Behavior and on-line cognition in marital interaction

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Abstract
This research examined the relations among various distal variables and interactive behavior and on-line cognition in a complete longitudinal design over 1 year. Fifty-seven married couples had problem-solving discussions that were videotaped. Interactive behavior was coded by observers, and on-line cognitions were assessed using a tape-review procedure (see Fletcher & Fitness, 1990). As predicted, the association between relationship satisfaction and both interactive behavior and on-line cognition was generally mediated by negative attributions to the partner; however, depression obtained direct unmediated paths to interactive behavior and on-line cognition. Cross-lagged analyses suggested that the causal links between distal variables and problem-solving interactive behaviors and on-line cognition tend to go in both directions over time. Implications are discussed.

An increasingly accepted proposition in the study of married or other intimate relationships is that the way in which couples deal with conflict plays a crucial role in influencing relationship-related affect and cognition, interactive behavior, and ultimately the stability and longevity of the relationship itself (e.g., Bradbury & Fincham, 1991; Gottman, 1994; Markman, 1991). In the present research we adopted a standard social psychological approach that stresses the interdependence between relationship partners and posits that specific problem-solving or conflictual interactions are a function of two classes of variable. First, distal variables (traits, attitudes, and so forth) are thought to predate and shape specific interactive sequences. Second, over and above the effects of distal variables, on-line cognition and interactive behavior (proximal-level variables) are assumed to influence one another during the course of dyadic interactions (for example, see Bradbury & Fincham, 1991; Fletcher & Thomas, 1996; Kelley et al., 1983).

Consistent with a social psychological orientation, evidence has accumulated showing that important distal variables—such as depression, relationship satisfaction, and attributional patterns—are related both to one another and also to relationship interactive behavior. For example, those who are more satisfied with their relationships are less depressed (Beach, Sandeen, & O’Leary, 1980; Fletcher, Fitness, & Blampied, 1990), are less inclined to attribute the causes and blame to their partner for relationship problems (for reviews see Bradbury & Fincham, 1990; Fletcher & Fincham, 1991), and produce more positive interactive behavior when resolving conflict (Bradbury & Fincham, 1992; Fletcher & Fitness, 1990). In addition, making more negative attributions to the partner for relation-
ship problems is associated not only with higher levels of depression (Fincham & Bradbury, 1993) but also with more negative interactive behavior (Fletcher & Fitness, 1990).

However, untangling the myriad possible causal connections among distal and proximal-level variables is a complex business. In this article we distinguish between a model in which variables can only exert causal influences in one direction and those in which causal influences can flow in both directions. If confined to correlational designs, then testing the former kind of model in which distal variables can cause interactive behavior and on-line cognition, but not vice versa, can be accomplished by measuring the variables in the same temporal order as specified by the model. The best way of testing the latter kind of model, which allows for bi-directional causal influences, is to set up a complete longitudinal design in which all variables are measured at least twice.

This research addressed both kinds of causal model in assessing the role of three distal variables that, as noted, have been examined extensively in prior research: marital satisfaction, depression, and attributional patterns. However, this study goes beyond most previous research dealing with marital interaction in three major ways. First, we tested a mediational model, using structural equation modeling (SEM), that deals with the process by which distal variables influence interactive behavior in problem-solving discussions. Second, we examined the role of on-line cognition during marital conflict. Third, we used a complete longitudinal design in which all variables were measured twice over a 1-year period. This last design feature allowed us to address some fundamental and hitherto unanswered questions concerning the direction of causality between distal variables and relationship interactive behavior and on-line cognition over long periods of time. For example, does relationship satisfaction cause interactive behavior, or vice versa, or is the causal flow circular? We explicate each kind of causal account separately.

Explaining Specific Relationship Interaction Episodes: A Meditational Model

Figure 1 shows our proposed model, which traces the links among three distal variables and interactive behavior and on-line cognition occurring in the context of a specific episode of behavioral interaction. Note that in this study, we measured the variables in the same temporal order as shown in Figure 1. We hypothesized that attributions mediate the link between relationship satisfaction and both interactive behavior and on-line cognition; namely, higher levels of relationship satisfaction (controlling for depression) produce less negative attributions (less blame and causality attributed to the partner for the problems), which in turn generates more positive interactive behavior and on-line cognition. In contrast, we predicted that depression (controlling for relationship satisfaction) directly influences all the key variables (negative attributions, interactive behavior, and on-line cognition). These two hypotheses are based on the distinction between intraindividual personality and cognitive-style dispositions (e.g., depression), and dispositions that focus on interpersonal features of the relationship (e.g., relationship satisfaction).

Consider the mediational role of negative attributions with respect to relationship satisfaction and the on-line marital interaction variables. Because all three sets of variables involved have a cognitive focus on the relationship, the possibility of a strong mediational relation is enhanced. It is perhaps arguable as to whether attributions for the problems constitutes a distal or a proximal-level variable, especially as this distinction almost certainly lies along a dimension rather than being categorical. We have chosen to term it as a distal factor because it is a stored cognitive construct that partners bring to the interaction episode, although it is considerably more con-

1. The term “negative attribution” will henceforth be used to refer to the tendency to attribute blame and causality to the partner for the relationship problems.
Distal Variables | Distal Mediating Variables | Outcome Variables
---|---|---
Depression | Negative Attributions for Problems | Behavior: Problem-solving interaction
Relationship Satisfaction |  | On-line cognition: Problem-solving interaction

Figure 1. Proposed mediational model linking the distal variables with interactive behavior and on-line cognition from the problem-solving discussions.

In contrast to relationship satisfaction, depression is an intraindividual variable that has a diffuse impact extending well beyond specific relationships. For example, levels of depression should influence one's general affective mental set or mood state, and mood states have been shown to affect the positivity of a vast range of social behavior and cognition (see Forgas, 1995). Such an argument implies that depression has a scatter-gun effect and, thus, should uniquely influence the negativity of attributions in addition to interactive behavior and on-line cognition. In short, we predicted that the way people explained their marital problems would not mediate the links between depression and the on-line marital interaction variables.

The role and measurement of on-line cognition

In this study we used a technique to measure on-line cognition that was initially developed by Ickes, Robertson, Tooke, and Teng (1986), and adapted by Fletcher and Fitness (1990) specifically for use with couples in problem-solving discussions. For this procedure, the couples’ discussions are videotaped; next, each partner independently reviews the videotaped interaction and records any cognitions (including emotional attributions) that he or she can remember having experienced during the interaction. These protocols can then be coded in terms of the positivity of the cognitions.

A good deal of evidence has accumulated concerning the validity and reliability of this technique in terms of tapping into the conscious cognitive events that occur

2. The stability of this variable proved to be quite high over a 1-year period, which supported our theoretical decision to term it a distal variable.
during dyadic interaction (see Ickes, Bissonnette, Garcia, & Stinson, 1990, for a review). Fletcher and Fitness (1990) reported that this technique produced reliable estimates of the positivity of on-line cognition, in the interactions of dating couples, that were related in theoretically feasible ways to both distal variables and interactive behavior. For example, more positive on-line cognitions were related to higher levels of relationship satisfaction, lower levels of depression, and more positive verbal behavior (as coded by raters). The present study goes considerably beyond the research of Fletcher and Fitness (1990). However, based on their findings, and given the intimate connection between interactive behavior and on-line cognition, we predicted that the links between the distal variables and the two dependent variables of on-line cognition and interactive behavior would be similar (see Fig. 1).

Taking account of the interpersonal nature of marital relationships: The use of structural equation modeling (SEM)

To test our proposed model linking distal and mediating variables with the dependent variables, we used SEM. The SEM analysis confers critical advantages with these data. First, it is possible to control for the shared variance between the predictor variables. Second, SEM can be used to test for the presence of significant gender differences in the paths (see Murray, 1996; Thomas, Fletcher, & Lange, 1997). Third, it is possible to test a model simultaneously that has more than one dependent variable (as is the case with the model shown in Fig. 1). Fourth, the overall fit of the model can be assessed using various indices. Finally, and perhaps most importantly, SEM deals with the problem of nonindependence across husbands and wives in particular variables, and allows for the examination of paths that cross between husbands and wives as well as within-spouse paths.

Causal Relations Between Distal and Proximal-Level Variables Over Time

So far we have dealt with postulated causal influences that proceed only one way from distal variables to proximal-level variables. However, it is clearly the case that interactive behavior and on-line cognition might also influence distal variables like relationship satisfaction or depression. Indeed, the existence of such feedback loops is a fundamental assumption of most theoretical approaches to intimate relationships, including social psychological theories (see, for example, Karney & Bradbury, 1995; Kelley et al., 1983). As previously noted, there is only one way of testing (in correlational designs) whether causal influences between distal factors and interactive behavior or on-line cognition go in one or in both directions;
namely by carrying out a complete longitudinal design in which every variable is measured twice. Cross-lagged analyses can then be used to test the relation between, for example, relationship satisfaction at time 1 and interactive behavior at time 2 (controlling for interactive behavior at time 1), and vice versa. Such analyses were carried out in the current research (also using SEM analyses) with couples completing the identical procedure on two occasions over a 1-year period.

Surprisingly, given that over 100 longitudinal studies of married couples have been published (for a review see Karney & Bradbury, 1995), complete designs in which all variables are measured twice are rare (for one of the notable exceptions, see Noller, Feeney, Bonnell, and Callan, 1994). Indeed, we could not find a single published study in which interactive behavior in married couples had been recorded and coded by observer raters on more than one occasion. Most designs have focussed on the prediction of relationship satisfaction over time, and some studies have reported that more positive interactive behavior at time 1 predicts increases in relationship satisfaction at time 2 (see Karney & Bradbury, 1995). However, there is a distinct absence of empirical data addressing the question of whether distal variables influence either observer-coded interactive behavior or online cognition over long time periods.

Hence, the current longitudinal design addresses some important questions hitherto not dealt with empirically in the close relationship domain. First, what is the stability in married couples over time of interactive behavior and online cognition? Second, to what extent do distal variables influence interactive behavior and online cognition over time, and vice versa? If commonly made theoretical assumptions are correct, then we should find general evidence of bi-directional associations between the distal and relationship interaction variables over time.

It is important not to blandly assume that the links between distal variables and behavior or online cognition are necessarily symmetrical. Consider, for example, the casual links between relationship satisfaction and relationship behavior over time. Well-established attribution models and a wealth of research findings show that people who are happy with their relationships tend to write off negative behavior in relationship contexts, using the kind of attributional strategies already described (see Fletcher & Fincham, 1991). Accordingly, it is plausible that the occurrence of positive or negative behavior will have a relatively muted influence on relationship satisfaction, compared to the stronger influence of relationship satisfaction on behavior.

Summary

To summarize, the current study examined the interactive behavior and online cognition of 57 married couples in the context of problem-solving discussions. An overarching model (Fig. 1) was tested in which various distal variables were postulated as impacting in different ways on interactive behavior and online cognition. Finally, the longitudinal component of the design, with a duplication of all measures across a 1-year period, allowed us to consider some hitherto unaddressed questions in the relationship domain.

Method

Participants

A community-based sample of 74 married couples from the Canterbury region in New Zealand completed the first research phase. However, 57 couples completed both research phases (2 couples divorced, 5 couples moved away, 1 person died, and 9 couples declined to take part in the second phase). This sample was initially derived from 230 married couples who were randomly selected from the electoral rolls (in New Zealand, adults are required by law to register for these rolls, from which it is possible to determine their marital status). Couples were initially sent letters inviting their participation in this research, and
these were followed up 3 to 5 days later with phone calls. Couples who agreed to participate were paid $50 for each research phase. The mean age of the sample was 39.06 years (SD = 7.50 years), and couples had been married on average 14.19 years (SD = 7.54 years). Eighty-four percent of the couples had children living at home.

Procedure

Couples completed the second research phase 1 year after completing the first phase. Procedures for both research stages were identical. Participants completed depression scales in their own homes, 1 to 5 days prior to coming into the laboratory. Participants were requested to complete these scales independently, to refrain from discussing any of the contents with their partners, and upon completion to seal them in the separate envelopes provided.

Upon arrival at the laboratory, participants completed the relationship satisfaction scale, then independently listed two problems in their relationships that they considered to be serious or were currently experiencing conflict over (in order of perceived seriousness). Two of these problems were then chosen by the experimenter in such a manner that each partner provided at least one of the problems. If the top-ranked problems were different, then both of these conflicts were selected as the two discussion topics. If the most serious problem was the same for each partner, this issue was selected. If the second-ranked problem was the same for both partners, this problem was then chosen. If the second-ranked problems were different and the first-ranked problems were the same, the second-ranked problem was selected at random. The experimenter then wrote down the two respective problems selected on a prepared sheet and left them on view on a coffee table. Before proceeding to the discussion, couples independently completed the attribution and problem-seriousness scales for both problems.

The videotaped interaction was set in a pleasantly furnished and spacious soundproof laboratory. Couples sat around a coffee table, with microphones attached to their lapels, while facing one another in two chairs positioned at right angles so that the wall-mounted camera could obtain a clear picture of both spouses. An adjacent laboratory housed all the recording equipment (a microphone and intercom system, two connected videocassette recorders and two color television monitors).

Participants were instructed to forget about the camera and to behave as naturally as possible, as if they were having the discussion in their own homes. Couples were asked to attempt as far as possible to resolve the problem being discussed. They were also assured that their tapes and data would be anonymous and confidential and that the room was soundproof. At this point the experimenter left the room to start the video equipment and couples participated in a brief conversation concerning something of mutual interest to help them feel more comfortable in the situation. Next, each couple discussed each problem for 5 minutes. Two copies of the taped discussions were produced simultaneously, with a running count of the time elapsed in seconds electronically embedded in the corner of the television screen.

Collection of on-line cognition data. The procedures used in this phase of the research were based on those developed by Ickes and his colleagues (Ickes et al., 1986, 1990), and Fletcher and Fitness (1990). Immediately after the completion of their discussions, couples were separated and partners were located in separate soundproof laboratories. They were then informed that they were going to review a videotape of their discussion independently. When they could recall experiencing a particular thought or feeling, participants were instructed to stop the tape using the pause button on the remote control, to indicate the time elapsed in seconds, write a clear and candid description of the specific thought and/or feeling they had experienced, and then restart the tape. All participants stopped the tape at least three times.
At time 1, the mean number of occasions on which the tape was stopped was 11.72 (SD = 5.60), and at time 2, the mean number of tape stops was 11.38 (SD = 5.56).

It was stressed to participants that they were to describe only those cognitions that they could distinctly remember experiencing during the discussion and not to construct new cognitions. They were also assured that their partner would not gain access to any information subsequently provided. A written summary of these instructions remained with each subject. After an initial practice to familiarize themselves with the equipment and the procedure, the experimenter left each partner to review the tape in privacy. The time gap between the discussions and the videotaping was kept as short as possible to maximize the veridicality of the subsequent reports of cognitive content (see Fletcher & Kininmonth, 1991).

Measures

The interrater reliabilities of the observer-coded behavior (using Cohen's kappa) and the internal reliabilities of the scales adopted (using Cronbach's alpha) were all satisfactory (ranging from .69 to .92). All reliability estimates are shown in Table 1.

Observer ratings of interactive behavior. Positivity of marital behavior was coded directly from the videotapes. One rater initially partitioned the verbal discourse into basic verbal units that were defined as homogeneous in content, regardless of duration or syntactic structure. Typically, these are conversation turns (see Hahlweg, Revenstorf, & Schindler, 1984). The same rater and one additional rater then independently coded these verbal units as positive or negative using verbal content, voice tone cues, and nonverbal behavior. The independent agreement rates for positive versus negative verbal units were 93% and 96% for the year 1 and year 2 data sets, respectively. All disagreements between raters were resolved by discussion. The percentage of positive verbal units for each subject was derived using the number of positive verbal units as the numerator and the total number of units (positive and negative) as the denominator.

Observer ratings of on-line cognitive protocols. One coder initially classified the on-line cognitive protocols into either cognitive or emotion units. Both raters then independently coded all units into positive, negative, or neutral categories. Overall agreement rates were 93% for the year 1 data set and 96% for the year 2 data set. The overall percentage of positive cognitions (including emotional attributions) was derived from these data using the sum of the positive, negative, and neutral units as the denominator.

Similarity of problems discussed across the two research phases. Couples were left free to discuss the same problems at year 2 that they had dealt with a year earlier, or to discuss new problems. Thirty couples discussed the same two problems across the year period, 20 couples chose one new problem and one old problem, and 7 couples chose to discuss two new problems. These results were converted to a variable (with values of 1, 2, or 3) to represent the similarity of problems discussed on the two occasions.

Seriousness of problems discussed. Participants' perceptions of the seriousness of the two problems discussed were assessed by three 7-point semantic differential scales, for each problem, anchored by the following endpoints: not serious at all—very serious; very easy to solve—very difficult to solve; no anxiety about problem—very anxious about problem. These scores were aggregated to produce one measure of perceived problem seriousness for each year.

4. A second procedure was also carried out, after the procedure outlined here, which involved the measurement of empathic accuracy. The results from this second procedure are reported elsewhere (Thomas et al., 1997). In addition, various other scales were completed that are not relevant to this study and, hence, are not reported here.
Table 1. Variable reliabilities, means, standard deviations, and correlations between spouses for the two research phases

<table>
<thead>
<tr>
<th>Variable</th>
<th>Year 1</th>
<th>Year 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Husbands M</td>
<td>Wives M</td>
</tr>
<tr>
<td>% Positive Behavior</td>
<td>89.90</td>
<td>86.88</td>
</tr>
<tr>
<td>Problem Seriousness</td>
<td>4.35</td>
<td>4.33</td>
</tr>
<tr>
<td>Negative Attributions</td>
<td>2.67</td>
<td>3.24</td>
</tr>
<tr>
<td>Relationship Satisfaction</td>
<td>5.78</td>
<td>5.94</td>
</tr>
<tr>
<td>Depression</td>
<td>1.52</td>
<td>1.57</td>
</tr>
</tbody>
</table>

Note: All means and SDs were converted to 7-point scales to improve readability (apart from the % ratings). The reliability ratings (labeled as Rel.) for the % variables are Cohen kappas and the remainder represent internal reliability coefficients (Cronbach's alpha).

Partner negative attributions for the marital problems. Participants answered the same five attributional questions for each of the two problems discussed. These items, or very similar ones, have been commonly used in the attributional literature (see Bradbury & Fincham, 1990), but the specific items used here have been derived from work by Bradbury and Fincham (1992) and Fletcher et al. (1990). Attributions of blame were assessed by three questions, accompanied by a 7-point scale (endpoints: “not at all” to “very much”): “To what extent is your partner to blame for this problem?”, “To what extent is this problem caused by behavior that is intentional and planned by your partner?”; “To what extent is this problem a reflection of your partner’s selfish concerns?” Causal attributions to the partner were assessed by two questions (accompanied by the same scales and endpoints): “To what extent are the causes located in your partner?” and “To what extent are the causes of this problem under the control of your partner?” It was decided to combine these two sets of attributions (blame and causal attributions) into one measure of negative attributions, given their high interitem and item-total correlations (see Table 1).

Relationship satisfaction. Consistent with the advice of various investigators (e.g., Fincham & Bradbury, 1987; Norton, 1983), we used bi-polar Likert-type scales that assessed relationship satisfaction in a direct and global fashion. The scale used comprised four global judgments on 7-point Likert scales measuring perceptions of love for the partner, relationship happiness, general relationship satisfaction, and relationship stability. Previous evidence suggests that this scale constitutes a reliable and valid measure of relationship satisfaction (see Fletcher et al., 1990; Fletcher & Fitness, 1990). We also reanalyzed some data from a recent study (Fletcher, Simpson, & Thomas, in press) and obtained a .88 correlation with Hendrick’s (1988) measure of relationship satisfaction, which suggests that the scale used in the present study performs in a very similar way to other published measures.

Depression. Beck’s Depression Inventory (Beck, Rush, Shaw, & Emery, 1979) is a widely used 21-item self-report questionnaire (ranging from 0 to 63) that assesses the severity of common depressive symptoms.
Results

Where appropriate, the results were analyzed and reported separately for each sample within each of the research phases, which allowed us to test whether the results replicated across the two testing periods. This feature helps offset the problems associated with the relatively low sample size used in relation to the number of paths included in the SEM models.

Descriptive analyses and zero-order correlations among the variables

The reliabilities, means, and standard deviations of each of the variables are shown in Table 1. As can be seen, the reliabilities of all the measures were adequate (varying from .69 to .92), with little variability across the two data sets. The means obtained are typical for a normal sample of married couples with, for example, relatively high levels of relationship satisfaction reported and relatively low levels of depression. Although the coding schemes for assessing the positivity of the behavior and the on-line cognitive protocols are not necessarily conceptually equivalent, the results do suggest that the interactive behavior of the couples was considerably more positive in content and tone than were their private cognitions.

Before analyzing the data further, the interactive behavior and on-line cognition variables (expressed in percentages) were transformed using arcsine transformations to stretch the tails of the distributions and produce more normally distributed data. This is a commonly recommended transformation when dealing with proportional data (e.g., Judd & McClelland, 1989).5

As expected, the correlations between the partners showed considerable evidence of interdependence within the married couples (see Table 1). In particular, partners were moderately to strongly related in terms of the positivity of their interactive behavior, on-line cognition, problem seriousness ratings, and relationship satisfaction. In contrast, there was evidence of relative independence across partners for the variables of depression and negative attributions. To test for mean difference changes over time, we carried out dependent t-tests within men and women for the six variables shown in Table 1. Using a Bonferonni adjustment to adjust for Type 1 error, we set the alpha level at $p < .004$. The results showed that men's behavior became more negative over time ($t(54) = 4.67, p < .001$). No other results were significant.

The correlations among all the variables can be seen in Table 2. The general pattern of relations for both research phases was similar, and was more or less as expected. Importantly, some of our within-spouse correlations replicate a considerable body of previous research—a feature that allows more confidence to be placed in our novel analyses and results. First, individuals who were more positive in their interactive behavior attributed less negative attributions for the problems, were more satisfied with their relationships, and were less depressed (although the correlations vary somewhat across sex and research phase). Second, individuals who were less depressed and more satisfied with their relationships produced less negative attributions for the relationship problems under discussion. Third, partners who were more satisfied with their relationships were less depressed.

As can be seen in Table 2, there was also considerable evidence of moderate and significant between-spouse correlations, typically in a similar direction to the within-spouse correlations. However, given the evidence of strong interdependence across partners in some of the key variables, and the moderate to strong relations among variables (such as between depression and relationship satisfaction), such correlations need to be treated with caution, and they make a full SEM analysis advisable.

5. All other variables were reasonably normal in their distributions except for depression. However, analyses using a transformed version of depression produced very similar results; accordingly, this variable was left in its original state. Other analyses revealed that one couple was a strong outlier in the correlational and SEM results. This couple was accordingly removed from all analyses, producing a final sample of 56 couples.
Table 2. Correlations among variables both within and between spouses for year 1 and year 2 data sets, respectively

| Variable                          | Husbands | | | | | | Wives | | | | |
|----------------------------------|----------|---|---|---|---|---|---------|---|---|---|---|---|
|                                  | 1        | 2  | 3  | 4  | 5  | 6  |         | 1  | 2  | 3  | 4  | 5  | 6  |
| Husbands                         |          |   |   |   |   |   |         |   |   |   |   |   |   |
| 1. % Positive behavior          | —        | .30| -.32| .09| .21| -.31|         | .57| .47| -.36| -.17| .23| -.23|
| 2. % Positive cognitions        | .41      | —  | -.21| -.24| .12| -.20|         | .19| .17| .15 | -.07| .12| -.12|
| 3. Negative attributions        | -.28     | -.20| —  | .16| -.45| .23  |         | -.10| .00| -.06| .23  | -.24| .08 |
| 4. Problem seriousness          | .05      | -.22| -.08| —  | -.40| .20  |         | -.02| .13| .00 | .52  | -.39| .12 |
| 5. Relationship satisfaction    | .55      | .33| -.38| -.22| —  | -.38 |         | .20| .13| -.15| -.43| .37 | -.12|
| 6. Depression                   | -.33     | -.35| .29 | .26 | -.35| —    |         | -.23| -.11| .20 | .24  | -.16| .14 |
| Wives                            |          |   |   |   |   |   |         |   |   |   |   |   |   |
| 1. % Positive behavior          | .91      | .47 | -.33| .06| .39 | -.29 |         | .47| .47| -.41| -.25| .28 | -.27|
| 2. % Positive cognitions        | .49      | .56 | -.22| -.05| .32 | .03  |         | .52| —  | -.25| -.17 | .20 | -.20|
| 3. Negative attributions        | -.46     | -.27| .14 | -.03| -.38| .23  |         | -.49| -.35| —  | .31  | -.48| .20 |
| 4. Problem seriousness          | -.11     | -.29| -.08| .48 | -.41| .28  |         | -.21| -.25| .39 | —    | -.69| .39 |
| 5. Relationship satisfaction    | .39      | .29 | -.29| -.24| .67 | -.27 |         | .50| .38| -.57| -.56 | —   | -.26|
| 6. Depression                   | -.40     | -.34| .25 | .12 | -.35| .25  |         | -.42| -.41| .40 | .34  | -.57| —   |

*Note:* Correlations from the year 1 data set are to the right of the diagonal, and correlations from the year 2 data set are to the left of the diagonal. Correlations of .22 and above are significant at the $p < .05$ level (1-tailed test) and are set in boldface.
Testing the mediational model for specific relationship problem-solving episodes

Overall fits and path coefficients. As previously described, SEM analysis confers critical advantages with these data and allows us to test the model shown in Figure 1. We used EQS for Windows (Bentler & Wu, 1995), with the observed variables rather than an analysis with latent variables. This choice was made because using latent variables (with their associated indicator variables) would have substantially increased the total number of variables and degrees of freedom, thus producing severe problems of low power and associated difficulties in interpreting the fit indices with the sample size in this study.

Tests for gender differences in paths were accomplished by initially constraining all the equivalent paths for husbands and wives as equal. For example, in Figures 2 and 3 the path from husbands' relationship satisfaction to husbands' negative attributions and the path from wives' relationship satisfaction to wives' negative attributions were set as equal. Specifying the Lagrange multiplier test then tests whether releasing the constraints on the paths for husbands and wives (i.e., allowing them to vary) significantly increases the variance explained in the overall model, both for the entire set of constrained paths and each unique pairwise set of constraints. Subsequent SEM analyses reported were tested in this way for gender differences. However, the associated chi-square tests were well short of significance levels (all p levels being higher than .20), showing that there were no significant gender differences. Accordingly, all paths were left as pooled across gender of spouse. The relevant regression coefficients are set as equal in their unstandardized form, which means that the standardized path coefficients (as shown in Figs. 2 and 3) may vary slightly across gender.

The model shown in Figure 1 was tested independently against year 1 and year 2 data sets, and the results are shown in Figures 2 and 3, respectively, with the standardized path coefficients obtained. To measure overall model fit we used the Satorra-Bentler scaled chi-square, a comparative fit index (CFI), and the Bentler-Bonett nonnormed fit index (FI), which is especially suitable for small samples (see Bentler & Wu, 1995). Both year 1 and year 2 data sets produced very good fits: year 1—Bentler-Bonett Non-

![Figure 2. Standardized path coefficients derived from an SEM test of the overall model from year 1 data (coefficients that did not reach the p < .05 1-tailed level are shown in brackets).](image-url)
Variables Distal Mediating Variables Outcome Interaction Variables

Figure 3. Standardized path coefficients derived from an SEM test of the overall model from year 2 data (coefficients that did not reach the \( p < .05 \) 1-tailed level are shown in brackets).

To summarize, the specific path coefficients obtained were very similar across both research phases and were generally consistent with our predictions. Higher levels of relationship satisfaction (controlling for depression) were associated with lower levels of negative attributions, which in turn were related to more positive levels of both relationship interactive behavior and online cognition. In contrast, lower levels of depression (controlling for relationship satisfaction) were uniquely related to both lower levels of negative attribution, and to more positive levels of interactive behavior and online cognition. Especially noteworthy are the between-spouse paths showing that the wives’ tendency to make less negative attributions to their partners was associated with more positive levels of interactive behavior and online cognition from their husbands. The reverse pattern of findings was also the case with the husbands’ tendency to make less negative attributions to their partners being associated with more positive levels of interactive behavior and online cognition from their wives.

The path regression coefficients were all tested for significance with 1-tailed tests, given that we had made specific a priori predictions. These were all significant at the \( p < .05 \) level, except for the paths in year 1 for the links between depression and negative attributions and the between-spouse paths from negative attributions to the positivity of online cognition (see Fig. 2).

**Mediational analyses.** The results shown in Figures 2 and 3 are consistent with a mediational model in that higher levels of relationship satisfaction were related to lower levels of negative attributions for the problems, which in turn were associated with higher levels of positive interactive behavior and online cognition. However, for a mediational model to be fully supported, the direct links between relationship satisfaction (or depression) and the dependent variables of interactive behavior and online cognition should be reduced to nonsignificant levels when the mediating variable is controlled for (see Baron & Kenny, 1986).

To provide these additional tests for both depression and relationship satisfaction, the
direct paths between depression and satisfaction and the dependent variables were assessed in the context of the full model, but with the mediating variable omitted. Then, the mediating variable was included as in the full models shown in Figures 2 and 3, but with additional paths from relationship satisfaction and depression to the dependent variables included. As previously done, the paths were initially set as equal across gender. All such pairs of paths were left as pooled, given that none of the gender differences were significant at the \( p < .05 \) level, except for the one case noted in Table 3, which also shows results of the testing.

The additional analyses for the mediational hypothesis with respect to relationship satisfaction were not completely clear-cut for the year 2 data set. However, overall the results showed that including the mediational variable (negative attributions) sharply reduced the direct paths between relationship satisfaction and the dependent variables (with the one exception of the wives' link between relationship satisfaction and interactive behavior for the year 2 data set as shown in Table 3). In contrast, as predicted, introducing the mediating variable had virtually no impact on the prior direct paths between depression and the dependent variables.

**Are the results an artifactual product of perceived problem seriousness or relationship length?** Two alternative interpretations of any of the paths shown in Figures 2 and 3 are in terms of the perceived seriousness of the problems discussed, or the length of the marriage. For example, it is plausible that the seriousness with which relationship problems are perceived cause couples to become more or less dissatisfied, more or less depressed, produce more or less negative attributions, and also to discuss the same problems in a more or less negative fashion. Accordingly, we repeated the SEM analyses previously described, but controlling first for the links between husbands' and wives' perceived problem seriousness, and second for marital length. The results were largely unchanged, with all significant paths remaining significant (at the \( p < .05 \) level), and all nonsignificant paths remaining nonsignificant.

To summarize these analyses, regardless of the perceived seriousness of the prob-

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**Table 3. Direct path coefficients between depression and relationship satisfaction and the dependent variables, including or omitting mediating variable of negative attributions from the full model**

<table>
<thead>
<tr>
<th>Paths</th>
<th>Year 1 OMV</th>
<th>Year 1 IMV</th>
<th>Year 2 OMV</th>
<th>Year 2 IMV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Husbands</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relationship Satisfaction–Behavior</td>
<td>.12*</td>
<td>-.02</td>
<td>.15*</td>
<td>.03</td>
</tr>
<tr>
<td>Relationship Satisfaction–Cognition</td>
<td>.10*</td>
<td>.04</td>
<td>.13</td>
<td>.04</td>
</tr>
<tr>
<td>Depression–Behavior</td>
<td>-.17*</td>
<td>-.14*</td>
<td>-.05</td>
<td>-.08*</td>
</tr>
<tr>
<td>Depression–Cognition</td>
<td>-.16*</td>
<td>-.16*</td>
<td>-.27*</td>
<td>-.28*</td>
</tr>
<tr>
<td>Wives</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relationship Satisfaction–Behavior</td>
<td>.15*</td>
<td>-.02</td>
<td>.24*</td>
<td>.21*</td>
</tr>
<tr>
<td>Relationship Satisfaction–Cognition</td>
<td>.16*</td>
<td>.03</td>
<td>.18</td>
<td>.11</td>
</tr>
<tr>
<td>Depression–Behavior</td>
<td>-.17*</td>
<td>-.13*</td>
<td>-.06</td>
<td>-.08*</td>
</tr>
<tr>
<td>Depression–Cognition</td>
<td>-.12*</td>
<td>-.15*</td>
<td>-.28*</td>
<td>-.29*</td>
</tr>
</tbody>
</table>

*Note: Equivalent paths for husbands and wives were set as equal (although they may differ in their standardized form shown above). However, the equality constraint for the year 2 relationship satisfaction–behavior paths was removed, because of a significant difference between the paths for husbands and wives; \( \chi^2 (1, N = 56) = 3.85, p < .05 \). OMV = omitting mediating variable; IMV = including mediating variable.

\*\( p < .05 \) (1-tailed).
lems discussed or marital length, partners who were more satisfied and less depressed tended to attribute less negative attributions to their partners. Less negative attributions, in turn, were associated with more positive interactive behavior and on-line cognition. However, unlike relationship satisfaction, the influence of depression on interactive behavior and on-line cognition was not mediated by the level of negative attributions for the problems. Instead, less depressed partners produced more positive interactive behavior and on-line cognition regardless of their attributional patterns.

Cross-lagged analyses

Before carrying out the cross-lagged analyses, we calculated the within-spouse longitudinal correlations across the year period for all variables for both husbands and wives (see Table 4). These show that, even when the extent to which couples discussed the same problems was controlled for, there was moderate to substantial consistency over the year period for levels of relationship satisfaction, depression, negative attributions, and interactive behavior and on-line cognition. The one exception was the low and nonsignificant longitudinal correlation for wives' frequency of positive on-line cognition.

To analyze the cross-lagged relations we also used an SEM approach, which calculates the cross-lagged paths simultaneously for each pair of variables, and as a bonus deals with the problem of nonindependence across marital partners. We tested each distal variable in turn with both the positivity of interactive behavior and on-line cognition. We describe the analysis with respect to interactive behavior and relationship satisfaction to illustrate and explain our design strategy (see Fig. 4). As can be seen in Figure 4, interdependence between husbands and wives for the same variables (relationship satisfaction and interactive behavior) was controlled for via the double-headed arrows. In addition, within-spouse relations between interactive behavior and relationship satisfaction at year 1 were controlled for (also via double-headed arrows). The four pairs of lagged husband/wife paths connect the year 1 variables with the year 2 variables. The two pairs of cross-lagged paths reveal any evidence of causal relations across the year period. As previously, equivalent husband and wife cross-lagged paths were initially set as equal, and tested for significant differences using the procedures previously described in EQS.6

As can be seen in Figure 4, the results suggested that higher initial levels of relationship satisfaction were associated with increases in positive interactive behavior, and vice versa, over the 1-year period. The remaining distal variables were tested in the same way, and the full results (including those depicted in Fig. 4) are shown in Table 4. Comparisons between the cross-lagged paths for husbands and wives revealed no significant differences, and were, thus, left as pooled (except for the one case described in Table 4). As can be seen, there was evidence that increased negative attributions for the problems were associated with more negative interactive behavior over time, but not vice versa, and that more negative interactive behavior at time 1 produced increased levels of depression in wives (but not husbands). With respect to on-line cognition, the findings suggested that higher levels of relationship satisfaction produced more positive on-line cognition over time, whereas more positive levels of on-line cognition at time 1 led to lower levels of depression.

Finally, as shown in Table 4, the cross-lagged results showed that more positive interactive behavior at time 1 was related to

6. The longitudinal husband/wife paths were also set as equal; for example, the wives' path from year 1 behavior to year 2 behavior was set as equal to husbands' path from year 1 to year 2 behavior. The key advantage of this strategy is that any significant differences between husband and wife cross-lagged coefficients cannot then be artificially produced by different longitudinal path coefficients for husbands and wives (lower longitudinal correlations make it easier for significant cross-lagged coefficients to emerge because there is more available variance to explain for the other time variable).
Table 4. *Within-spouse correlations across the 1-year period and regression coefficients from cross-lagged SEM analyses*

<table>
<thead>
<tr>
<th>Variables</th>
<th>$r$</th>
<th>Marital Behavior as Dependent Variable</th>
<th>Marital Behavior as Predictor Variable</th>
<th>On-line Cognition as Dependent Variable</th>
<th>On-line Cognition as Predictor Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>H</td>
<td>W</td>
<td>H</td>
<td>W</td>
<td>H</td>
</tr>
<tr>
<td>% Positive Behavior*</td>
<td>.63*</td>
<td>.47*</td>
<td>.21*</td>
<td>.17*</td>
<td>.22*</td>
</tr>
<tr>
<td>% Positive On-line Cognition*</td>
<td>.37*</td>
<td>.15</td>
<td>.21*</td>
<td>.17*</td>
<td>---</td>
</tr>
<tr>
<td>Negative Attributions*</td>
<td>.58*</td>
<td>.61*</td>
<td>-.11</td>
<td>-.08</td>
<td>-.15</td>
</tr>
<tr>
<td>Relationship Satisfaction</td>
<td>.65*</td>
<td>.64*</td>
<td>.24*</td>
<td>.19*</td>
<td>.24*</td>
</tr>
<tr>
<td>Depression</td>
<td>.81*</td>
<td>.56*</td>
<td>-.09</td>
<td>-.08</td>
<td>-.18</td>
</tr>
</tbody>
</table>

Note: For the variables with asterisks, all cross-lagged analyses were calculated while controlling for the extent to which the same problems were discussed in the two research phases. Equivalent paths for husbands and wives were set as equal (although they may differ in their standardized form shown above). However, the equality restraint for depression in which marital behavior was the predictor variable was removed, because of a significant difference between the paths for husbands and wives; $\chi^2 (1, N = 56) = 7.36, p < .01$. $H =$ Husbands, $W =$ Wives.

*p < .05 (2-tailed).*
increased positive on-line cognition over time. Conversely, more positive on-line cognition at time 1 was related to increased positive interactive behavior over the 1-year period.

Discussion
This study set out to test two kinds of models or hypotheses with correlational data. The first model (see Fig. 1) applied to a specific interaction episode, and assumed that distal variables can influence the positivity of both interactive behavior and on-line cognition (but not vice versa). The second set of hypotheses concerned whether causal relations might run in both directions between distal and proximal-level interaction variables over long time periods (1 year in this case). We discuss each set of relevant findings in turn.

Explaining specific problem-solving interactions
The SEM results supported the model shown in Figure 1. Specifically, the results confirmed our predictions that, regardless of perceived problem seriousness, relationship length, or levels of depression, husbands and wives who were more satisfied with their relationships tended to attribute less negative attributions to their partners for the problems under discussion. Less negative attributions to the partner, in turn, were associated with more positive interactive behavior and on-line cognition (although the results were stronger for interactive behavior than for on-line cognition in both research phases). Partners who were less depressed, as expected, also tended to produce more positive interactive behavior and on-line cognitions, regardless of their levels of relationship satisfaction. These results replicated well across the two time periods.

Our findings are consistent with the postulate that intraindividual distal variables are likely to play different roles to interpersonal distal variables that focus on the relationship. In the current study, for example, depression appeared to have a shotgun effect on other variables, being related to the negativity of attributions as well as to inter-

Figure 4. Standardized path coefficients derived from a cross-lagged SEM analysis of interactive behavior and relationship satisfaction over a 1-year period.
active behavior and on-line cognition. In contrast, relationship satisfaction had a narrower application, exerting an influence on interactive behavior and on-line cognition largely through its effects on negative attributions. These results are consistent with prior research findings (see Fincham & Bradbury, 1993; Fletcher & Fincham, 1991), and suggest that intraindividual variables (like depression) will often influence cognitions and behaviors in relationship contexts in a scattergun and perhaps weaker fashion, in contrast to interpersonal distal variables (like relationship satisfaction).

The critical role played by attributions in this research is certainly consistent with previous research (e.g., see Bradbury & Fincham, 1990; Fletcher & Fincham, 1991). However, this is the first demonstration we know of that attributional patterns can be mediating variables between relationship satisfaction and interactive behavior and on-line cognition. One important caveat here is that the role played by any distal variable is likely to depend on the specificity of the measures used. Attributions, for example, can be assessed in terms of general attributional styles, or in terms of much more localized targets (such as specific marital problems as in the current study), or in terms of on-line attributions as they occur in dyadic discussions. Depending on what measure of attributions is chosen, attributions could be viewed as a distal variable, as a distal variable that is also a mediating variable, or as an outcome variable. The patterns of relations between such attributional measures and other relationship variables, in turn, are likely to differ. Indeed, there is evidence that very general attributional styles are less closely linked to relationship satisfaction than more specific relationship-focused attributional measures of the sort we used in this study (Fletcher et al., 1990; Horneffer & Fincham, 1995).

Another novel but predicted finding, made possible by the use of SEM, was that less negative attributions by husbands was associated with more positive interactive behavior and on-line cognition evinced by their wives. The opposite pattern was also the case, with less negative attributions by the wives being associated with more positive interactive behavior and on-line cognition from their husbands. This pattern further implicates the central role of attributions in problem-solving discussions, and illustrates the truly interpersonal nature of the links between cognition and behavior in marital couples.

The generally high between-spouse correlations between the error terms of both interactive behavior and on-line cognition (see Figs. 2 and 3) shows that the problem-solving behaviors and on-line cognitions were not completely determined by the distal variables. Rather, the interactive behaviors and on-line cognitions of each partner seem to represent individual responses (at least in part) to the idiosyncratic nature of each specific dyadic interchange.

In broad terms, the results strikingly confirmed the three basic postulates of a social psychological approach to marital interaction previously described. First, there was general evidence of considerable interdependence across partners. Second, what married couples brought with them into problem-solving interactions, in the form of cognitive/affective structures, seemed to shape both interactive behavior and on-line cognition. Third, interactive behaviors and cognitions at the proximal level appear to be also uniquely influenced by the idiosyncratic fashion in which each problem-solving interactive dance unfolded.

**Relations between distal and proximal-level variables over time**

The longitudinal, within-spouse, cross-lagged analyses suggested that the influence that distal variables have on interactive behavior and on-line cognition is not just a transitory phenomenon. Distal factors and on-line marital interaction variables appear to influence each other across long time periods.

With respect to interactive behavior, the cross-lagged analyses found that partners who reported higher levels of relationship
satisfaction, and who made less negative attributions at time 1, produced more positive interactive behavior a year later than was evinced on the first occasion. This is the first longitudinal evidence we know of that implicates the role of any distal variable in causing interactive, observer-coded behavior. Second, consistent with previous research, there was evidence of causal influences also proceeding in the opposite direction, with more positive interactive behavior at time 1 being associated with higher levels of relationship satisfaction and lower levels of depression a year later (although this latter finding was true only for wives). With respect to on-line cognition, the results revealed that higher levels of relationship satisfaction at time 1 were associated with increases in the positivity of on-line cognition, and that more positive levels of on-line cognition at time 1 were associated with lower levels of depression a year later.

The final set of within-spouse cross-lagged analyses revealed that more positive on-line cognitions at time 1 resulted in increases in the positivity of interactive behavior at time 2. Conversely, more positive interactive behavior at time 1 was associated with higher levels of positive on-line cognition at time 2. These analyses suggest that interactive behavior causes on-line cognition and on-line cognition causes interactive behavior—a finding that makes eminent theoretical sense.

In a nutshell, the cross-lagged findings suggest that relationship satisfaction, lay explanations for serious relationship problems, and the fashion in which couples discuss and attempt to resolve problems tend to be linked together in circular feedback loops. It is a common claim in the literature that if marital disputes are handled in an acrimonious fashion, they will fuel negative cognitions and emotions, leading to even more bitter exchanges, and perhaps a downward spiral that may eventually end in relationship dissolution (e.g., Gottman, 1994; Markman, 1991). Such a claim is certainly theoretically plausible and is consistent with previous research findings (see, for example, Noller et al., 1994). However, the current study provides some of the most direct evidence to date for such a proposition.

The results also validate the common claim that there is something especially diagnostic about conflictual or problem-solving interactions in intimate relationships. Of course, the specific 10-minute problemsolving interactions observed in this research, by themselves, may not be the actual cause of changes in distal variables over time. Rather, the particular problem-solving episodes are likely to be proxies for general interactive styles associated with conflict resolution. This latter possibility is consistent with the fact that the longitudinal cross-lagged results were obtained when the similarity of the problem topics that couples discussed across the time period was statistically controlled for.

The exact pattern of significant and non-significant findings in the cross-lagged analyses (see Table 4) need to be treated with circumspection, given the varying internal reliabilities and longitudinal correlations across measures. Moreover, the fact that we are using a “normal” sample in this study means that some of the variables are skewed in the expected and standard directions. For example, depression seldom goes above mild levels, and relationship satisfaction is typically high. Nevertheless, such variables attained sufficient variance to obtain substantive correlations with other key variables. In general, the results support the general conclusion that relationship satisfaction has more powerful connections to marital behavior and on-line cognition, over long periods of time, than has either depression or attributions. Close relationship evaluations surely constitute one of the most central and accessible class of distal variables stored in long-term memory.

**On-line cognition in problem-solving discussions**

This study supports the reliability and validity of the technique adopted here for the study of on-line cognition, and it generally
affirms the thesis that the private flow of conscious cognitive activity in problem-solving is an important factor in understanding the causes and consequences of marital conflict. Moreover, our results are consistent with one of the few previous studies that has utilized this technique in the context of intimate heterosexual relationships.

Two qualifying points need to be made. First, the technique used here accesses the individual's conscious memories of cognitions experienced during an interaction. Given that there is bound to be a substantial stream of on-line unconscious cognition that is not verbally accessible, this technique only addresses one component of cognitive activity (see Fletcher, Rosanowski, & Fitness, 1994). Second, because emotional attributions were counted as cognitions, and we coded all the cognitions in terms of positivity, it follows that the derived variable of on-line cognition should be viewed as a measure of "hot" or evaluatively loaded cognition.

In this respect, one intriguing feature of the results was that the overall tone of the on-line cognitions was starkly negative in contrast to the relatively positive flavor of the interactive behavior (although these results should be treated with caution, given that the two coding schemes for cognitions and behaviors are not necessarily conceptually equivalent). Videotaped discussions of even the most positive or apparently banal discussions typically seemed to be accompanied by a darker melange of attributed negative emotions and harsh judgments. Of course, as our results show, the positivity of the behavioral and cognitive streams are moderately related (the within-spouse correlations between the positivity of interactive behavior and on-line cognitions ranged from .30 to .52). Nevertheless, these results imply that people routinely censor or control the expression of their negative cognitions and emotions during relationship interaction, a process Fletcher (1998) has termed behavioral accommodation. The kind of on-line technique used in this research would be a useful methodology for investigating further such behavioral accommodation in ecologically valid relationship settings.

Generally, the results suggest that on-line cognition may be a more unstable and evanescent variable than interactive behavioral patterns. However, the cross-lagged analyses showed that more positive on-line cognition at time 1 was associated with more positive interactive behavior and lower levels of depression a year later. This latter result suggests that on-line cognition is not just the cognitive tail wagged by the behavioral dog.

Conclusions

Further investigations of the sort attempted here could benefit from analyzing both interactive behavior and on-line cognition in a more fine-grained fashion (rather than in terms of global positivity), by following relationships over longer periods of time with more points of measurement, testing the model with other kinds of samples, such as dating or recently married samples and, no doubt, in many other ways. Moreover, these data are, of course, correlational, and they suffer from the problem that one cannot draw unequivocal causal conclusions. Nevertheless, the present research has broken new ground and has confirmed the thesis that understanding close relationship interaction requires paying attention to the interplay among distal variables and their connections to interactive behavior and associated on-line cognition.

References


