeping with the predictions of the relationship maintenance hypothesis, MVDPP was associated with love through its effect on satisfaction, and love, but not satisfaction, was associated with relationship maintenance behavior. Specifically, those whose

partners were higher in quality relative to alternatives felt more satisfaction with, and love toward, their partner, and those in love engaged more frequently in relationship maintenance behavior. These findings are in keeping with the possibility that love motivates investment in valuable relationships.

Using the dyadic nature of Study 3, we also provided some evidence against the possibility that the relationship between MVDPP and love stems from a blinding effect of love on perceptions of one's partner. Specifically, the relationship between MVDPP and romantic love remained significant even when computing MVDPP on the basis of a partner's *self-ratings* of their standing on each trait. As a result, the relationship between MVDPP and love appears to be attributable to an effect of relative partner quality on feelings of romantic love—not an effect of love on perceptions of relative partner quality. Like Study 2, however, the commitment device hypothesis also received some support. Specifically, the relationship between partner quality relative to alternatives and relationship satisfaction was weaker among those more in love with their partner—however, this relationship did not hold when MVDPP was based exclusively on partner reports.

Although Studies 1 – 3 provided strong support for the relationship maintenance hypothesis and modest support for the commitment device hypothesis, all three studies used the same measure of romantic love: The Triangular Love Scale. Study 4 was therefore conducted to assess the generalizability of these results to another operationalization of romantic love.

Study 4

Given the mixed results for the commitment device hypothesis in Studies 1 - 3, Study 4 examined love using an alternative measure: the love subscale of the Perceived Relationship Quality Components (PRQC) Inventory (Fletcher, Simpson, & Thomas, 2000). Doing so allowed

us to examine whether evidence for the two models generalized across multiple measures of love.

Method

Participants

Participants were $n = 1,044$ people who were members of $k = 522$ committed, heterosexual, romantic dyads. Participants were $M = 56.9$ years old on average ($SD = 14$) and had been in their relationship for $Mdn = 27$ years at the time of their participation.

Measures.

Mate Preferences. Participants completed a 31-item mate preference questionnaire. This questionnaire assesses 15 partner traits, each assessed with two questions, and preferred partner age.

Relationship Quality. The love subscale of the PRQC was used as a measure of romantic love (Fletcher, Simpson, & Thomas, 2000). The love subscale of the PRQC inventory is a brief, 3-item measure assessing how much one loves, cherishes, and adores their partner ($\alpha = .94$). Relationship satisfaction was measured using the same materials as those used in Study 3 ($\alpha = .98$).

Data Processing

As in Study 3, preference fulfillment and MVDPP values were calculated using a Euclidean distance function averaging across self and partner ratings of a partner's traits. Also in keeping with Study 3, we repeated these computations when relying exclusively on a partner's self-ratings of their traits, allowing us to rule out the potentially confounding effect of love on perceptions of one's partner.

Data Analysis

Like Study 3, we re-specified the relationship maintenance mediation model from Studies 1 and 2 as a saturated actor-partner interdependence model and added equality constraints to constrain men and women's coefficients to be equivalent for all paths. We also specified the commitment device model as a multilevel model, with participants nested within each dyad. All variables were standardized prior to running analyses.

Results

Descriptive statistics and correlation coefficients are shown in Table 7. Male and female romantic love and male and female relationship satisfaction were highly correlated. Additionally, self-reports of love and self-reports of relationship satisfaction were highly correlated among both males and females. All correlations were positive and statistically significant ($p < .001$). Because all variables were standardized prior to analyses, coefficient estimates can be interpreted comparably to standardized effect sizes.

In contrast with Studies 2 and 3, love and MVDPP did not significantly interact to predict relationship satisfaction in the commitment device model, $b = -.01$, $p = .214$. The relationship between satisfaction and MVDPP was not significantly weaker among those more in love with their partner.

In the relationship maintenance model, MVDPP was a significant positive predictor of relationship satisfaction, $b = 1.63$, $p < .001$, and relationship satisfaction was a positive predictor of romantic love, $b = .13$; $p < .001$. The direct effect of MVDPP on romantic love was also significant, $b = -.05$; $p = .001$, as was the indirect (mediational) effect through relationship satisfaction, $b = .22$, $SE = 0.02$, $p < .001$. The complete results of the actor-partner interdependence model analyses are summarized in Table 8.

To fully replicate Study 3 and rule out the potentially confounding effects of partner idealization, we re-analyzed the direct and indirect effects of MVDPP on romantic love when relying exclusively on partners' own ratings of their traits. Both the direct effect of MVDPP on romantic love ($b = -.04, p = .009$) and the indirect effect through relationship satisfaction ($b = .23, SE = 0.02, p < .001$) were significant. Like the results of Study 3, these results are consistent with a mediational effect of relationship satisfaction and suggest that the relationship between love and MVDPP cannot be attributed to the effects of love on MVDPP, such as partner idealization. We also used partners' ratings of MVDPP to re-examine the commitment device model. Once again, love did not significantly interact with MVDPP to predict feelings of relationship satisfaction, $b = -.02, SE = .01, p = .064$.

Table 7*Descriptive Analyses and Correlations*

	M	SD	Skewness	Kurtosis	1	2	3	4	5	6
1. Male love	.87	.17	-1.44	1.64						
2. Male relationship satisfaction	.05	.95	-1.64	2.69	.82***					
3. Male MVDPP	.85	.23	-1.95	3.00	.24***	.41***				
4. Female Love	.84	.18	-1.41	1.63	.78***	.73***	.29***			
5. Female Relationship Satisfaction	-.05	1.05	-1.46	1.59	.71***	.81***	.37***	.84***		
6. Female MVDPP	.85	.23	-2.02	3.62	.28***	.32***	.40***	.40***	.50***	

Note. All p -values are significant $< .001$.

Table 8*Path model estimates in Study 4 for the Relationship Maintenance Mediation Model.*

Effect	Estimate	SE	p
<i>Regressions</i>			
Male Satisfaction			

Male MVDPP	1.63	.11	<.001
Female MVDPP	.83	.11	<.001
Female Satisfaction			
Female MVDPP	1.63	.11	<.001
Male MVDPP	.83	.11	<.001
Male Love			
Male MVDPP	-.05	.01	.001
Male Satisfaction	.13	.004	<.001
Female MVDPP	-.01	.01	.314
Female Satisfaction	.03	.004	<.001
Female Love			
Female MVDPP	-.05	.01	.001
Female Satisfaction	.13	.004	<.001
Male MVDPP	-.01	.01	.314
Male Satisfaction	.03	.004	<.001
<i>Covariances</i>			
Male MVDPP			
Female MVDPP	.02	.002	<.001
Male Love			
Female Love	.004	.00	<.001
Male Satisfaction			
Female Satisfaction	.57	.04	<.001

Note. The results are represented in a table, rather than a figure, due to the number of terms. The two models are depicted without actor and partner effects in Figure 1.

Discussion

Study 4 found support for the relationship maintenance hypothesis over the commitment device hypothesis. Using a different measure of love, MVDPP was once again associated with love through its effect on satisfaction, and this effect remained even when computing MVDPP exclusively on the basis of a partner's own ratings of the traits they possess. Taken together, the results of Studies 1 - 4 provide converging evidence for the predictions of the relationship maintenance hypothesis across multiple measures of love. By contrast, love did not interact with MVDPP in predicting satisfaction. Thus, the commitment device hypothesis was supported only in Studies 2 and 3, only when relying on self-reports of MVDPP, and only when using a single measure of love.

Nonetheless, despite the strong support for the relationship maintenance hypothesis found in Studies 1 - 4, these studies exclusively examined participants in the United States. Study 5 was conducted to examine whether the predictions of the relationship maintenance hypothesis generalize in a large cross-cultural sample.

Study 5

Study 5 sought to examine the generalizability of the predictions posed by the relationship maintenance hypothesis across cultures. If the observed relationship between MVDPP and romantic love reflects uniquely Western conceptualizations of romantic love, these results may not generalize to other regions. However, if the observed relationship between MVDPP and romantic love reflects the operation of a species-typical mechanism designed for motivating relationship maintenance, these results should generalize across cultures. To examine this possibility, Study 5 tested a key prediction from the relationship maintenance hypothesis—that MVDPP calibrates feelings of romantic love—across 44 countries around the world. Due to space limitations, relationship satisfaction was not included in this survey. As a result, we were unable to examine the commitment device hypothesis.

Method

Participants

Data were collected in person (not online) from participants across 44 different countries, $n = 8,805$ (4,913 female). Each study site collected data from both university populations and community samples. Due to a lack of records from about half of the sites, there is incomplete information about the percentage of each type of sample. From those sites that did keep records ($n = 3824$, 43.4%), a little over half of participants were students ($n = 2142$, 56%). Age of participants ranged from 18-87 years old ($Mdn = 27$, $M = 30.6$, $SD = 11$). These data have been

used in other work published previously (Sorokowski et al., 2021; Walter et al., 2020; Walter et al., 2021; Conroy-Beam et al., 2019a; Conroy-Beam et al., 2019b; Kowal et al., 2020).

Participants who were under the age of 18 when taking the survey were excluded from the sample. Additionally, participants who were not in a relationship, did not fill out any part of the mate preferences survey, did not fill out any part of the Triangular Love Scale, or did not report their sex were also excluded. The original dataset included 47 countries. However, two countries surveyed did not include the mate preferences portion of the survey (Serbia and Ukraine), and one country did not include the Triangular Love Scale (Bulgaria). These countries were excluded from all analyses.

Measures.

Actual, Self, and Ideal Partner Traits. Participants completed a 5-item questionnaire on their actual long-term mate, their ideal long-term mate, and themselves. Specifically, participants rated themselves and their actual and ideal mates on five traits: kindness, intelligence, health, physical attractiveness, and good financial prospects. All items were rated on bipolar adjective scales ranging from 1 (e.g., very unintelligent) to 7 (e.g., very intelligent).

Love. Participants completed the complete, 45-item version of Sternberg (1997)'s Triangular Love Scale ($\alpha = .96$). The 45-item Triangular Love Scale is comprised of three subscales: passion, intimacy, and commitment.

Data Processing

MVDPP and preference fulfillment were computed using a Euclidean distance function, in keeping with the procedures described in Study 1. However, because the data were collected across cultures, MVDPP was computed exclusively on the basis of potential partners within one's own country.

Data Analysis

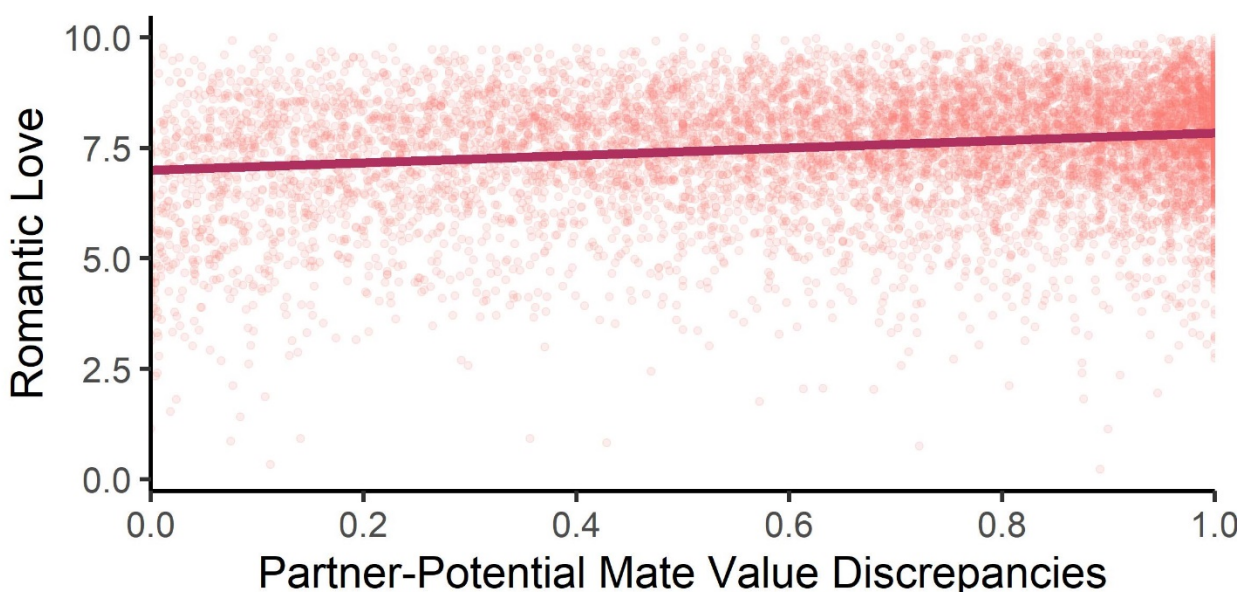
Data were analyzed using a multilevel model, with participants nested within country. This multilevel model predicted romantic love from participant MVDPP, with random slope and intercept terms. Romantic love and MVDPP were standardized across countries.

Results

Because all variables were standardized prior to analyses, coefficient estimates can be interpreted comparably to standardized effect sizes. Across cultures, MVDPP positively predicted feelings of love, $b = .21$, $SE = .02$, $p < .001$ (see Figure 6). Those participants whose partners were higher in quality relative to alternatives reported significantly greater levels of love. The random slope terms ranged from $b = .08$ in Malaysia to $b = .33$ in Russia, and the random intercept terms ranged from 5.93 in Russia to 7.67 in Norway (see Figure 7). Countries with low slopes, such as Norway, tended to also have high intercepts, suggesting that low slopes such as these are attributable to ceiling effects.

Figure 6

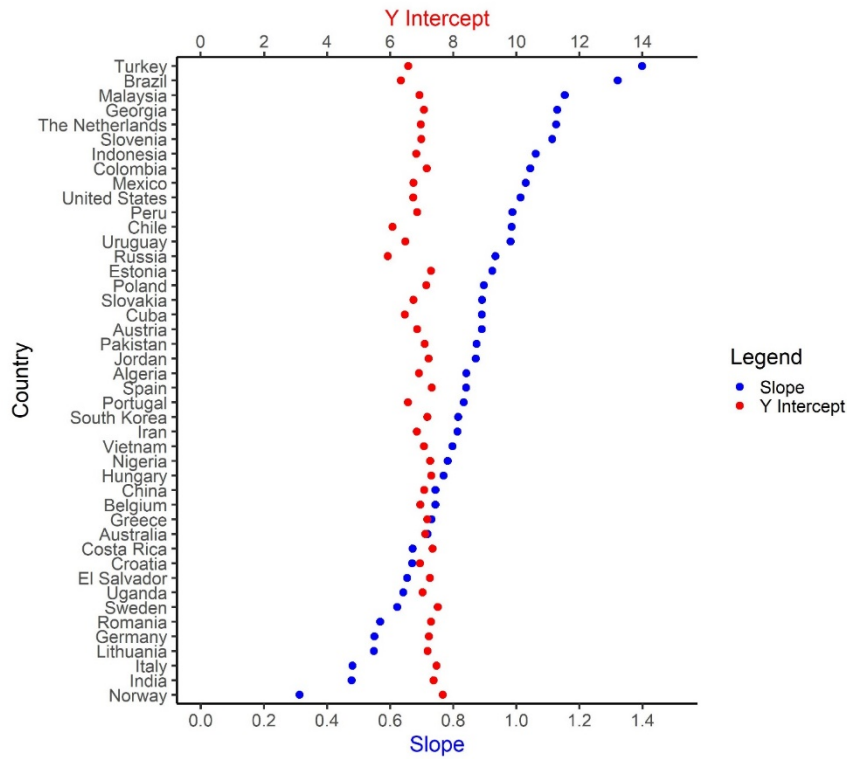
Romantic Love as a Function of Partner-Potential Mate Value Discrepancies (MVDPP)



Note. The relationship between MVDPP and romantic love, aggregating across 44 countries.

Figure 7

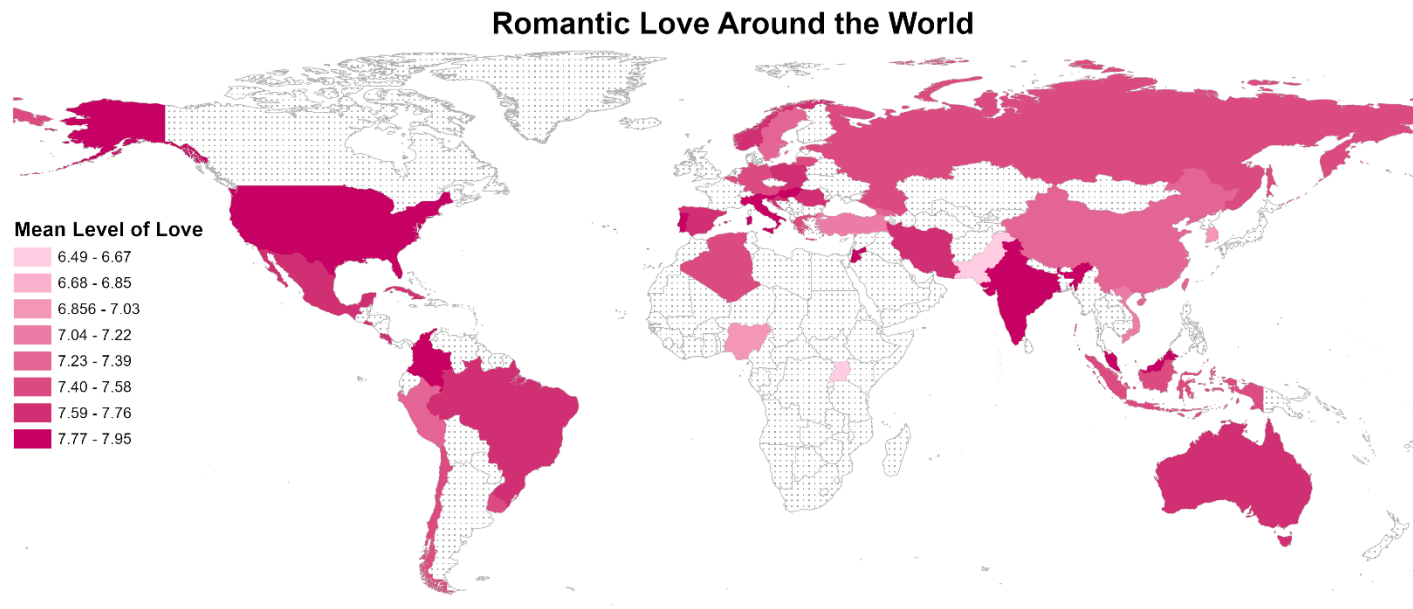
MVDPP as a Function of Romantic Love in Study 5



Note. Results of a multilevel model examining the effect of MVDPP on romantic love nested within each country.

Figure 8

Romantic Love Across 44 Countries



Note. Mean levels of romantic love across countries. Countries in the dataset are shown in pink.

Darker colors indicate higher mean levels of love. The results replicated across countries differing markedly in their overall intensity of romantic love.

Discussion

The key finding from Studies 1 through 4—that the quality of one’s partner relative to alternatives is positively associated with romantic love—replicated across 44 countries spanning 6 continents. These results are consistent with the hypothesis that romantic love is an output of a species-typical cognitive mechanism calibrated, in part, by the quality of one’s partner relative to alternatives.

General Discussion

What is love designed to do? Despite the importance and widespread interest in love and romantic relationships, this question has been surprisingly neglected. The dominant hypothesis within the existing literature has been the commitment device hypothesis. Borrowed from economics, this hypothesis proposes that love acts as a commitment device, designed to facilitate

commitment by motivating foreclosure on romantic alternatives. While the commitment device hypothesis has received some empirical support (Fletcher et al., 2015), tests of this hypothesis are relatively rare. Moreover, existing research poses a notable contradiction: possessing a partner low in quality relative to alternatives has been repeatedly shown to reduce relationship satisfaction and, in turn, lower commitment (Rusbult, Martz, & Agnew, 1998; Conroy-Beam, Goetz, & Buss, 2016). Here, we tested between two alternative models designed for resolving this contradiction.

According to the first model, which retains the commitment device hypothesis, love moderates the relationship between the quality of one's partner relative to alternatives and feelings of relationship satisfaction. In this view, the quality of one's partner relative to alternatives may be expected to predict feelings of satisfaction only among those *not* strongly in love in with their partner—that is, love acts by “shielding” relationship satisfaction and commitment against the negative effects of high-quality alternatives.

According to the second model, which we refer to as the relationship maintenance model, love is designed not to serve as a commitment device but to motivate the maintenance of relationships to which one is already committed. In this view, the quality of one's partner relative to alternatives contributes to appraisals of the value of maintaining one's relationship (e.g., in the form of feelings of relationship satisfaction), and these appraisals, in acting as a barometer of relationship value, modulate a variety of relationship maintenance emotions, including love. Each emotion, in turn, is linked to the performance of a distinct class of relationship maintenance behaviors (see Figure 1). In this way, the relationship maintenance hypothesis predicts a mediational account in which the quality of one's partner relative to alternatives predicts feelings

of relationship satisfaction, relationship satisfaction predicts feelings of love, and love predicts the frequency of relationship maintenance behaviors.

Across five studies combining university, Mechanical Turk, dyadic, and cross-cultural samples, we compared the relationship maintenance mediation account to the commitment device moderation account. Overall, we found stronger support for the relationship maintenance hypothesis. In Studies 1 and 2, we found support for a mediational model in which relationship satisfaction mediated the relationship between the quality of one's partner relative to alternatives and romantic love. In Studies 3 and 4, using a dyadic design, we found that this relationship is unlikely to be attributed to the idealization of one's partner among those in love. In Study 5, we found that the relationship between relative quality of alternatives and feelings of romantic love generalized across a sample of 44 countries around the world. In contrast, the moderation relationship predicted by the commitment device hypothesis was supported in only two out of four studies; in both cases, it was not clear whether this reflected a true moderation effect or a restriction of range owing to the strong correlations between satisfaction, love, and relative quality of alternatives. Furthermore, this moderation relationship was limited to just one measure of romantic love and only emerged when using self-reports of partner characteristics.

An alternative method of testing the commitment device model is to examine the relationship between the quality of alternatives and love directly. If love were specifically designed to protect an individual against the temptations of romantic alternatives, levels of love would increase—or at least hold constant—as the number of temptations increases. Yet, the positive correlation between love and MVDPP—our measure of the quality of one's partner relative to alternatives—suggests that those with higher quality alternatives, who are most in need of a commitment device, actually experience *less* romantic love. This appears antithetical to

a commitment device function. To refer to our previous analogy, a rental agreement which became less binding as the number of alternatives on the market increased would never succeed as a commitment device as it would cease to take effect precisely when it is most needed.

Importantly, our results do not call into question the core logic of the commitment device hypothesis. The commitment problem that Frank (1988) identifies may be a real one: Establishing a relationship would likely be challenging if one could not guarantee commitment to at least some degree even in the face of appealing alternatives. Nonetheless, other psychological processes, such as attraction, may more closely resemble the commitment device envisioned by Frank (1988). Indeed, in the original formulation of the commitment device hypothesis, Frank (1988) used the word “love” in a colloquial sense—not necessarily intending it to map one-to-one onto the psychometric operationalizations of romantic love developed by psychologists. For example, Frank (1988) provided little detail about what exactly he meant by “love”, defining love simply as a “deep bond of affection” (p. 54). It was psychologists who later imported Frank’s hypothesis and attempted to apply it to psychometric operationalizations of love. It could be, though, that Frank’s colloquial sense of love would be better applied to psychological constructs such as trust, attraction, or interdependence.

Alternatively, the commitment problem may be present in romantic relationships but solved by something other than a commitment device. For example, some have proposed that attraction itself begets attraction (Murray, Holmes, & Collins, 2006). Indeed, people are more attracted to prospective partners who are uniquely attracted to them in return (Walster, 1973), and “mutual attraction” has historically been ranked one of the most important qualities in a potential partner (Hill, 1945; Buss, 1990). This interest in interested persons opens the door for positive feedback cycles in attraction, in which A’s attraction to B increases B’s attraction to A,

which further increases A's attraction to B, and so on (Murray, Holmes, & Collins, 2006; Tooby & Cosmides, 1996; Conroy-Beam, 2021). If attraction tracks both the quality of a potential partner and their degree of mutual interest, this could solve the commitment problem without the need for a lease-like commitment device; over time, a partner could become uniquely valuable over and above alternatives not just due to their initial desirability, but to the uniquely high level of mutual interest and attraction that reciprocity builds over time.

A third possibility is that a commitment device such as love may only operate early on in a relationship. Indeed, some authors have suggested that love operates in distinct stages (Bode & Kushnick, 2021) or may only be designed to last for several years following the birth of a child (Fischer, 2000). Indeed, a commitment device may only be needed on a short-term basis if the costs of terminating a relationship increase over time. For example, love often leads to marital vows which can bind two extended families together, the severing of which could be costly to kin. Moreover, divorce after marital commitment can be costly in terms of time, resources, physiological stress, and perceived mate value. In this way, both the commitment device and relationship maintenance hypotheses of love could, in principle, be compatible with one another if love only *initially* acts as a commitment device but later motivates relationship maintenance behavior. Future research should attempt to investigate this possible directly. This would still be somewhat at odds with the results of Study 1, where we failed to find evidence of a moderation effect and did find evidence of a positive relationship between MVDPP and love even in a sample of young participants in very early relationships. Nonetheless, more focused explorations of love across the whole trajectory of relationship development may be warranted.

In summary, our results do not clearly support the hypothesis that romantic love—as measured by psychologists—acts as a commitment device in the sense described by Frank

(1988). Far from motivating foreclosure on romantic alternatives, romantic love appears to do just the opposite, shifting in response to the quality of a partner relative to these alternatives. Nonetheless, the commitment problem could still be very real. Thus, it remains possible that another process, such as attraction, may act as a commitment device; that the commitment problem may be solved by something other than a commitment device, such as feedback cycles in mutual interest; or that love acts as a commitment device in the early stages of a relationship and as a motivator of relationship maintenance in the later stages of a relationship.

Limitations and Future Directions

Despite the strengths of this research in specifying and testing two models of romantic love, there were several methodological and theoretical limitations worth noting. One methodological challenge inherent in testing the relationship maintenance model of love is that self-reports of the perceived quality of romantic alternatives pose a directionality issue: elevated levels of love could arise from having few high-quality romantic alternatives, or elevated levels of love could bias perceptions of the quality of romantic alternatives. We attempted to address this directionality issue by measuring the quality of romantic alternatives indirectly using MVDPP. To compute MVDPP, ratings of a partner's traits either come from the participant (Studies 1, 2, and 5) or the partner themselves (Studies 3 and 4). When relying on participant ratings of love and partner ratings of their standing across traits, MVDPP provides a measure of the quality of alternatives that is largely unaffected by participants' own subjective experience. Nonetheless, participants' feelings of love could still influence a partner's ratings of their traits indirectly. For example, if those in love are more likely to point out their partner's best features, one person's love for their partner may influence that partner's perception of their own traits. Future research should examine love and MVDPP longitudinally to test the possibility that

changes in perceptions of alternatives precede changes in satisfaction and love across time, rather than the other way around.

Furthermore, MVDPP is necessarily an indirect measure of the quality of alternatives. Although this way of measuring quality of alternatives may help to disentangle the directionality of the relationship between the quality of alternatives and feelings of romantic love, it remains unclear to what extent it corresponds to participants' subjective perceptions of partner quality relative to alternatives. Future research may benefit from examining MVDPP and self-reported perceptions of alternatives in tandem or manipulating the quality of alternatives experimentally.

Additionally, although we found cross-cultural support for our prediction that MVDPP calibrates feelings of romantic love in Study 5, this study did not assess the mediating role of relationship satisfaction. As a result, we were unable to test the full mediation model or the commitment device hypothesis across cultures. Future research should examine the relationships between love, MVDPP, and relationship satisfaction in cultures outside of the United States.

In addition, many types of love have been described in the literature, including passionate love (Sprecher & Fehr, 2005), companionate love (Hatfield, 1988), love styles (Lee, 1988), and others (for a review, see Graham, 2011). Although the present studies revealed qualitatively similar results across both the Triangular Love Scale and the love subscale of the Perceived Relationship Quality Components questionnaire, the sheer number of love taxonomies described in the literature necessarily means that many operationalizations of love could not be examined here. Future research should attempt to replicate these effects using alternative measures of love to better understand the scope of the relationship maintenance model.

Although our main analyses focused on overall love scores, the Triangular Love Scale includes distinct subscales for commitment, intimacy, and passion. In the supplementary

materials, we reexamined our results at the subscale level to determine whether the commitment device model was more consistently supported across one of these three components of the Triangular Love Scale, but we found that the overall pattern of results was generally unchanged (see Supplementary Table 2). Nonetheless, it remains a possibility that some components of love serve commitment device functions and others serve relationship maintenance functions. Future research employing more granular measures of love may be required to tease apart this distinction.

The present studies also had some theoretical limitations. In particular, some aspects of the relationship maintenance hypothesis require further refinement and elaboration. First, the relationship maintenance mediation model we propose (Figure 1), while a useful starting point, is not complete. For instance, the present studies examined how relationship satisfaction is influenced by the quality of alternatives, but a variety of additional factors are also associated with relationship satisfaction, including preference fulfillment (Campbell & Fletcher, 2015); mate value discrepancies between oneself and one's partner (Conroy-Beam, Goetz & Buss, 2016); and factors outside the relationship, such as external stressors (Randall & Bodenmann, 2017), among others. Establishing the causal pathways between these variables and relationship satisfaction will provide a more complete understanding of the path to relationship maintenance behaviors. Additionally, it is also possible that relationship satisfaction is not the critical mediating variable. Instead, the relationship between relative partner quality and romantic love may be mediated by other, correlated appraisals such as feelings of commitment or trust.

Second, while we examined evidence pertaining to the function of love over time, we did not derive more detailed predictions from the relationship maintenance hypothesis to clarify what is activating relationship maintenance emotions in moment-to-moment contexts. Here, we briefly

sketch out some possibilities. Navigating a relationship requires a person to engage in many different maintenance behaviors, such as showing affection, negotiating for better treatment, and defending against interlopers. Nonetheless, not all of these behaviors are worth doing all the time, nor can a person engage in all such behaviors simultaneously. Successfully regulating behavior requires a sense of priority, so that urgently useful behaviors are engaged before less urgent behaviors and costly behaviors are eschewed in favor of beneficial ones.

Successful prioritization requires making several key decisions. First, one must assess whether the relationship is worth maintaining in its current state—an assessment we hypothesize to be tracked by relationship satisfaction. The mere fact that a relationship is valuable, however, does not provide information about *when* relationship maintenance behaviors should be deployed. Consequently, one must also continually assess their environment for threats or opportunities which prompt the need for relationship maintenance. Finally, once the need for relationship maintenance behavior is triggered, one must assess which suite(s) of behaviors will be most tributary to that end given the current context (or, alternatively, which behaviors will be most useful in changing or dissolving one's relationship). In this way, satisfaction might regulate the intensity of, or proneness to, relationship maintenance emotions, but it is unlikely to activate them directly.

As a simple example, people with higher levels of relationship satisfaction may feel stronger immediate feelings of love and engage in more support behaviors when their partner does something loving, such as providing an unexpected gift. Similarly, a clear and unambiguous infidelity scenario may lead to higher levels of jealousy when satisfaction is high relative to when satisfaction is low (indeed, in this latter context, pro-dissolution emotions such as disgust, may activate in place of jealousy). These predictions offer valuable avenues for future research.

Conclusion

The evolved function of romantic love is a surprisingly underexplored question. Here, we compared the well-known commitment device hypothesis of love with a newly developed relationship maintenance hypothesis. Overall, we found stronger support for the relationship maintenance hypothesis. The association between the quality of one's partner relative to alternatives and romantic love replicated across 44 countries, two dyadic samples, and two additional samples within the United States. Using dyadic data, we also provided evidence against the possibility that the relationship between the quality of one's partner relative to alternatives and feelings of romantic love may be attributed to an effect of love on perceptions of others. These findings raise the possibility that love may not be designed as a commitment device and suggest instead that love may be calibrated by the quality of one's partner relative to alternatives. Moreover, this research highlights the need for additional work examining the role of love in both the formation and continuation of romantic relationships.

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.
- Balzarini, R. N., Dharma, C., Kohut, T., Campbell, L., Lehmler, J. J., Harman, J. J., & Holmes, B. M. (2019). Comparing relationship quality across different types of romantic partners in polyamorous and monogamous relationships. *Archives of sexual behavior*, 48(6), 1749-1767.
- Bode, A., & Kushnick, G. (2021). Proximate and Ultimate Perspectives on Romantic Love. *Frontiers in psychology*, 1088.
- Bryan, G., Karlan, D., & Nelson, S. (2010). Commitment devices. *Annu. Rev. Econ.*, 2(1), 671-698.
- Buss, D. M. (1988). Love acts. The evolutionary biology of love. In: Sternberg, RJ, Barnes, ML (Eds.), *Psychology of Love*. Yale University Press, New Haven, 100-118.
- Buss, D. M., Abbott, M., Angleitner, A., Biaggio, A., Blanco-Villasenor, A., Bruchon Schweitzer, M [& 45 additional authors]. (1990). International preferences in selecting mates: A study of 37 societies. *Journal of Cross Cultural Psychology*, 21, 5-47.
- Buss, D. M. (2013). Sexual jealousy. *Psihologijske teme*, 22(2), 155-182.
- Buss, D.M. (2016). *The evolution of desire: Strategies of human mating*. New York: Basic Books.
- Buss, D. M., Goetz, C., Duntley, J. D., Asao, K., & Conroy-Beam, D. (2017). The mate switching hypothesis. *Personality and Individual Differences*, 104, 143-149.
- Buss, D. M. (2019). The evolution of love in humans. *The new psychology of love*, 42-63.
- Campbell, L., & Fletcher, G. J. (2015). Romantic relationships, ideal standards, and mate selection. *Relationship Science*, 1, 97–100. <https://doi.org/10.1016/j.copsyc.2015.01.007>

- Campbell, L., & Loving, T. J. (2016). Love and commitment in romantic relationships.
- Collins, N. L., Kane, H. S., Metz, M. A., Cleveland, C., Khan, C., Winczewski, L., ... & Prok, T. (2014). Psychological, physiological, and behavioral responses to a partner in need: The role of passionate love. *Journal of Social and Personal Relationships*, 31(5), 601-629.
- Conroy-Beam, D., Goetz, C. D., & Buss, D. M. (2015). Why do humans form long-term mateships? An evolutionary game-theoretic model. In *Advances in experimental social psychology* (Vol. 51, pp. 1-39). Academic Press.
- Conroy-Beam, D., Goetz, C. D., & Buss, D. M. (2016). What predicts romantic relationship satisfaction and mate retention intensity: mate preference fulfillment or mate value discrepancies?. *Evolution and Human Behavior*, 37(6), 440-448.
- Conroy-Beam, D., Buss, D. M., Asao, K., Sorokowska, A., Sorokowski, P., Aavik, T., ... & Zupančič, M. (2019a). Contrasting computational models of mate preference integration across 45 countries. *Scientific reports*, 9(1), 1-13.
- Conroy-Beam, D. (2021). Couple Simulation: A Novel Approach for Evaluating Models of Human Mate Choice. *Personality and Social Psychology Review*, 1088868320971258.
- Conroy-Beam, D., Roney, J. R., Lukaszewski, A. W., Buss, D. M., Asao, K., Sorokowska, A., ... & Zupančič, M. (2019b). Assortative mating and the evolution of desirability covariation. *Evolution and Human Behavior*, 40(5), 479-491.
- Crosby, C. L., Durkee, P. K., Meston, C. M., & Buss, D. M. (2020). Six dimensions of sexual disgust. *Personality and individual differences*, 156, 109714.
- Dandurand, C., & Lafontaine, M. F. (2014). Jealousy and couple satisfaction: A romantic attachment perspective. *Marriage & Family Review*, 50(2), 154-173.
- Ellis, B. J., & Malamuth, N. M. (2000). Love and anger in romantic relationships: A discrete

- systems model. *Journal of Personality*, 68(3), 525-556.
- Fletcher, G. J., Simpson, J. A., & Thomas, G. (2000). The measurement of perceived relationship quality components: A confirmatory factor analytic approach. *Personality and Social Psychology Bulletin*, 26(3), 340-354.
- Fletcher, G. J., Simpson, J. A., Campbell, L., & Overall, N. C. (2015). Pair-bonding, romantic love, and evolution: The curious case of Homo sapiens. *Perspectives on Psychological Science*, 10(1), 20-36.
- Frank, R. H. (1988). *Passions within reason: The strategic role of the emotions*. WW Norton & Co.
- Galperin, A., Haselton, M. G., Frederick, D. A., Poore, J., von Hippel, W., Buss, D. M., & Gonzaga, G. C. (2013). Sexual regret: Evidence for evolved sex differences. *Archives of Sexual Behavior*, 42(7), 1145-1161.
- Gable, S. L., & Reis, H. T. (2010). Good news! Capitalizing on positive events in an interpersonal context. In *Advances in experimental social psychology* (Vol. 42, pp. 195-257). Academic Press.
- Gavrilets, S. (2012). Human origins and the transition from promiscuity to pair bonding. *Proceedings of the National Academy of Sciences*, 109(25), 9923-9928.
- Graham, J. M. (2011). Measuring love in romantic relationships: A meta-analysis. *Journal of Social and Personal Relationships*, 28(6), 748-771.
- Gonzaga, G. C., Haselton, M. G., Smurda, J., sian Davies, M., & Poore, J. C. (2008). Love, desire, and the suppression of thoughts of romantic alternatives. *Evolution and Human Behavior*, 29(2), 119-126.

- Hatfield, E., Traupmann, J., & Sprecher, S. (1984). Older women's perceptions of their intimate relationships. *Journal of Social and Clinical Psychology, 2*(2), 108-124.
- Hatfield, E. (1988). Passionate and companionate love. *The psychology of love*, 191-217.
- Hendrick, S. S., Hendrick, C., & Adler, N. L. (1988). Romantic relationships: Love, satisfaction, and staying together. *Journal of personality and social psychology, 54*(6), 980.
- Hill, R. (1945). Campus values in mate selection. *Journal of Home economics, 37*(9), 554-558.
- Jankowiak, W. R., & Fischer, E. F. (1992). A cross-cultural perspective on romantic love. *Ethnology, 31*(2), 149-155.
- Kenrick, D. T., Neuberg, S. L., Zierk, K. L., & Krones, J. M. (1994). Evolution and social cognition: Contrast effects as a function of sex, dominance, and physical attractiveness. *Personality and Social Psychology Bulletin, 20*(2), 210-217.
- Kowal, M., Sorokowski, P., Sorokowska, A., Dobrowolska, M., Pisanski, K., Oleszkiewicz, A., ... & Zupančič, M. (2020). Reasons for facebook usage: Data from 46 countries. *Frontiers in psychology, 11*, 711.
- Le, B., & Agnew, C. R. (2003). Commitment and its theorized determinants: A meta-analysis of the Investment Model. *Personal Relationships, 10*(1), 37-57.
- Lee, J. A. (1988). Love-styles. *The psychology of love*, 38-67.
- Maner, J. K., Rouby, D. A., & Gonzaga, G. C. (2008). Automatic inattention to attractive alternatives: The evolved psychology of relationship maintenance. *Evolution and Human Behavior, 29*(5), 343-349.
- Miller, R. S. (1997). Inattentive and contented: Relationship commitment and attention to alternatives. *Journal of Personality and Social Psychology, 73*(4), 758.

- Moors, A. C., Ryan, W., & Chopik, W. J. (2019). Multiple loves: The effects of attachment with multiple concurrent romantic partners on relational functioning. *Personality and Individual Differences, 147*, 102-110.
- Murray, S. L., Holmes, J. G., & Griffin, D. W. (1996). The benefits of positive illusions: Idealization and the construction of satisfaction in close relationships. *Journal of personality and social psychology, 70*(1), 79.
- Murray, S. L., Holmes, J. G., & Collins, N. L. (2006). Optimizing assurance: The risk regulation system in relationships. *Psychological bulletin, 132*(5), 641.
- Simpson, J. A., Gangestad, S. W., & Lerma, M. (1990). Perception of physical attractiveness: Mechanisms involved in the maintenance of romantic relationships. *Journal of Personality and Social Psychology, 59*(6), 1192.
- Sprecher, S., & Fehr, B. (2005). Compassionate love for close others and humanity. *Journal of social and personal relationships, 22*(5), 629-651.
- Stafford, L., Dainton, M., & Haas, S. (2000). Measuring routine and strategic relational maintenance: Scale revision, sex versus gender roles, and the prediction of relational characteristics. *Communications Monographs, 67*(3), 306-323.
- MacDonald, G., & Leary, M. R. (2005). Why does social exclusion hurt? The relationship between social and physical pain. *Psychological bulletin, 131*(2), 202.
- Murray, S. L., Holmes, J. G., & Collins, N. L. (2006). Optimizing assurance: The risk regulation system in relationships. *Psychological bulletin, 132*(5), 641.
- Norton, R. (1983). Measuring marital quality: A critical look at the dependent variable. *Journal of Marriage and the Family, 45*, 141-151.

- O'Farrell, K. J., Rosenthal, E. N., & O'Neal, E. C. (2003). Relationship satisfaction and responsiveness to nonmates' flirtation: Testing an evolutionary explanation. *Journal of Social and Personal Relationships*, 20(5), 663-674.
- Randall, A. K., & Bodenmann, G. (2017). Stress and its associations with relationship satisfaction. *Current opinion in psychology*, 13, 96–106.
<https://doi.org/10.1016/j.copsyc.2016.05.010>
- 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.
- Sell, A., Tooby, J., & Cosmides, L. (2009). Formidability and the logic of human anger. *Proceedings of the National Academy of Sciences*, 106(35), 15073-15078.
- Schützwohl, A., Joshi, N., & Abdur-Razak, F. (2019). Competitor derogation in romantic jealousy and friendship rivalry. *Evolutionary Behavioral Sciences*.
- Shackelford, T. K., Besser, A., & Goetz, A. T. (2008). Personality, marital satisfaction, and probability of marital infidelity. *Individual differences research*, 6(1).
- Sorokowski, P., Sorokowska, A., Karwowski, M., Groyecka, A., Aavik, T., Akello, G., ... & Sternberg, R. J. (2021). Universality of the triangular theory of love: adaptation and psychometric properties of the triangular love scale in 25 countries. *The Journal of Sex Research*, 58(1), 106-115.
- Sternberg, R. J. (1986). A triangular theory of love. *Psychological review*, 93(2), 119.
- Sternberg, R. J. (1997). Construct validation of a triangular love scale. *European journal of social psychology*, 27(3), 313-335.
- Tooby, J., & Cosmides, L. (1996, January). Friendship and the banker's paradox: Other pathways to the evolution of adaptations for altruism. In *Proceedings-British Academy* (Vol. 88,

- pp. 119-144). OXFORD UNIVERSITY PRESS INC..
- 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). The Guilford Press.
- Tucker, P., & Aron, A. (1993). Passionate love and marital satisfaction at key transition points in the family life cycle. *Journal of Social and Clinical Psychology*, 12(2), 135-147.
- Valentova, J. V., de Moraes, A. C., & Varella, M. A. C. (2020). Gender, sexual orientation and type of relationship influence individual differences in jealousy: A large Brazilian sample. *Personality and Individual Differences*, 157, 109805.
- Walster, E., Walster, G. W., Piliavin, J., & Schmidt, L. (1973). "Playing hard to get": Understanding an elusive phenomenon. *Journal of Personality and Social Psychology*, 26(1), 113.
- Walter, K. V., Conroy-Beam, D., Buss, D. M., Asao, K., Sorokowska, A., Sorokowski, P., ... & Zupančič, M. (2021). Sex differences in human mate preferences vary across sex ratios. *Proceedings of the Royal Society B*, 288(1955), 20211115.
- Walter, K. V., Conroy-Beam, D., Buss, D. M., Asao, K., Sorokowska, A., Sorokowski, P., ... & Zupančič, M. (2020). Sex differences in mate preferences across 45 countries: A large scale replication. *Psychological Science*, 31(4), 408-423.