Love and Anger in Romantic Relationships: A Discrete Systems Model

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ABSTRACT In a study of 124 dating couples, we tested a discrete systems model of the functions of two emotion systems in romantic relationships: love and anger/upset. This model posits that the operation of these systems reflects adaptations shaped by natural selection to solve different adaptive problems. Accordingly, we hypothesized that the love and anger/upset emotion systems would be largely independent in the classes of information they track in romantic relationships, in the psychological mechanisms that process that information, and in the resultant behavior generated. Consistent with the discrete systems model, and in contrast to a competing "crossover" model, differences across relationships in feelings of love covaried with differences in strategic facilitation but not in strategic interference by partners. Similarly, differences in feelings of anger/upset during conflict covaried with differences in strategic interference but not strategic facilitation. In turn, feelings of love predicted commitment-promoting

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behavior but not partner-directed aggression, whereas levels of anger/upset predicted aggression but not commitment. As also predicted by our model, the love and anger/upset emotion systems converged to predict relationship satisfaction.

Researchers have long recognized the central role in romantic relationships of emotions such as love and anger. On the whole, however, these two emotions and related behaviors have been studied within independent lines of research emerging from different concerns. One line of inquiry has concerned aggressive and abusive behavior. It has largely focused on negative affectivity, particularly anger and its impact on aggression, marital stability, and satisfaction (e.g., Fincham, Bradbury, Arias, & Byrne, 1997; Malamuth, Linz, Heavey, Barnes, & Acker, 1995; Margolin, John, & Gleberman, 1988). The other line of inquiry has concerned the experience of love and its defining elements. It has largely focused on such topics as the multidimensional complexity of love (e.g., Hazan & Shaver, 1987; Hendrick & Hendrick, 1986) and identifying a set of organized features that characterize the typical instance of love, including beliefs about the events that precipitate love (Fitness & Fletcher, 1993; Shaver, Schwartz, Kirson, & O'Connor, 1987), descriptions of the subjective experience of love (Fehr, 1988; Kelley, 1983), and reports about the things individuals do that reflect or display their love (Buss, 1988; Shaver, Schwartz, Kirson, & O'Connor, 1987; Swensen, 1972). Surprisingly, though, research has seldom considered within a unified model the role in romantic relationships of both of these central emotional systems, despite the obvious fact that both occur in most romantic relationships and, moreover, that love and aggression often coexist in such relationships (e.g., Bookwala, Frieze, & Grote, 1994; Arias, Samios, & O'Leary, 1987). The present research attempts to develop and test such a unified functional model of the role of love and anger/upset in the regulation of behavior in romantic relationships.

The importance of developing and testing models of the role of positive and negative emotions within the context of relationships can be illustrated by considering some recent findings focusing on aggression in relationships. This work has reported that individuals in abusive and/or violent relationships are more likely to report both more negative affect and less positive affect. These findings have typically been based on correlational data or mean comparisons among the relevant groups (e.g., Allen, Calsyn, Fehrenbach, & Benton, 1989; Hamberger & Hastings,

1986; Yelsma, 1996). Some researchers have suggested that these findings may be the result of a common source, namely that assaultive persons have a greater difficulty regulating their emotions, negative or positive (e.g., Yelsma, 1996). An alternative explanation, however, suggested by the model developed in the present research is that those in troubled relationships have largely independent reasons for feeling more negatively (e.g., more imposition of costs by partner) and less positively (e.g., less conferral of benefits by partner). Such a possibility is in keeping with research suggesting that positively and negatively valenced emotions sometimes co-occur and may represent independent systems (Diener & Emmons, 1984; Watson & Tellegen, 1985; Watson & Clark, 1997; Zevon & Tellegen, 1982), and that subjective evaluations of marital quality have largely independent positive and negative dimensions (Fincham & Linfield, 1997).

The Discrete Systems Model of Love and Anger/Upset

From an evolutionary perspective, emotions are adaptations that track important costs and benefits in the environment and adjust behavior in ways that increase the individual's capacity and tendency to respond adaptively to those costs and benefits (Frank, 1988; Nesse, 1990; Tooby & Cosmides, 1990). As suggested by Nesse (1990; Nesse & Berridge, 1997), specific emotions prepare us to respond adaptively to the threats and opportunities characteristic of specific kinds of situations that often influenced fitness during human evolution. For example, the emotion of disgust prepares us to respond adaptively to dangerous foods (Rozin & Fallon, 1987), but not to dangerous predators. This view underscores the independence of emotion systems: Each emotion can be expected to take a distinct and delimited class of situations as input and to transform that input into physiological and behavioral output specifically relevant to those situations. The model developed in this article uses such a framework in developing a functional model of love and of anger/upset, as described in the following four interrelated propositions:

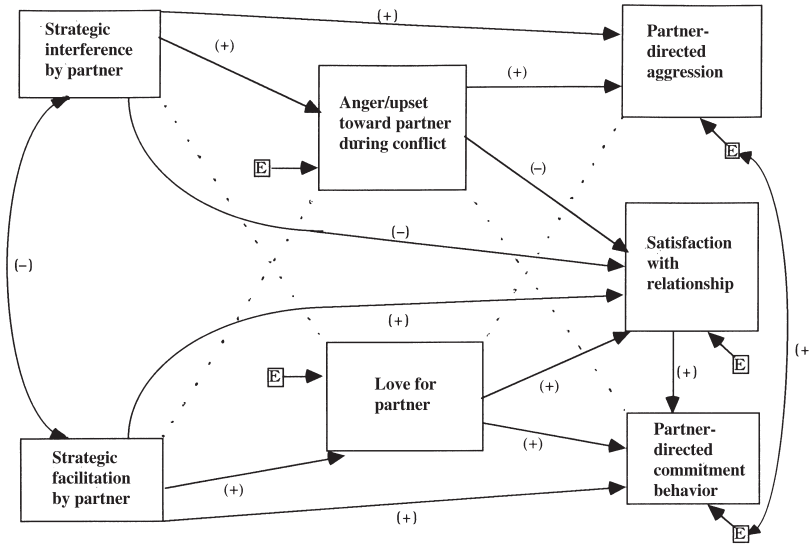
1. Variations in characteristic levels of love and anger/upset experienced in different relationships should track specific, largely independent fitness-relevant features of those relationships. Specifically in terms of anger/upset and love, we suggest the following:

a. The emotions of anger and upset operate as representations (to the individual) of overall levels of strategic interference by one's partner and function to prepare and motivate the individual to respond adaptively to this interference.[1] Our use of the terms "anger" and "upset" refer to relationship-specific traits—summary abstracts of the typical levels of anger and upset that individuals experience during episodes of conflict with their romantic partners. Strategic interference within a relationship refers to behaviors performed by one's partner (e.g., sexual rejection, infidelity, physical coercion) that block or impede the pursuit of one's own goals. Individuals who tend to experience relatively strong feelings of anger/upset during conflict with their partners should be involved in relationships characterized by relatively high levels of strategic interference and should experience relatively frequent activation of behavior-regulating mechanisms that function to reduce that interference (e.g., energizing action such as aggression toward sources of provocation; Buss, 1989). This reasoning suggests that the relation between strategic interference and partner-directed aggression will be at least partially mediated by feelings of anger/upset (see Figure 1).

b. The emotion of love informs the individual of overall levels of strategic facilitation by one's partner and prepares and motivates the individual to respond adaptively to this facilitation. We use the term "love" to refer to a relationship-specific trait—"an attitude held by a person toward a particular other person, involving predispositions to think, feel, and behave in certain ways toward that other person" (Rubin, 1970, p. 265). In the case of romantic love, these thoughts, feelings, and actions tend to include strong affiliative and dependent needs, a predisposition to help, and exclusiveness and absorption (Rubin, 1970).[2] Strategic facilitation within a relationship refers to behaviors performed by one's partner (e.g., economic support, social support, sexual

1. We use the term "respond adaptively" to refer to classes of behavior that in ancestral environments tended to promote reproductive success in the contexts that evoked them. In current environments, these "adaptive responses" may or may not promote any kind of success.

2. This research focuses on variations in the intensity of romantic love, rather than on the multidimensional complexity of love styles, which is a focus of much personality research on the topic (e.g., Hendrick & Hendrick, 1986).



Note. Dotted lines show paths that are specified by the crossover model but not by the discrete systems model.

Figure 1
Path diagram of the discrete systems model of the love and anger/upset emotion systems

intercourse) that advance the pursuit of one's own goals. Individuals who experience relatively strong feelings of love should be involved in relationships characterized by relatively high levels of strategic facilitation and should experience relatively frequent activation of behavior-regulating mechanisms that function to enhance relationship commitment (e.g., high investment, sexual exclusivity; see Frank's [1988] discussion of love as a commitment device). This reasoning suggests that the relation between strategic facilitation and performance of commitment behaviors will be at least partially mediated by feelings of love (see Figure 1).

2. Because anger/upset and love track different features of relationships and function to regulate different facets of behavior, these emotion systems should be largely independent. The psychological mechanisms that underlie variations in feelings of anger/upset are

hypothesized to take strategic interference (but not strategic facilitation) as input and to produce as output changes in levels of aggressive behavior directed toward one's partner (but not changes in commitment behavior). Conversely, the mechanisms underlying variations in feelings of love are hypothesized to take strategic facilitation (but not strategic interference) as input and to produce as output changes in levels of commitment-promoting behavior (but not partner-directed aggressive behavior).

It is important to distinguish between the independence of emotion systems, on the one hand, and the independence of inputs and outputs to these systems, on the other. Different emotion systems are independent to the extent that they track different sources of information in the environment (inputs) and generate different forms of behavior in response to that information (outputs). Different systems can be largely independent, even if their specific inputs or outputs happen to correlate. For example, the fact that the love system is hypothesized to track levels of strategic facilitation but not strategic interference does *not* imply that strategic facilitation and strategic interference will themselves be independent. To the contrary, the marital interaction literature documents a consistent negative correlation between the frequency of positive and negative actions performed by spouses (e.g., Floyd, O'Farrell, & Goldberg, 1987; Koren, Carlton, & Shaw, 1980; Margolin & Wampold, 1981). Rather, the discrete systems model posits that strategic interference and facilitation will be largely independent and domain-specific in their contributions to feelings of love and anger/upset, even though strategic interference and facilitation should be negatively associated with each other. This predicted negative correlation is represented by a two-headed arrow in Figure 1. Likewise, we are not postulating that partner-directed aggression and commitment-promoting behaviors will be independent. In fact, past research suggests that aggression and commitment tend to be positively correlated (e.g., Hanley & O'Neill, 1997; Sugarman & Hotaling, 1989), possibly because each reflects greater relationship involvement/interdependence (see discussions in Howard & Dawes, 1976; Sprecher & Femlee, 1993). Rather, the discrete systems model posits that love and anger/upset will be largely independent and domain-specific in their effects on aggression and commitment, even though aggression and commitment should

be positively associated with each other. The assumption that relationship involvement/interdependence is a common, nonmeasured cause responsible for covariation between aggression and commitment is represented in Figure 1 by a two-headed arrow between the error terms associated with aggression and commitment.

It is also important to distinguish between the independence of emotion systems at the level of individual differences (relationship-specific traits) and the level of momentary passions (relationship states). The discrete systems model does not suggest that immediate emotional states will be independent. For example, the immediate feelings of anger and upset that an individual experiences during an intense episode of relationship conflict may temporarily block feelings of love. Rather, the discrete systems model posits that individual differences in average levels of anger/upset that are experienced during episodes of relationship conflict will be largely independent of individual differences in overall feelings of love.

3. Although the operation of the love and anger/upset systems should be largely independent, these two systems may each provide input to more general mechanisms underlying variations in feelings of relationship satisfaction. A basic premise of social exchange theory is that the greater the rewards a relationship provides and the lower the costs, the more satisfying that relationship will be to the individual (e.g., Burgess & Huston, 1979). Along these lines, there is an extensive literature showing that frequency of positive behaviors performed by one's spouse (e.g., approval/caring, positive physical touching) correlates positively with marital satisfaction, whereas frequency of negative behaviors performed by one's spouse (e.g., criticism, negative nonverbal behavior) correlates negatively with marital satisfaction (reviewed in Weiss & Heyman, 1990). Presuming that variations in intensity of love track levels of relationship rewards (strategic facilitation) and variations in intensity of anger/upset track levels of relationship costs (strategic interference), then the love and anger/upset emotion systems should each make unique contributions to predicting satisfaction. In total, love should at least partially mediate the relation between strategic facilitation and satisfaction, whereas anger/upset should at least partially mediate the relation between strategic interference and satisfaction (see Figure 1). We propose that satisfaction serves as a

"meter" feeling integrating information from the love and anger/upset emotion systems.

4. Feelings of love and relationship satisfaction should each contribute uniquely to levels of commitment-promoting behaviors directed toward one's partner (see Figure 1). As discussed above, the discrete systems model posits that the love system will have a *direct* effect on commitment behavior. The anger/upset emotion system, however, may also influence commitment behavior *indirectly* through its effect on satisfaction. That is, individuals who are experiencing relatively high levels of strategic interference and anger/upset should feel less satisfied with their relationships, which in turn should reduce commitment. In evolutionary perspective, this causal sequence may have functioned to promote dissolution of mating relationships that too strongly interfered with the pursuit of fitness-relevant goals. The effect of satisfaction on commitment is well established in past research (e.g., Rusbult & Buunk, 1993; Rusbult, Johnson, & Morrow, 1986).

The discrete systems model of love and anger/upset, as described by these propositions, is shown in Figure 1. As discussed above, the model includes four mediational hypotheses. Because a significant association between a predictor variable and an outcome variable is a necessary precondition for mediation (Baron & Kenny, 1986), an initial direct path from predictor to outcome is required to test for mediation. Four direct paths were thus added to the model (strategic interference to partner-directed aggression, strategic facilitation to partner-directed commitment, strategic interference to satisfaction, and strategic facilitation to satisfaction; see Figure 1). The discrete systems model also included the hypothesis that strategic interference and anger/upset would have indirect effects on commitment through satisfaction. This was not a mediational hypothesis, however, because the model specified the absence of bivariate relations between these two predictor variables and the outcome (see Holmbeck, 1997, for a discussion of the distinction between mediated and indirect effects). Thus, direct paths were not included between either strategic interference or anger/upset and commitment.

The Crossover Model: An Alternative to the Discrete Systems Model

A straightforward alternative to the discrete systems model is that the love and anger/upset emotion systems are not generally independent; that is, that each system takes as input information about both costs and benefits in relationships and produces as output both positive and negative relationship behaviors. We refer to this alternative as the "crossover model," because it specifies paths that cross over between the two emotion systems. More specifically, the crossover model suggests that variations in feelings of love and anger/upset track levels of both strategic facilitation and strategic interference by partners, and that these variations reflect an integration of information about these two classes of behavior by partners. In turn, the crossover model suggests that variations in partner-directed commitment behaviors and aggression are the product of both love and anger/upset, and that these behaviors are motivated by an integration of these two emotion systems. In total, the crossover model proposes the addition of four paths (depicted by dotted lines in Figure 1) to the discrete systems model. The crossover model accords with common sense and is consistent with many theories in psychology, such as reinforcement theory (e.g., Cate, Lloyd, Henton, & Larson, 1982; Clore & Byrne, 1974) and interdependence theory (Kelley & Thibaut, 1978; Thibaut & Kelley, 1959).

METHOD

Participants

Two hundred forty-eight individuals constituting 124 heterosexual dating couples participated in the study. Participants were obtained by placing newspaper advertisements in local newspapers in a medium-sized Midwestern city, by placing flyers around the downtown area of this city, and by sending messages to the major electronic mail user groups at a large university in this city. All forms of advertising contained an announcement of a dating couples study at the university, included a request for heterosexual couples who had been dating at least 3 months, ensured complete confidentiality, and informed potential participants that the study would take about 1 hr to complete and would pay $20 per couple. The mean age of the men was 22.05 years (range = 17 to 46; *SD* = 4.7; median = 21) and the mean age of the women was 21.15 years (range = 16 to 48; *SD* = 4.2; median = 20). The mean length of the relationship at the time of the study was 17.27 months (range = 3 to 100; *SD* = 14.2; median = 13.25).

Procedure

Couples reported to a large experimental room in groups of 8 to 14 couples. The experimenter told participants that they would be asked to complete a series of questionnaires, and that all responses would be confidential and would not be revealed to anyone, including dating partners. He then passed out the surveys in number-coded packets so that each dyad could be identified later for the purpose of data analysis. The female participants were then led into a separate room by a female research assistant where they completed and turned in their surveys, while the male participants were led into a separate room by a male research assistant where they completed and turned in their surveys.

Materials

Strategic facilitation and strategic interference. Levels of strategic facilitation and interference encountered in one's relationship were assessed with two instruments: The Partner-Specific Investment Inventory (Ellis, 1998) and Buss' (1989) checklist of sources of conflict between men and women. The Partner-Specific Investment Inventory contains 62 items that assess the frequency with which one's partner performs a variety of both positive investment behaviors (e.g., "She displays concern for my problems," "He makes a special effort to spend time with me") and negative investment behaviors (e.g., "She ignores me in social settings," "He refuses to have sex with me"). Responses were on a 5-point frequency scale (1 = *never*, 5 = *very often*). To create an overall score for strategic facilitation, the 29 positively valenced items were summed in a unit-weighted composite. Cronbach's alphas were .90 for females and .86 for males.

Both the investment inventory and conflict checklist were used to create the measure of strategic interference. First, the 33 negatively valenced items in The Partner-Specific Investment Inventory were summed in a unit-weighted composite. Cronbach's alphas were .89 for females and .91 for males. Second, scores were computed on Buss' (1989) conflict checklist. This checklist contains 64 acts of conflict that sometimes occur in romantic relationships (e.g., "She treated me like I was stupid or inferior," "He told me that I was ugly"). Participants checked off each act that their partner had performed within the last 6 months. The total score on the conflict checklist was based on the number of items marked. Cronbach's alphas were .86 for females and .89 for males. Correlations between the total scores on the conflict checklist and the negative investment composite were .48 ($p < .001$) for females and .52 ($p < .001$) for males. Given these correlations and the conceptual similarity between the two measures, the conflict checklist and negative investment scores were standardized and then averaged to form an overall measure of strategic interference.

Love. The amount of love expressed for the current partner was measured by the self-report version of the Rubin Love Scale (Rubin, 1970), which contains 13 statements concerning how one feels about or what one would do for one's partner (e.g., "If I could never be with my partner, I would feel miserable"). Participants responded to these statements on 9-point scales (1 = *Not at all true; disagree completely,* 9 = *Definitely true; agree completely*). Composite scores were based on the average of the 13 items. Cronbach's alphas were .82 for females and .80 for males.

Anger/upset. In the present study, we were interested in studying anger/upset as a partner-specific trait—a summary of the typical levels of anger and upset that individuals experience during conflict with their partners. In recent reviews pertaining to the assessment of anger in marital relationships (Eckhardt, Barour, & Stuart, 1997; Langinrichsen-Rohling & Vivian, 1994), reviewers have stressed the importance of assessing spouse-specific anger and have emphasized the inadequacy of existing general measures of anger for this purpose. Eckhardt et al. (1997) bemoan the fact that " . . . there are presently no existing spouse-specific anger scales" (p. 354). In order to enable testing of the present model, therefore, a measure of partner-specific anger/upset was developed for this study.

Typical levels of anger and upset that individuals experienced during episodes of conflict with their romantic partners were assessed by an addition to Buss' (1989) checklist of sources of conflict between men and women. For each act of conflict that participants checked off as having been performed by their partner, they also rated how upsetting it was to them on a 7-point scale (1 = *not upsetting at all,* 7 = *extremely upsetting*) when their partner did it. A composite anger/upset score was computed based on the average upset rating for all of the acts marked by a participant.[3] This compositing of upset scores across multiple episodes of

3. Cronbach's alpha could not be calculated on the anger/upset measure, because it was based on a different number of items per individual. The construct validity of the measure, however, could be assessed by examining its relation to other variables. It is well known that measures of anger correlate positively with neuroticism (e.g., Schill, Thompson, & Wang, 1987) and marital violence (e.g., Malamuth et al., 1995). Consistent with past research, the present measure of anger/upset also correlated positively with these two variables. A partner-report measure of the Big Five (based on factor analyses reported in Goldberg, 1992) was included in the present data set. Women's reports of men's neuroticism (r = .22, p < .05) and agreeableness (r = –.18, p < .05) were significantly correlated with men's self-reported anger/upset. Likewise, men's reports of women's neuroticism (r = .19, p < .05) and agreeableness (r = –.19, p < .05) were significantly correlated with women's self-reported anger/upset. None of the other Big Five factors were significant predictors of either men's or women's anger/upset. Furthermore, men's anger/upset scores were significantly correlated with both men's self-reported aggression (r = .32, p < .001) and women's report of aggression by men (r = .24, p < .01). Likewise, women's anger/upset scores were significantly correlated with both women's self-reported

conflict conforms to commonly used observational methods for assessing anger (in which the intensity of anger registered in separate conflict interactions is averaged across episodes to form a total score [e.g., Malamuth et al., 1995]).

Commitment behaviors. Level of commitment-oriented behavior was assessed by six true-false items marking the occurrence of specific events in dating relationships. These items were drawn from The Relationship Events Scale (King & Christensen, 1983). Three of the items referred to one's own behavior in the relationship: "I do not date anyone other than my partner," "I have referred to my partner as my girlfriend/boyfriend," and "I have said 'I love you' to my partner." For these items, participants marked whether they had performed each action. In addition, participants reported whether their partner had performed each action (e.g., "My partner does not date anyone other than myself "). The remaining three items referred to joint activities in the relationship: "We have spent a whole day just with each other," "We have discussed living together," and "We have discussed the possibility of getting married." A total self-report score for commitment-oriented behavior was calculated by summing the individual's *true* answers to the three "I . . . " items and three "We . . . " items. A total partner-report score was calculated by summing the partner's *true* answers to the three "My partner . . . " items and three "We . . . " items. Cronbach's alphas were .60 for female self-reports, .55 for female partner-reports, .59 for male self-reports, and .52 for male partner-reports. Correlations were .76 ($p < .001$) between women's ratings of their own level of commitment behavior and their partners' ratings of this behavior and .77 ($p < .001$) between men's ratings of their own level of commitment behavior and their partners' ratings of this behavior. These strong correlations indicate that men and women largely agreed on whether the six commitment-oriented events had occurred in their relationship. The two data sources were thus combined into a composite index. Total scores for level of commitment-oriented behavior were computed based on equal weighting of self- and partner-report data.

Aggression toward partner. Partner-directed aggression was measured by the 10-item Conflict Tactics Scale (Straus, 1990), which includes subscales for both verbal and physical aggression. The verbal aggression index included behaviors such as swearing, insulting, sulking, and use of spiteful language. The physical aggression index included behaviors such as pushing, hitting, kicking, and throwing objects.[4] Using 7-point scales ranging from *never* to *more than 20*

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aggression ($r = .41$, $p < .001$) and men's report of aggression by women ($r = .30$, $p < .001$). In sum, the anger/upset measure fit reasonably well into a predictable network of relationships.

4. The original version of the Conflict Tactics Scale was used, which did not include items such as using guns, because with the type of population studied here such behaviors are seldom reported.

times, subjects recorded the frequency with which (a) they performed such acts against their partner in the last 6 months and (b) their partner performed such acts against them in the last 6 months. Correlations between verbal and physical aggression scales (for both sexes and both the self- and partner-report data) were consistently above .50; thus, these two scales were standardized and combined into a single measure of partner-directed aggression. Cronbach's alphas were .86 for female self-reported aggression toward partner, .81 for male self-reported aggression toward partner, .81 for female's report of aggression by partner, and .89 for male's report of aggression by partner. Correlations were .63 ($p < .001$) between both (a) females' self-reported aggression and males' report of aggression by females and (b) males' self-reported aggression and females' report of aggression by males. This level of correspondence was considered sufficiently high to combine the two data sources. Total scores for partner-directed aggression were computed based on equal weighting of self- and partner-report data.

Satisfaction. General satisfaction with the relationship was assessed by three items: "Overall, how satisfied are you with your relationship with your partner?" "Overall, how satisfied are you with your emotional relationship with your partner?" and "Overall, how satisfied are you with your sexual relationship with your partner?" Subjects responded to these questions on 7-point scales (1 = *extremely dissatisfied*, 7 = *extremely satisfied*). The three items were then averaged to form a composite index. Cronbach's alphas were .75 for females and .77 for males.

RESULTS

We tested the predictions shown in Figure 1 via path analysis using the EQS program (Bentler, 1993). Parameter estimates were based on maximum likelihood estimation. Although the discrete systems model does not posit sex differences, past theory and research indicate that men and women differ in many aspects of functioning in close relationships (e.g., Buss, 1994; Symons, 1979). Males and females were thus analyzed separately.

Control Variables

The correlations among all variables used in these analyses, as well as the correlations between these variables and relationship length, can be found in Table 1. As shown in this table, six of the seven variables used in the model were positively correlated with relationship length. For both men and women, three of these six positive correlations reached statistical

Table 1
Means, Standard Deviations, and Zero-Order Correlations Among Variables

Variable	*Males* *M* (*SD*)	*Females* *M* (*SD*)	1.	2.	3.	4.	5.	6.	7.	8.
1. Strategic interference by partner	.02 (0.87)	–.02 (0.86)	***	–.47	.47	–.12	.34	.01	–.32	.17
2. Strategic facilitation by partner	3.80 (0.36)	4.01 (0.39)	–.51	***	–.21	.32	.05	.48	.39	.19
3. Anger/upset	3.25 (1.06)	3.76 (1.02)	.54	–.15	***	–.28	.31	–.15	–.42	.09
4. Love	7.07 (1.00)	6.94 (1.10)	–.29	.40	–.15	***	–.04	.39	.39	.04
5. Partner-directed aggression	.01 (0.89)	–.03 (0.87)	.40	–.02	.40	–.13	***	.34	–.18	.48
6. Partner-directed commitment	5.26 (1.08)	5.24 (1.07)	–.18	.50	–.03	.41	.26	***	.28	.33
7. Satisfaction	5.62 (0.99)	5.73 (0.96)	–.49	.38	–.39	.32	–.19	.35	***	–.07
8. Relationship length	17.3 (14.2)	17.3 (14.2)	.14	.16	.21	.16	.40	.34	–.03	***

Note. $N = 124$ males and 124 females. Interscale correlations for males are above the diagonal and for females are below the diagonal. For correlations of .19 or greater, $p < .05$, two-tailed. For correlations of .24 or greater, $p < .01$, two-tailed.

significance ($p < .05$). This pattern of positive correlations represents a potential confound in testing the discrete systems model: It is possible that the love and anger/upset emotion systems could be negatively correlated (as suggested by the crossover model) yet appear largely independent or even positively correlated because both systems positively covary with relationship length. To control for this potential confound, we partialled out relationship length from all seven variables used in these analyses (by saving the unstandardized residuals after controlling for relationship length in regression analyses). The path analyses were based on these residuals.

Test of Competing Models

The discrete systems model and the crossover model have important similarities as well as differences. Whereas the two models attempt to account for associations among the same set of variables, they estimate a different number of path coefficients needed to account for these associations. Specifically, the crossover model estimates four more paths (denoted by the dotted lines in Figure 1) than does the discrete systems model; therefore, the two models are "nested." According to the discrete systems model, strategic facilitation should predict love but not anger/upset, whereas strategic interference should predict anger/upset but not love. In turn, love should predict levels of commitment-oriented behavior but not levels of aggression, whereas anger/upset should predict aggression but not commitment-oriented behavior. In contrast, according to the crossover model, strategic facilitation and strategic interference should each account for unique variance in both love and anger/upset. In turn, love and anger/upset should each account for unique variance in both commitment-oriented behavior and aggression.

The difference in goodness of fit between nested models can be evaluated statistically by using the chi-square difference test (Loehlin, 1992). First we tested the discrete systems model. This model estimated the 11 regression paths and two correlations denoted by the darkened lines in Figure 1 (males: $\chi^2 [8, N = 124] = 21.93$, $p = .005$; females: $\chi^2 [8, N = 124] = 11.68$, $p = .17$). Next we tested the crossover model. This model estimated the 13 parameters from the discrete systems model, plus the four regression paths denoted by the dotted lines in Figure 1 (males: $\chi^2 [4, N = 124] = 21.61$, $p < .001$; females: $\chi^2 [4, N = 124] = 4.74$, $p = .32$). These additions did not significantly improve the fit of the model

(males: change in $\chi^2 = 0.32$, *df* change = 4, $p > .90$; females: change in $\chi^2 = 6.94$, *df* change = 4, $p > .10$). These data indicate that the discrete systems model provided a better and more parsimonious fit to the data than did the crossover model. As stated by Loehlin (1992): "The smallest number of variables connected by the smallest number of arrows that can do the job is the path diagram to be sought for, because it represents the most parsimonious explanation of the phenomenon under consideration" (p. 6).

Moreover, the specific predictions from the discrete systems model, but not the crossover model, received empirical support. Higher levels of strategic interference by one's partner were associated with stronger feelings of anger/upset during relationship conflict (males: $r = .46$, $p < .001$; females: $r = .52$, $p < .001$), even after controlling for the effect of strategic facilitation on anger/upset (males: $\beta = .47$, $p < .001$; females: $\beta = .60$, $p < .001$). There was also a significant zero-order correlation in males only between strategic facilitation by one's partner and levels of anger/upset (males: $r = -.23$, $p < .05$; females: $r = -.18$, $p = ns$). Importantly, though, this relation dropped to nonsignificant levels in both sexes after controlling for the effect of strategic interference on anger/upset (males: $\beta = .01$, $p = ns$; females: $\beta = .14$, $p = ns$). In total, variations in strategic interference contributed uniquely to the prediction of anger/upset in both men and women, whereas variations in strategic facilitation did *not* contribute uniquely to the prediction of anger/upset in either gender.

Reciprocally, higher levels of strategic facilitation by one's partner were associated with stronger feelings of love for one's partner (males: $r = .32$, $p < .001$; females: $r = .39$, $p < .001$), even after controlling for the effect of strategic interference on love (males: $\beta = .34$, $p < .001$; females: $\beta = .31$, $p < .001$). There was also a significant zero-order correlation in females only between strategic interference and love (males: $r = -.13$, $p = ns$; females: $r = -.32$, $p < .001$). Importantly, though, this relation dropped to nonsignificant levels in both sexes after controlling for the effect of strategic facilitation on love (males: $\beta = .04$, $p = ns$; females: $\beta = -.15$, $p = ns$). In total, variations in strategic facilitation contributed uniquely to the prediction of love in both men and women, whereas variations in strategic interference did *not* contribute uniquely to the prediction of love in either gender.

In turn, stronger feelings of anger/upset during relationship conflict were associated with higher levels of partner-directed aggression (males: $r = .30$, $p < .001$; females: $r = .35$, $p < .001$), even after controlling for

the effect of love on aggression (males: $\beta = .31$, $p < .001$; females: $\beta = .33$, $p < .001$). There was also a significant zero-order correlation in females only between love and partner-directed aggression (males: $r = -.06$, $p = ns$; females: $r = -.21$, $p < .05$). Importantly, though, this relation dropped to nonsignificant levels in both sexes after controlling for the effect of anger/upset on aggression (males: $\beta = .03$, $p = ns$; females: $\beta = -.15$, $p = ns$). In total, variations in anger/upset contributed uniquely to the prediction of aggression in both men and women, whereas variations in love did *not* contribute uniquely to the prediction of aggression in either gender.

Reciprocally, stronger feelings of love for one's partner were associated with higher levels of commitment-oriented behavior (males: $r = .40$, $p < .001$; females: $r = .38$, $p < .001$), even after controlling for the effect of anger/upset on commitment (males: $\beta = .38$, $p < .001$; females: $\beta = .38$, $p < .001$). There was also a significant zero-order correlation in males only between anger/upset and commitment behavior (males: $r = -.20$, $p < .05$; females: $r = -.11$, $p = ns$). Importantly, though, this relation dropped to nonsignificant levels in both sexes after controlling for the effect of love on commitment (males: $\beta = -.09$, $p = ns$; females: $\beta = -.04$, $p = ns$). In total, variations in love contributed uniquely to the prediction of commitment in both men and women, whereas variations in anger/upset did *not* contribute uniquely to the prediction of commitment in either gender.

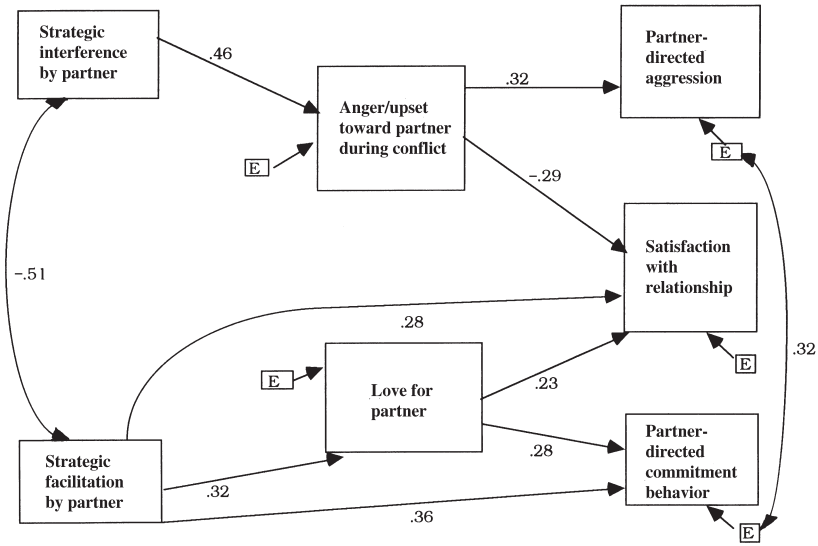
Tests of Mediational Hypotheses

Four mediational hypotheses were tested. It was predicted that (a) the relation between strategic interference and partner-directed aggression would be mediated by anger/upset, (b) the relation between strategic interference and relationship satisfaction would be mediated by anger/upset, (c) the relation between strategic facilitation and partner-directed commitment behavior would be mediated by love and relationship satisfaction, and (d) the relation between strategic facilitation and relationship satisfaction would be mediated by love. As outlined by Baron and Kenny (1986), mediational models must meet the following set of conditions: First, the predictor variable significantly predicts both the mediating variable and the outcome variable. Second, the path between the predictor variable and the outcome variable is significantly reduced when the mediating variable is controlled for.

Third, the path from the mediating variable to the outcome variable is significant when the predictor variable is controlled for. The four mediational hypotheses were tested both in isolation and as embedded in the larger path analysis. In all four cases, both sets of analyses revealed the same pattern of results. Thus, we describe in detail only the results of the embedded tests.

Prediction of partner-directed aggression. The hypothesis that anger/upset would mediate the relation between strategic interference and partner-directed aggression was supported. Strategic interference significantly predicted aggression when anger/upset was omitted (males: $\beta = .25$, $p < .01$; females: $\beta = .35$, $p < .001$), but the strength of this relation was reduced when anger/upset was controlled for (males: $\beta = .13$, p = *ns*; females: $\beta = .24$, $p < .05$). This reduction was statistically significant (males: $t = 2.55$, $p < .05$; females: $t = 2.16$, $p < .05$), using Sobel's (1982) formula. (See MacKinnon, Warsi, and Dwyer's [1995] discussion of the calculation of mediated effects.) In addition, the path from strategic interference to anger/upset was statistically significant (males: $\beta = .46$, $p < .001$; females: $\beta = .52$, $p < .001$), as was the path from anger/upset to aggression after controlling for strategic interference (males: $\beta = .26$, $p < .01$; females: $\beta = .21$, $p < .05$). In sum, anger/upset significantly mediated the relation between strategic interference and partner-directed aggression. Because there was full mediation in the male subsample (i.e., the direct path from strategic interference to partner-directed aggression dropped to a statistically nonsignificant level after controlling for the mediator), the direct path was eliminated from the final model (see Figure 2).

Prediction of partner-directed commitment behavior. The hypothesis that love would mediate the relation between strategic facilitation and partner-directed commitment behavior was also supported. Strategic facilitation significantly predicted partner-directed commitment behavior when love was omitted (males: $\beta = .45$, $p < .001$; females: $\beta = .38$, $p < .001$), but the strength of this relation was reduced when love was controlled for (males: $\beta = .36$, $p < .001$; females: $\beta = .30$, $p < .001$). This reduction was statistically significant (males: $t = 2.60$, $p < .05$; females: $t = 2.75$, $p < .01$), using Sobel's (1982) formula. In addition, the path from strategic facilitation to love was statistically significant (males: $\beta = .32$, $p < .001$; females: $\beta = .39$, $p < .001$), as was the path from love to commitment after controlling for strategic facilitation (males: $\beta = .28$, p



Note. $N = 124$. For standardized path coefficients greater than .22, $p < .01$; for standardized path coeffcients greater than .27, $p < .001$.

Figure 2
Path analysis of the love and anger/upset emotion systems in males

< .01; females: $\beta = .23$, $p < .01$). In sum, love significantly mediated the relation between strategic facilitation and partner-directed commitment behavior.

Prediction of relationship satisfaction. The hypothesis that anger/upset would mediate the relation between strategic interference and satisfaction was supported in the female subsample only. In females, but not in males, strategic interference significantly predicted satisfaction when anger/upset was omitted ($\beta = –.39$, $p < .001$), but was reduced when anger/upset was controlled for ($\beta = –.26$, $p < .01$). This reduction was statistically significant ($t = –2.27$, $p < .05$). In addition, the path from strategic interference to anger/upset was statistically significant ($\beta = .52$, $p < .001$), as was the path from anger/upset to satisfaction after controlling for strategic interference ($\beta = –.22$, $p < .05$). In sum, women's feelings of anger/upset significantly mediated the relation between strategic interference by male partners and women's feelings of satisfaction. Given the

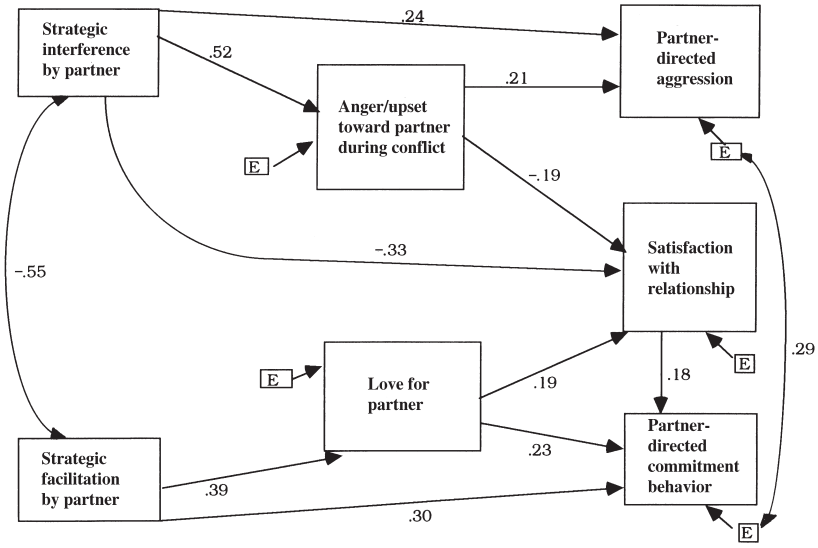
absence of an equivalent mediational relation in the male subsample, the direct path from strategic interference by female partners to men's feelings of satisfaction was eliminated from the final model (see Figure 2).

Finally, the hypothesis that love would mediate the relation between strategic facilitation and satisfaction was supported in the male subsample only. In males, but not in females, strategic facilitation significantly predicted satisfaction when love was omitted ($\beta = .35$, $p < .001$), but was reduced when love was controlled for ($\beta = .28$, $p < .01$). This reduction was statistically significant ($t = 2.26$, $p < .05$). In addition, the path from strategic facilitation to love was statistically significant ($\beta = .32$, $p < .001$), as was the path from love to satisfaction after controlling for strategic facilitation ($\beta = .23$, $p < .05$). In sum, men's feelings of love significantly mediated the relation between strategic facilitation by female partners and men's feelings of satisfaction. Given the absence of an equivalent mediational relation in the female subsample, the direct path from strategic facilitation by male partners to women's feelings of satisfaction was eliminated from the final model (see Figure 3).

Test of Indirect Effects Hypothesis

We hypothesized that strategic interference and anger/upset would influence partner-directed commitment behavior indirectly through their effects on relationship satisfaction.[5] This was not a mediational hypothesis because the discrete systems model specifies that strategic interference and anger/upset should *not* have bivariate relations with commitment. Consistent with this supposition, such bivariate relations were not found in either the male or female subsamples (see Table 1). We tested the indirect effects hypothesis both in isolation and as embedded within the larger path analysis by requesting the indirect effects in the EQS output. When tested in isolation, the indirect effects hypothesis received good support. Specifically, the indirect effect of strategic interference on commitment through anger/upset and satisfaction (males:

5. As discussed in Holmbeck (1997), an "indirect effect" occurs when (a) the indirect path from predictor→mediator→outcome *is* statistically significant and (b) the bivariate relation between predictor and outcome is *not* statistically significant. An initial direct path from predictor→outcome is a necessary precondition for a "mediated effect" (Baron & Kenny, 1986). Without this direct path, the mediator cannot "account" for the predictor→outcome relation (because there is no relation to account for; Holmbeck, 1997).



Note. $N = 124$. For standardized path coefficients greater than .17, $p < .05$; for standardized path coefficients greater than .22, $p < .01$; for standardized path coefficients greater than .27, $p < .001$.

Figure 3
Path analysis of the love and anger/upset emotion systems in females

standardized coefficient for indirect effect = –.06, $p < .01$; females: standardized coefficient for indirect effect = –.18, $p < .001$) and the indirect effect of and anger/upset on commitment through satisfaction (males: standardized coefficient for indirect effect = –.13, $p < .001$; females: standardized coefficient for indirect effect = –.15, $p < .001$) were each significant and substantial. When these indirect effects were tested for in the context of the overall path analysis, however, they were markedly reduced. Specifically, the indirect effect of strategic interference on commitment only reached statistical significance in the female subsample (males: standardized coefficient for indirect effect = –.01, $p = ns$; females: standardized coefficient for indirect effect = –.08, $p < .05$). Likewise, the indirect effect of anger/upset on commitment through satisfaction only reached statistical significance in females (males: standardized coefficient for indirect effect = –.04, $p = ns$; females: standardized coefficient for indirect effect = –.08, $p < .05$). This reduction in the size

of the indirect effects occurred because, by including paths from both strategic facilitation and love to commitment in the overall model, the beta for the path from satisfaction to commitment was reduced (males: from .32 to .09; females: from .37 to .19). Because the path from men's satisfaction to men's commitment failed to reach statistical significance, it was eliminated from the final model (see Figure 2).

The final path analysis for men is shown in Figure 2 and for women is shown in Figure 3. The final path analysis for men provided a reasonable fit to the data (χ^2 [11, N = 124] = 25.09, p = .008; Comparative Fit Index [CFI] = .93; Root Mean Square Error of Approximation [RMSEA] = .10) and for women provided a good fit to the data (χ^2 [9, N = 124] = 14.14, p =.12; CFI = .98; RMSEA = .07).

DISCUSSION

An evolutionary perspective focuses attention on emotions as discrete systems designed by natural selection over vast periods of time to solve specific adaptive problems faced by our ancestors. Each emotion system should specialize in processing only certain classes of information from the environment, information that specifies the adaptive problem that an individual is facing, and transform that information into physiological and behavioral output that is oriented toward solving that adaptive problem. Drawing on this framework, the present study (a) developed and tested a discrete systems model of love and anger/upset in romantic relationships and (b) contrasted this model with the competing crossover model. The results showed that the discrete systems model provided a better and more parsimonious account of the data than did the crossover model. The pattern of results was basically the same for men and women, with some relatively minor variations (as might be expected by chance). We await replication of these gender difference in future studies before speculating on their meaning.

The discrete systems model states that characteristic levels of love and anger/upset experienced in different relationships track specific, largely independent fitness-relevant features of those relationships. This model was supported in a study of 124 heterosexual dating couples. Variations in strategic facilitation (but not strategic interference) contributed uniquely to the prediction of love in both men and women, whereas variations in strategic interference (but not strategic facilitation) contributed uniquely to the prediction of anger/upset in both men and women.

Thus, for example, the frequency with which one's partner "takes care of me when I am sick" or "displays concern for my problems" uniquely predicted feelings of love but *not* intensity of anger/upset. Conversely, the frequency with which one's partner "cancels dates with me at the last minute" or "treats me like I am stupid or inferior" uniquely predicted anger/upset but *not* love. What was most striking about these data was the lack of "crossover" effects. Contrary to intuitive predictions, (a) being in a relationship characterized by relatively high levels of strategic interference did not jeopardize love, and (b) being in a relationship characterized by relatively high levels of strategic facilitation did not soften anger/upset. This is not to say that strategic facilitation and strategic interference were themselves independent (there was a tendency for individuals who experienced more strategic interference to also experience less strategic facilitation, and vice versa), but rather that strategic facilitation and strategic interference were largely independent and domain-specific at the emotional level in their contributions to either love or to anger/upset.

The discrete systems model states that, because the emotions of love and anger/upset correspond to different adaptive problems in close relationships (securing strategic facilitation vs. reducing strategic interference), they prepare and motivate the individual to engage in different forms of partner-directed behavior. Consistent with the model, feelings of love for one's partner uniquely predicted commitment-promoting behavior (but not partner-directed aggression) in both men and women, whereas typical levels of anger/upset experienced during conflict with one's partner uniquely predicted aggression (but not commitment) in both men and women. Thus, for example, individuals who felt more love for their partners were more likely to propose marriage or maintain dating exclusivity but were *not* less likely to shout at their partners or throw objects at them. Conversely, individuals who experienced more anger/upset during conflict were more likely to shout at their partners or throw objects but were *not* less likely to propose marriage or maintain dating exclusivity. Again, what was most striking about these data was the lack of "crossover" effects: (a) relatively strong feelings of love did not inhibit aggression, and (b) relatively strong feelings of anger/upset did not directly undermine commitment. This is not to say that aggression and commitment were themselves independent (there was a tendency for individuals who were more aggressive toward their partners to also perform more commitment-promoting behaviors, and vice versa), but

rather that anger/upset and love were largely independent and domain-specific in their direct effects on either aggression or commitment. The independence of love and aggression may have analogues in the parent-child relationship, where many parents who love their children dearly nonetheless use harsh physical discipline.

The discrete systems model of love and anger/upset may be relevant to understanding the persistence of violence in many dating and marital relationships. Substantial proportions of couples involved in violent relationships have stayed in those relationships and have even reported deeper involvement or an improvement in the relationship following aggression (Bookwala, Frieze, & Grote, 1994; Cate, Henton, Koval, Christopher, & Lloyd, 1982). The discrete systems model provides a possible explanation for why some individuals remain committed to violent partners: The mechanisms that underlie feelings of love and commitment-oriented behavior are largely independent from the mechanisms that underlie anger/upset and aggression; hence, the love system may not be designed to take as input levels of strategic interference by one's partner. Love and aggression may co-occur in some romantic relationships because individuals simultaneously experience high levels of strategic facilitation (with correspondingly strong feelings of love and attachment) and high levels of strategic interference, possibly in the form of physical or psychological abuse. While such abuse may result in elevated levels of anger/upset, this elevation does not appear to directly weaken commitment.

On the other hand, it may be adaptive for individuals who are experiencing too much strategic interference to initiate behaviors that terminate or reduce commitment to their relationships. Although the anger/upset emotion system did not relate directly to commitment-oriented behavior, components of the system did have indirect effects on commitment through satisfaction. Specifically, there were statistically significant indirect effects of strategic interference on commitment (through anger/upset and satisfaction) and of anger/upset on commitment (through satisfaction). Although these indirect effects must be interpreted with caution because of the absence of bivariate relations between either strategic interference or anger/upset and commitment (see Holmbeck, 1997), these data raise the possibility that feelings of relationship dissatisfaction are a mechanism through which the anger/upset emotion system can decrease commitment-oriented behavior.

Relationship Satisfaction

Consistent with the present model, the love and anger/upset emotion systems converged in their prediction of relationship satisfaction, with each system accounting for unique variance in subjects' reports of satisfaction. Love, anger/upset, strategic facilitation (in males), and strategic interference (in females) each had statistically significant direct effects on satisfaction. In addition, men's feelings of love significantly mediated the relation between strategic facilitation by female partners and men's feelings of satisfaction, whereas women's experiences of anger/upset significantly mediated the relation between strategic interference by male partners and women's feelings of satisfaction. Love and anger/upset were about commensurate in their ability to predict satisfaction. The independent contributions of love and anger/upset to relationship satisfaction is consistent with past research showing that overall levels of positive and negative emotions (while largely independent) each contribute unique variance to general life satisfaction (Lucas, Diener, & Suh, 1996).

The present model and associated findings suggest a refinement of the recent evolutionary perspective on marital satisfaction proposed by Shackelford and Buss (1997). These investigators suggest that "marital satisfaction or dissatisfaction can be viewed as psychological states that track the overall benefits and costs associated with a particular marital union" (p. 10). Our data are consistent with this model but also suggest a hierarchical type of organization of the mind in which largely independent emotion systems (e.g., love and anger/upset) provide information that is integrated at a "higher" level of information processing. Therefore "benefits" and "costs" may be tracked separately and summarized in satisfaction measures. This finding underscores the importance of explicitly considering both the love and anger/upset emotion systems in research on relationship satisfaction. Researchers have frequently studied the contributions of one of these emotion systems to satisfaction while ignoring the other or have used measures that do not adequately distinguish between the two systems but include elements of both within the same scale. It may even be useful in future research to assess satisfaction and dissatisfaction separately rather than measuring them as opposite ends of the same pole. Moreover, careful distinctions may be called for among constructs that are often equated within the marital satisfaction literature. For example, in some studies (e.g., Burleson & Denton, 1997),

measures of positive feelings toward one's partner have been largely equated with the construct of marital satisfaction. Although the current study supports the important contribution of such feelings to satisfaction, it also highlights the value of distinguishing between these constructs.

Implications for Emotion Research

As noted earlier, the discrete systems model of love and anger/upset is consistent with past research documenting the independence of general positive and negative affect (Diener & Emmons, 1984; Watson & Tellegen, 1985; Watson & Clark, 1997; Zevon & Tellegen, 1982). In addition, the present work builds on past research in two ways. First, the present data showed that a specific positive emotion system (love) and a specific negative emotion system (anger/upset) were largely independent in a naturally occurring context. That is, in actual dating relationships, the typical levels of anger/upset that individuals experienced in response to conflict-evoking acts by their partners were largely independent of the intensity of love that individuals felt for their partners. Past research on the independence of positive and negative affect has been *context-general*: It has employed inventories of affective states (e.g., "elation," "excitement," "anger," "distress") to assess how individuals are feeling at the present moment or over some period of time (Diener & Emmons, 1984; Watson & Tellegen, 1985; Watson & Clark, 1997; Zevon & Tellegen, 1982), irrespective of the specific contexts that may have generated those feelings. Such research has not addressed *context-specific* questions such as whether the "elation" or "excitement" that individuals feel in response to becoming involved in a passionate romantic relationship is independent of the "anger" or "distress" that individuals feel in response to maltreatment by their relationship partner. The present data, therefore, provide a meaningful extension of past research by documenting the relative independence of love and anger/upset in the actual contexts in which they occur.

Second, the discrete systems model provides an explanation for why love and anger/upset are largely independent. Past research has been more concerned with identifying the factor structure of general positive and negative affect than with identifying its causal origins. There is no theory of the psychological processes underlying the observed independence of positive and negative affect. The discrete systems model suggests that experiences of love and anger/upset within romantic

relationships are largely independent because they were shaped by natural selection to solve different adaptive problems encountered in those relationships during human evolution. The selection pressures generated by these adaptive problems presumably favored the evolution of discrete psychological mechanisms underlying the love and anger/upset emotion systems, a separation that would enable variations in one system to operate independently from variations in the other. Discrete psychological mechanisms should have been selected for because the same mechanisms are rarely capable of solving qualitatively different adaptive problems (Tooby & Cosmides, 1992; see also discussion of the domain-specificity of emotions in the Introduction). For example, variations in feelings of love, which may solve the adaptive problem of whether to commit to one's present partner or to continue searching for alternatives, probably do little to solve the adaptive problem of how to reduce strategic interference by one's partner.

Limitations and Future Directions

Limitations of the present study should be noted because they provide important directions for future research. First, this research was limited by the use of self-report measures of love and anger/upset. This was inevitable in the measurement of love, given that there is not yet a validated observational method for assessing the degree of love that one person feels for another. In the assessment of anger/upset, however, future research on the discrete systems model could benefit from collecting additional data sources, including observational coding of facial expressions and expressed emotion as well as on-line physiological assessments during episodes of relationship conflict (see, for example, Gottman, 1994). Second, the generalizability of this study is limited by the use of middle-class, college-age dating couples. The discrete systems model needs to be replicated on other samples that differ in age, culture, socioeconomic status, marital status, and so forth.

Third, although the discrete systems model specifies causal relationships, the direction of causation cannot be inferred from the correlational data used in this study. This is a relevant issue for future research because there may be bidirectional causal relations within the love and anger/upset emotion systems. For example, the amount of love that individuals feel for their partners may influence the amount of strategic facilitation they receive from their partners. Likewise, the

amount of aggression that individuals direct toward their partners may impact the level of strategic interference they receive from their partners. Even if such feedback loops exist, however, they would not call into question the major conclusions of this study. These conclusions concern the relative independence of the love and anger/upset emotion systems in the context of romantic relationships, and the implications of this independence for understanding relationship satisfaction and the persistence of relationship violence. These conclusions would not be altered by the presence of feedback loops because the question of bidirectional causation *within* either emotion system is empirically distinct from the question of independence *between* the two systems.

Finally, the present study used *absolute* rather than *relative* measures of strategic interference and strategic facilitation. That is, we assessed the frequency of different types of interfering and facilitating behaviors on an absolute scale ranging from 1 (*never*) to 5 (*very often*). What is probably more important than absolute levels, however, are relative levels of strategic interference and facilitation by partners, both in comparison to what individuals believe they would experience in alternative relationships (e.g., "How does what I am getting now compare to what I could get elsewhere?") and in comparison to what individuals believe they could or should be getting in their current relationship (e.g., "How much is my partner doing for me compared to what he could be doing?"). Developing measures of relative strategic interference and strategic facilitation is an important direction for future research in this area.

In closing, it is noteworthy that the discrete systems model of emotions and supporting data presented here converge well with findings from a number of other research sources. These include studies of comparative animal phylogeny, which indicate that emotions promoting behaviors such as aggression evolved separately millions of years before emotions promoting behaviors such as parental caregiving or resource sharing (Eibl-Eibesfeldt, 1971, 1990). Furthermore, of particular importance are studies on the neurological underpinnings of emotions, which also support a discrete systems model (e.g., LeDoux, 1996). There are also studies, however, that point to the need for further refinements of the model. For example, animal research on hormonal correlates of anger and of love (e.g., Wingfield, Hegner, Dufty, & Ball, 1990) indicate that there can be temporary surges of hormones designed to meet antagonistic challenges that indirectly interrupt the ability to engage in "loving" behavior (e.g., parental care). Such findings point to the need for further

clarification of apparent contradictions between intuitive models based on immediate experience of inverse relations between emotions such as love and anger/upset, as contrasted with the type of discrete systems model emphasized here, which is supported by converging findings from ethological, neurological, mood, and close relationships research.

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