



Published in final edited form as:

*J Consult Clin Psychol*. 2015 February ; 83(1): 103–114. doi:10.1037/a0038005.

## Prediction of Treatment Response at 5-year Follow-up in a Randomized Clinical Trial of Behaviorally Based Couple Therapies

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### Abstract

**Objective**—Building on earlier work examining predictors of short- and moderate-term treatment response, demographic, intrapersonal, communication, and interpersonal variables were examined as predictors of clinically significant outcomes five years after couples completed one of two behaviorally based couple therapies.

**Method**—One hundred and thirty-four couples were randomly assigned to Integrative Behavioral Couple Therapy (IBCT; Jacobson & Christensen, 1998) or Traditional Behavioral Couple Therapy (TBCT; Jacobson & Margolin, 1979) and followed for 5 years after treatment. Outcomes include clinically significant change categories of relationship satisfaction and marital status at 5-year follow-up. Optimal subsets of predictors were selected using an automated, bootstrapped selection procedure based on Bayesian Information Criterion.

**Results**—Higher levels of commitment and being married for a longer period of time were associated with decreased likelihood of divorce/separation (Odds Ratio [*OR*] = 1.39, *p* = .004; *OR* = 0.91, *p* = .015). Being married for a longer period of time was also associated with increased likelihood of positive, clinically significant change (*OR* = 1.12, *p* = .029). Finally, higher levels of wife desired closeness were associated with increased odds of positive, clinically significant

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change and decreased odds of divorce for moderately distressed, IBCT couples ( $OR = 1.16, p = 0.002$ ;  $OR = 0.85, p = 0.007$ , respectively) whereas the opposite was true for moderately distressed, TBCT couples ( $OR = 0.77, p < 0.001$ ;  $OR = 1.17, p = 0.002$ , respectively).

**Conclusions**—Commitment-related variables are associated with clinically significant outcomes at 5-year follow-up as well as at termination and moderate-term follow-up.

**Public health significance**—This study indicates that couples who begin marital therapy with higher levels of commitment are least likely to get divorced and most likely to report improvements in relationship satisfaction five years after ending treatment. In addition, it appears that the impact of wives' desired closeness depended on the type of treatment moderately distressed couple received.

## Keywords

couple therapy; prediction; clinically significant change; long-term response

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Although couple therapy has clear, short- and long-term benefits for relationship distress, not all couples who receive therapy experience improvement or maintain their gains. Thus, improving our understanding of which couples benefit the most (or least) from therapy has implications for modifying treatments to fit the needs of more couples. To date, only one study has examined long-term (more than 2 years after completion of treatment) predictors of clinically significant changes in relationship functioning (Snyder, Mangrum, & Wills, 1993). Examination of long-term responses to behaviorally based couple therapies is important for a number of reasons. First, long-term response to treatment represents a fundamentally different aspect of relationship outcomes than short-term response to treatment, namely the stability of change. Second, examining long-term response allows for a more sensitive exploration of differential prediction between treatments when differences are slow to emerge. Third, examining response to treatment over an extended period of time allows for inclusion of rare but clinically significant outcomes, such as divorce, that typically do not occur until a significant period of time has elapsed after treatment termination. The current study addresses this gap in existing literature by examining a comprehensive list of pre-treatment predictors of two clinically meaningful outcomes (clinically significant change categories of relationship satisfaction [Jacobson & Truax, 1991] and separation/divorce) assessed five years after treatment termination.

## Maintenance of Treatment Gains in Behaviorally Based Couple Therapies

Over 30 randomized control trials (RCTs) have evaluated the efficacy of behaviorally based couple therapies for relationship distress. Numerous meta-analyses agree that spouses who complete a course of behaviorally based couple therapy report significant improvements in relationship satisfaction at treatment termination ( $d$  ranging from .59 [Shadish & Baldwin, 2005] to .95 [Hahlweg & Markman, 1988]). However, approximately 30–60% of couples still report significant deterioration in treatment gains over time (Snyder, Castellani, & Whisman, 2005) and one study found that 38% of couples divorced in the four years following treatment termination (Snyder, Wills, & Grady-Fletcher, 1991).

The data for the current study come from Christensen and colleagues' (Christensen, Atkins, Berns, Wheeler, D. Baucom, & Simpson, 2004; Christensen, Atkins, Yi, D. Baucom, & George, 2006; Christensen, Atkins, Baucom, & Yi, 2010) long-term efficacy trial of Integrative Behavioral Couple Therapy (IBCT; Jacobson & Christensen, 1988) and Traditional Behavioral Couple Therapy (TBCT; Jacobson & Margolin, 1979). IBCT and TBCT are similar in that both interventions are behaviorally based couple therapies. However, there are also noteworthy differences between the two treatments (see Christensen, Atkins, Berns, Wheeler, D. Baucom, & Simpson, 2004 for a detailed discussion of the two therapies). TBCT emphasizes rule governed change strategies (such as guided behavioral exchange and communication skills training) for resolving conflict and improving relationship quality. In contrast, IBCT uses contingency shaped change strategies (i.e., strategies that promote change created by naturally occurring contingencies of behavior, such as comforting a spouse who expresses distress, rather than in response to a "rule" of being more supportive) to improve partners' understanding of and tolerance for their differences, to promote emotional acceptance and empathy between partners, and to facilitate effective communication between partners

Christensen and colleagues (Christensen et al., 2010) recently examined couples' responses to treatment over the five years following termination. Similar to previous RCTs of behaviorally based couple therapies, couples in both TBCT and IBCT demonstrated significant improvements in relationship satisfaction at treatment termination ( $d = .90$  for IBCT;  $d = .71$  for TBCT). Moreover, among those couples who remained married, these treatment gains in satisfaction were largely maintained over the five year follow-up period ( $d = 1.03$  for IBCT;  $d = .92$  for TBCT); couples who completed IBCT evidenced significantly greater maintenance of change compared to those who completed TBCT over the first two years of follow-up but there were no significant differences between the therapies during the last three years of follow-up. However, not all couples stayed together and analyses of clinically significant change categories (i.e., deteriorated, unchanged, improved, and recovered [Jacobson & Truax, 1991]) revealed a substantial amount of between-couple variability in the stability of response to both TBCT and IBCT. Across both therapies, only 56% of couples who reported clinically significant improvement or recovery at treatment termination also reported clinically significant improvement or recovery at the five year follow-up. A similar picture emerged in analyses of trajectories of change in relationship satisfaction of the five year follow-up period. Both husbands and wives reported continued changes in relationship. Not surprisingly, couples who divorced over the five year follow-up period had significantly different trajectories of change in relationship satisfaction prior to their divorce relative to couples who were still married at the end of the five year follow-up period. This collection of findings suggests that though many couples evidenced stable improvements in relationship satisfaction, there was also a substantial amount of between-couple variability in the stability of response to IBCT and TBCT.

## Predictors of Short- and Long-Term Treatment Response to BCTs

A number of predictors of short-term response to treatment have been identified. More specifically, existing empirical evidence links better short-term responses to treatment to younger spousal age (e.g., Hahlweg, Schindler, Revenstorf, & Brangelmann, 1984), higher

levels of spousal education (Crowe, 1978), less conflict about sex (Hahlweg et al., 1984), higher levels of commitment (e.g., Beach & Broderick, 1983), and lower levels of depression (Jacobson, Follette, & Pagel, 1986). However, between-couple variability in the stability of change in relationship satisfaction suggests that predictors of response to treatment at termination and at long-term follow-up may be different. Consistent with this possibility, Snyder et al. (1993) found different sets of predictors of treatment response at termination and at four year follow-up. Higher levels of negative marital affect and higher levels of depressive symptomatology were predictive of response to treatment at both assessments; however, several other variables (lower levels of problem-solving skills, psychological resilience, and emotional responsiveness as well as spousal employment status) emerged as predictors of treatment response at four year follow-up only.

A similar pattern of findings emerged in the work of Atkins and colleagues (Atkins et al., 2005), who examined predictors of response to treatment at termination, and Baucom and colleagues (Baucom et al., 2010), who examined predictors of response to treatment at two year follow-up, in data from the current clinical trial. Both studies examined three sets of predictors: demographic variables (e.g., age, education, income, etc.), interpersonal variables (e.g., commitment, influence in decision making, etc.), and intrapersonal variables (e.g., overall mental health, neuroticism, etc.). These three sets of predictors included variables empirically linked to treatment outcomes in earlier studies as well as variables theoretically linked to treatment outcome that had yet to be tested. In addition to these three sets of predictors, Baucom et al. (2009) included a fourth set of communication variables (e.g., demand/withdraw, affective communication, encoded arousal, etc.).

The only consistent predictor of response to treatment at termination and at two-year follow-up was the length of time that couples had been married, with more years married associated with better treatment response. In addition, there was a Treatment  $\times$  Sexual Satisfaction interaction for outcomes at termination only, such that more sexually dissatisfied couples that received TBCT had rapid early improvement that slowed in later stages of treatment whereas more sexually dissatisfied couples that received IBCT evidenced an accelerating pattern of improvement that began slowly but increased over time. At the two year follow-up, interactions with treatment and initial distress with vocally encoded arousal (i.e., the amount of emotional arousal conveyed by the voice) and hard and soft influence tactics emerged as predictors of response. Higher levels of wife vocally encoded arousal were more strongly associated with poorer response to treatment for TBCT couples than for IBCT couples and for couples that were moderately distressed than for couples that were severely distressed before beginning therapy. Higher levels of soft influence tactics were associated with better response only for couples that received IBCT, and lower levels of hard influence tactics were associated with worse response only for couples that were moderately distressed prior to beginning treatment.

In addition to the wide range of predictors of response to treatment included in previous work, emotional acceptance is one theoretically important variable that has yet to be examined. Jacobson and Christensen (1998) suggest that low levels of emotional acceptance may make it more difficult for spouses to engage in collaborative efforts to solve relationship problems and work towards a mutually satisfying resolution. Thus, low levels of

emotional acceptance could be associated with a less beneficial response to intervention. In addition, IBCT includes interventions to increase emotional acceptance whereas TBCT does not. This focus on emotional acceptance may increase the strength of the association between emotional acceptance and treatment outcomes for couples that receive IBCT relative to those that receive TBCT.

## Current Study

The current study is an exploratory examination of predictors of relationship outcomes five years after couples completed a course of IBCT or TBCT. Consistent with work examining pre-treatment predictors of relationship outcomes at treatment termination (Atkins et al., 2005) and at two years post-termination (Baucom et al., 2009), predictors are grouped into four categories: demographic variables, intrapersonal variables, communication variables, and interpersonal variables. Relationship outcomes are assessed using clinically significant change categories of relationship satisfaction at the 5-year assessment (Jacobson & Truax, 1991) and marital status (intact/divorced) at the 5-year assessment. Type of therapy received (IBCT vs. TBCT) and pre-treatment severity of relationship distress (moderate vs. severe) are explored as potential moderators.

## Method

### Participants

Participants were 134 severely and stably distressed married, heterosexual couples ( $N = 268$  individuals) recruited for participation in a two-site trial of couple therapy. Inclusion criteria included being legally married, cohabiting, and both spouses reporting significant levels of relationship distress over three consecutive screening assessments.<sup>1</sup> Exclusion criteria included current Axis I disorders of substance abuse or dependence, schizophrenia, bipolar disorder or current Axis II disorders of borderline, schizotypal, or antisocial personality disorder based on the Structured Clinical Interview for DSM-IV (First, Spitzer, Gibbon, & Williams, 1994) and self-reports of moderate to severe husband-to-wife physical aggression assessed using the Conflict Tactics Scale-Revised (Straus, Hamby, Boney-McCoy, & Sugarman, 1996). Participants were not allowed to receive any other forms of psychotherapy during the active treatment phase of the study, and participants taking psychotropic medications were required to be at a stable dosage prior to beginning participation in this study<sup>2</sup>. At least one partner in 119 (89%) of couples completed relationship satisfaction and/or marital status (married vs. separated/divorced) measures at the 5-year follow-up (separated/divorced individuals were not asked to report about their relationship satisfaction). These data were supplemented with online searches to obtain marital status data (i.e., divorce records) from all couples at 5-year follow-up. As a result, marital status data was available for all 134 couples, and it was possible to determine the clinically significant change category for 119 couples. There were no significant differences between

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<sup>1</sup>Relationship distress was assessed using the DAS, Marital Adjustment Test (Locke & Wallace, 1959), and Marital Satisfaction Index-Revised (Snyder, 1997) at screening assessments.

<sup>2</sup>A stable dose of medication was defined as a) having taken the medication for a minimum of 12 weeks prior to the pretreatment assessment, b) having taken a stable dose of the medication for a minimum of 6 weeks prior to the pretreatment assessment, and c) no anticipated changes in the medication based on their physician's evaluation.

the 15 couples for whom it was not possible to calculate a clinically significant change score and the remaining couples. Please see Christensen et al. (2004) for a complete description of recruitment procedures, inclusion criteria and study protocol. See Christensen et al. (2010) for description of follow-up procedures.

Participants in this sample ranged from 22 to 72 years old at pre-treatment, with a median age for men of 43 years and a median age for women of 42 years. They were, on average, college educated (median level of education for both men and women was 17 years) and earned a median annual income of \$45,000 for the men and \$30,000 for the women. Couples had been married for an average of 10.1 years ( $SD = 7.6$ ). Spouses largely self-identified as Caucasian (78%), with 7% African American, 5% Asian or Pacific Islander, 5% Latino/Latina, 1% Native American, and 4% "Other".

## Procedures

Couples completed up to 13 assessments over the course of the study. In addition to a pre-treatment assessment, couples were assessed twice during the active treatment phase (approximately 13 and 26 weeks after study enrollment), once immediately after treatment termination (which had to occur within one year after study enrollment), and up to 9 more times during the follow-up phase. Follow-up assessments were conducted every six months for two years after the 26-week assessment. Because of a lapse in funding, the next assessment was at 3 years post-treatment and subsequently every six months until the 5 year follow-up assessment. The current study primarily uses data from the pre-treatment and five year follow-up assessments. The pre-treatment assessment included a number of self-report questionnaires as well as participation in two 10-minute videotaped problem-solving discussions.<sup>3</sup> Each spouse determined the topic for one of the two discussions; the order of which spouse's topic was discussed first was randomized and counter balanced. The five year follow-up assessment was completed by phone and mail, and therefore did not include problem-solving discussions. All predictor variables are taken from the pre-treatment assessment, and clinically significant change categories were calculated using relationship satisfaction data from the pre-treatment and five year follow-up assessments.

A median split of spouses' combined reports on the Dyadic Adjustment Scale (DAS; Spanier, 1976) and the Global Distress Scale of the Marital Satisfaction Inventory-Revised (MSI-R; Snyder, 1997) from the screening phase was used to classify couples as being either moderately (66 couples) or severely distressed (68 couples). A stratified random assignment design was used to assign couples within these distress categories to receive up to 26 sessions of either TBCT (68 couples) or IBCT (66 couples). Additional details regarding the procedure used for random assignment to therapy are described in Christensen et al. (2004). Couples were not allowed to receive additional treatment from their study therapist for a period of two years and were discouraged from seeking any other couple therapy right after termination in an attempt to prevent unknown influences on post-treatment outcomes and so that they could consolidate gains made in treatment during the study. All procedures were

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<sup>3</sup>Problem-solving discussions were not recorded for one couple due to technical issues; couples completed social support interactions that were not analyzed for the current study.

approved by the Institutional Review Boards at the University of California, Los Angeles and the University of Washington.

## Measures

**Demographic variables**—Age, education, income, presence of children, parental marital status, years married, and gender were assessed with one item each on a demographic questionnaire created for the broader study. Wife report of number of years married was used in cases of disagreement between spouses.

**Intrapersonal variables**—**Neuroticism** was assessed using the 12-item neuroticism subscale from the 60-item NEO Five-Factor Inventory (NEO-FFI; Costa & McCrae, 1989). Cronbach's alphas were .88 and .85 for men and women respectively.

**Overall mental health** was assessed using the 30-item mental health index of the Compass Outpatient Treatment Assessment System (COMPASS; Sperry, Brill, Howard, & Grissom, 1996). The Subjective Well-Being, Current Symptoms, and Current Life Functioning subscales are summed to create the mental health index with higher scores indicating better mental health. Cronbach's alpha was .86 and .88 for men and women, respectively.

**Psychological diagnoses** were assessed using the Structured Clinical Interviews for DSM–IV for Axis I and II (SCID; First et al., 1994; Spitzer, Williams, Gibbon, & First, 1994).<sup>4</sup> Of the 42 (15.6%) spouses with a current, diagnosable disorder, 9 husbands (41%) and 10 (50%) wives met criteria for a mood disorder; 1 (5%) husband met criteria for a substance abuse disorder<sup>5</sup>; 12 (55%) husbands and 10 wives (50%) met criteria for an anxiety disorder; and, 2 (10%) wives met criteria for an adjustment disorder. Both spouses met criteria for a psychological disorder in 3 couples. Ten (45%) of husbands and 13 (65%) of wives met criteria for more than one psychological disorder. Psychological diagnosis was treated as a dichotomous variable (0 = no disorder, 1 = 1 or more disorders) in analyses.

**Family history of distress** was assessed using the 10-item Family History of Distress Scale of the MSI–R (Snyder, 1997). Higher scores indicate more distressed relationships in the family of origin. Cronbach's alpha was .76 and .79 for men and women respectively.

**Communication**—**Affective communication** was assessed using the 13-item Affective Communication Scale from the MSI–R (Snyder, 1997). Higher scores indicate greater dissatisfaction with the amount of affection and understanding expressed by one's partner. Cronbach's alpha was found to be .76 and .77 for men and women respectively.

The Communication Patterns Questionnaire (Christensen & Sullaway, 1984) was used to assess **constructive communication** (7 items), **wife demand/husband withdraw behavior** (3 items), and **husband demand/wife withdraw behavior** (3 items). Higher scores indicate greater engagement in the respective form of behavior. Cronbach's alpha was .69 and .67 for constructive communication for men and women respectively. Consistent with Baucom et

<sup>4</sup>Please see (omitted for review) for inter-interviewer reliability of SCID diagnoses.

<sup>5</sup>This couple was not deemed ineligible for the study because the substance abuse was judged to be mild enough that it would not interfere with treatment.

al. (2009), husband and wife reports of wife demand/husband withdraw and husband demand/wife withdraw were strongly correlated ( $r = .43, p < .001$ ;  $r = .44, p < .001$  respectively) so they were averaged to create couple-level composites. Cronbach's alpha was .69 for wife demand/husband withdraw and .72 for husband demand/wife withdraw.

**Encoded arousal** was assessed using range of fundamental frequency ( $f_0$ ).  $F_0$  refers to the pattern of vibration created as air rushes over the vocal folds during speech production and is measured in cycles per second, or Hertz. Range of  $f_0$  represents the difference between each spouse's maximum  $f_0$  and minimum  $f_0$  during the pre-treatment interactions with larger range of  $f_0$  scores indicating higher levels of encoded arousal. Range of  $f_0$  scores were averaged across both pre-treatment interactions to create a single score for each spouse, providing information about the emotional arousal experienced by each spouse during those discussions.

**Power processes** were assessed in terms of the amount of hard and soft influence tactics used during the pre-treatment interactions. Hard influence tactics are pressuring, controlling, and manipulative, leaving a spouse little freedom in choosing how to respond. In contrast, soft influence tactics are collaborative and give spouses significant freedom for negotiation. For example, in expressing a desire for more time together, a spouse could use a hard influence tactic by asking accusatorily, "Don't you want to spend more time together?", or a soft influence tactic by saying, "I would like it if we could spend more time together. Could we talk about a way to do that?" Hard and soft influence tactic scores were generated by analyzing the transcript of each pre-treatment interaction using Latent Semantic Analysis (Landauer & Dumais, 1997), a quantitative method for assessing semantic content of text. Both partners' language was analyzed simultaneously in order to generate more reliable scores and to maximize sample size. Scores were averaged across both interactions to generate one hard influence and one soft influence score for each couple.

**Other Interpersonal variables—Acceptance** was assessed using the Frequency and Acceptability of Partner Behavior Inventory (FAPBI; Christensen & Jacobson, 1997). The FAPBI is a 20-item, self-report measure of the frequency and acceptability of partner behaviors in the past month. The acceptability of the top five problems identified by each spouse were summed to create separate acceptance scores for each spouse (Doss et al., 2005). Cronbach's alpha was .78 for men and women.

**Closeness versus independence** was assessed using the 9-item Closeness and Independence Inventory (Heavey & Christensen, 1991). Higher scores indicate greater desired closeness. Cronbach's alpha was .76 and .75 for men and women respectively.

**Commitment** was assessed using the 14-item Marital Status Inventory (Weiss & Cerreto, 1980). Higher scores indicate more steps taken towards divorce and lower commitment. Husband and wife reports of commitment were strongly correlated ( $r = .44, p < .001$ ) so they were averaged to create a couple-level composite score where higher scores indicate lower levels of commitment. Cronbach's alpha was .85.



**Sexual satisfaction** was assessed using the 13-item Sexual Dissatisfaction Scale of the MSI-R (Snyder, 1997). Higher scores indicate higher levels of dissatisfaction with sexual activity in the relationship. Cronbach's alpha was .84 and .84 for men and women respectively.

**Influence in decision making** was assessed using the 8-item Influence in Decision Making Questionnaire (Kollock, Blumstein, and Schwartz, 1985). Higher scores indicate greater perceived influence over decisions in a number of categories (e.g., how to spend money, where to go on vacation, etc.). Cronbach's alpha was .72 and .78 for men and women respectively.

**Power bases** were calculated as the absolute difference between spouse reports of age, education and income. Higher scores indicate greater discrepancy between partners in a given area of power.

**Moderators—Distress severity** indicated moderate (−.5) or severe (.5) pre-treatment marital distress.

**Treatment condition** indicated assignment to IBCT (.5) or TBCT (−.5).

**Indicators of response to treatment—Clinically significant change categories** of relationship satisfaction were created using procedures recommended by Jacobson and Truax (1991). Clinically significant change category was a 4-level ordinal variable (deteriorated [reliable decrease in relationship satisfaction – i.e., reliable change score < −1.96], unchanged, improved [reliable increase in relationship satisfaction – i.e., reliable change score > 1.96], and recovered [reliable increase in relationship satisfaction and 5-year DAS score > 96.8]) calculated using DAS scores averaged across spouses at pre-treatment and at 5-year follow-up. Couples who divorced were considered to be deteriorated.

**Marital status** was a dichotomous variable indicating whether the couple was married versus separated/divorced at the 5-year follow-up assessment.

## Statistical Analyses

Consistent with the procedures used in Atkins et al., (2005) and Baucom et al. (2009), a series of regressions was used to test associations between treatment response variables and the four groups of predictor variables. Each group of variables included main effects for predictors, therapy, and pre-treatment severity plus two- and three-way interactions between predictors, therapy and/or pre-treatment severity. All continuous predictors were grand-mean centered prior to analysis. There was a small percentage of missing data in predictor variables (total amount of missing predictor data = 2.5%). The bulk of missing data was accounted for by the Influence in Decision Making questionnaire, because it was not collected for 59 of the UW couples. The remaining questionnaires were missing 0.8% of possible data points. Missing data were assumed to be Missing At Random and handled by creating five imputed data sets via maximum likelihood methods (e.g., Enders, 2012). Imputed data were used for all inferential analyses.

An optimal subset of predictors was selected from each group using an automatic variable selection procedure (Austin & Tu, 2004). This procedure is recommended when there are a large number of potential predictors relative to the number of available data points, such as in the current study. In the first step of this procedure, the outcome is regressed onto each candidate variable in separate models. Variables that achieve a significance level of  $p < .05$  are then passed to the bootstrapped resampling procedure.<sup>6,7</sup> In this second step of the procedure, 1000 data sets are generated using a resampling with replacement design. Bayesian Information Criterion (BIC; Raftery, 1995) is then used to select a subset of maximally informative predictors in each of the 1000 data sets. Variables that are selected in 50% or more of the data sets are considered to have a stable association with the outcome. The bootstrapped resampling strategy also reduces the likelihood of Type I error and increases the likelihood of out of sample replication. Analyses were conducted using R version 3.0.2 (R Core Team, 2013), including the bootStepAIC package (Rizopoulos, 2009) that implements that variable selection procedure.

## Results

Table 1 presents means, standard deviations, and correlations for predictors. As expected, greater severity of pre-treatment relationship distress was significantly correlated with significantly lower levels of constructive communication ( $r = -.40, p < .001$ ), greater distress about affective communication ( $r = .52, p < .001$ ), and lower commitment ( $r = .46, p < .001$ ). A number of additional significant correlations emerged in expected directions. For example, parental divorce was significantly associated with greater family history of distress ( $r = .28, p = .001$ ) and higher levels of constructive communication were significantly associated with lower levels of distress with affective communication ( $r = -.40, p < .001$ ), wife demand/husband withdraw ( $r = -.28, p = .002$ ), and husband demand/wife withdraw ( $r = -.20, p = .027$ ).

### Clinical significant change category

Table 2 presents parameter estimates for predictors of clinically significant change category. One demographic variable and one interpersonal variable were identified as significant and reliable predictors of response to treatment using the bootstrapped automated variable selection procedure. Being married for a longer number of years was significantly associated with a better response to treatment ( $B = 0.08, p = .016$ ). For each additional year of marriage, the odds of being in a better outcome category increase by 1.09. Bootstrap analyses revealed that number of years married was a reliable predictor of treatment response category as it was selected in 69% of the resamples. Additionally, the significant three-way interaction between wife desired closeness, therapy, and pre-treatment distress was significantly associated with response to treatment ( $B = -0.44, p = .031$ ). Bootstrap

<sup>6</sup>Austin and Tu (2004) recommend using  $p < .25$  as the criterion for selecting candidate predictors in univariate analyses. Using  $p < .25$  and  $p < .10$  as the criteria resulted in selection of too many candidate predictors. We therefore elected to use  $p < .05$  as the criterion for selecting candidate predictors and ran additional models using  $p < .06, .07, \text{ and } .08$  to assess stability of the predictors. All predictors that were significant using  $p < .05$  were significant in models using  $p < .06, .07, \text{ and } .08$ .

<sup>7</sup>The three-way interaction involving husband acceptance was significantly associated with divorce in the screening step, but it was not included in the automatic variable selection because its magnitude ( $OR = 48.04, p < .001$ ) suggests partial separation. Partial separation occurs when a predictor almost completely separates a dichotomous outcome (Albert & Anderson, 1984), and the maximum likelihood estimate of the predictor is unrealistically large.

analyses revealed that this interaction was a reliable predictor of treatment response category as it was selected in 62% of the resamples. Computing simple slopes for this interaction revealed that higher levels of wife desired closeness were significantly associated with increased odds of being in a better response category for moderately distressed, IBCT couples ( $OR = 1.16, p = 0.002$ ) but decreased odds of being in a better response category for severely distressed IBCT couples ( $OR = 0.88, p = 0.012$ ) and moderately distressed, TBCT couples ( $OR = 0.77, p < 0.001$ ). Wife desired closeness was not significantly associated with response to treatment for severely distressed TBCT couples ( $p = 0.34$ ). None of the main effects or interactions involving the intrapersonal, interpersonal, communication, or other demographic variables were significant.

### Marital status at 5-year follow-up

Table 3 presents parameter estimates for the bootstrapped automated selected predictors of marital status at 5-year follow-up<sup>8</sup>. One demographic variable and two interpersonal variables were identified as significant and reliable predictors of response to treatment. Being married for a longer number of years was significantly associated with a lower likelihood of separation/divorce ( $B = -0.09, p = .015$ ). For each additional year of marriage, the odds of being separated/divorced at 5-year follow-up decrease by 0.91. Bootstrap analyses revealed that numbers of years married was a reliable predictor of marital status as it was selected in 84% of the resamples. Higher levels of commitment were significantly associated with a lower likelihood of separation/divorce ( $B = 0.33, p = .004$ ). For each one unit decrease in commitment, the odds of being separated/divorced at 5-year follow-up increase by 1.39. Bootstrap analyses revealed that commitment was a reliable predictor of marital status as it was selected in 83% of the resamples. Finally, the significant three-way interaction between wife desired closeness, therapy, and pre-treatment distress was significantly associated with likelihood of separation/divorce ( $B = 0.36, p = .049$ ). Bootstrap analyses revealed that this interaction was a reliable predictor of treatment response category as it was selected in 53% of the resamples. Computing simple slopes for this interaction revealed that higher levels of wife desired closeness were significantly associated with increased odds of separation/divorce for moderately distressed, TBCT couples ( $OR = 1.17, p = 0.002$ ) but decreased odds of separation/divorce for moderately distressed, IBCT couples ( $OR = 0.85, p = 0.007$ ). Wife desired closeness was not significantly associated with likelihood of separation/divorce for severely distressed IBCT or TBCT couples ( $p = 0.99; p = 0.42$ , respectively). None of the main effects or interactions involving the intrapersonal, interpersonal, communication, or other demographic variables was significant.

### Discussion

This study explored associations between four groups of pre-treatment predictor variables and two indices of response to treatment assessed five years after couples completed one of two behaviorally based couple therapies. Being married for a longer period of time and higher levels of commitment prior to treatment were associated with decreased likelihood of divorce over the 5-year follow-up period; being married for a longer period of time was also associated with greater likelihood of clinically significant improvement. Additionally, higher levels of wife desired closeness were associated with greater likelihood of clinically

significant improvement and decreased likelihood of divorce for moderately distressed, IBCT couples but with decreased likelihood of clinically significant improvement and increased likelihood of divorce for moderately distressed, TBCT couples. We consider these findings in isolation as well as in the context of work on predictors of response to treatment at termination and at two year follow-up.

### Predictors of 5-year outcomes

The prognostic value of couple commitment is concordant with the theory and research on couple therapy outcomes (e.g. Beach & Broderick, 1983). Thus, it is not surprising that couples who entered therapy having taken fewer steps toward separation/divorce, a behavioral marker of greater commitment to their marriage, were more likely to remain married and living together. Of note, commitment was *not* a predictor of clinically significant change, indicating that although more committed couples were more likely to remain together, they did not necessarily experience stable improvement in relationship satisfaction. In contrast, the finding that number of years married was predictive of *both* remaining married/living together *and* clinically significant improvement, suggests that length of marriage was a stronger predictor of receiving the full potential benefit of couple therapy. Interestingly, this finding stands in contrast to previous evidence that younger age (which is highly correlated with length of marriage) was associated with better treatment outcomes (e.g., Hahlweg et al., 1984), a finding that has often been explained by theorizing that younger individuals are more open to change. However, it may be that married couples who have been married longer have greater experience with the vicissitudes of marriage and trust that, despite the current period of distress, their marriage can recover. In contrast, married couples who have been married for less time may not have had sufficient experience with successfully recovering from periods of distress to have such confidence. Alternatively, couples that have reached a stage of significant distress after a shorter period of marriage may have fundamental incompatibilities or other negative relationship characteristics (e.g., poor conflict resolution skills, lack of family support, external stress) that prevent them from fully benefiting from couple therapy.

The three-way interaction involving wife level of desired closeness also emerged as a consistent predictor of both clinically significant change and likelihood of divorce for moderately distressed couples. Higher levels of wife desired closeness were associated with positive outcomes for moderately distressed, IBCT couples and negative outcome for moderately distressed, TBCT couples. One possible explanation for these findings is that the greater emphasis on emotional acceptance and empathy in IBCT fosters increases in the desired emotional closeness to a greater extent than TBCT does. With one exception, wife desired closeness was not associated with either 5-year outcome for severely distressed couples. Baucom et al. (2009) observed a similar pattern in several predictors of 2-year outcomes with significant associations emerging for moderately distressed couples but not for severely distressed couples. These authors hypothesized that the sum total of the wide spread relationship dysfunction in severely distressed couples may overwhelm links between specific aspects of relationship functioning and response to treatment. It is possible that a similar phenomenon occurred with wife desired closeness. The one exception to this general pattern of findings is a counter-intuitive association between higher levels of wife desired

closeness and decreased likelihood of clinically significant improvement for severely distressed, IBCT couples. It is possible that in severely distressed couples, failed efforts to promote openness, vulnerability, empathy and emotional acceptance were discouraging to closeness seeking wives and led to poorer outcomes. If vulnerability is exposed in therapy but met with rejection by the partner, it can lead to greater hurt and anger than if the vulnerability had not been exposed at all. However, a similar finding did not emerge for likelihood of divorce, and this finding is in particular need of replication in future research.

### **Consistent predictors of outcomes across follow-ups**

In addition to being a significant predictor of both measures of couple response to treatment five years after treatment termination, the number of years a couple has been married was also a significant predictor of treatment outcomes at treatment termination (Atkins et al., 2005) as well as of treatment outcomes two years after treatment termination (Baucom et al., 2009). Number of years married is the only variable that predicted outcomes across all three time intervals. In seeking to understand the implications of this finding, it is important to consider couples on both ends of the longevity spectrum. These results suggest that couples who have been married for longer periods of time are particularly likely to benefit from IBCT or TBCT independent of their level of relationship distress at treatment onset, not only immediately but also over the first 5 years after treatment termination. One possible explanation for these findings is that couples who have been married for a longer number of years may have more at stake and therefore greater motivation to fully engage in couple therapy. Such a possibility is consistent with the Investment Model of Commitment, which suggests that invested resources, such as the length of time in a relationship, are a primary determinant of commitment to and dependence on a relationship (e.g., Rusbult, 1980). Additionally, couples who have been married for a longer period of time prior to beginning therapy may have already survived numerous ups and downs in their relationship. Successfully navigating these previous periods of relationship distress may increase spouses' confidence that they can navigate the current period of distress and they may be able to more fully engage in the therapy as a result.

In contrast, these results suggest that couples who seek couple therapy earlier in their marriages are less likely to benefit from IBCT or TBCT than are couples who seek therapy later in their marriages and those younger couples that do benefit from IBCT or TBCT are less likely to maintain those gains over time. It is not surprising that couples who are seriously distressed earlier on in their marriages are less likely to do well over time. However, this finding is in contrast to several studies that find younger couples to be more likely to respond positively to behaviorally based couple therapies (e.g., Hahlweg et al., 1984). One possible explanation for these contradictory findings is that, on average, the couples in the current study are more distressed than the couples in previous studies. Younger couples are generally at increased risk for relationship dissolution relative to older couples, and most marriages that end in divorce do so within the first 10 years (Norton & Bumpass, 2003). It may be that the confluence of this high risk time period with a high level of relationship distress creates at times an insurmountable situation for younger couples that is qualitatively different from that experienced by less distressed, younger couples. For

example, high levels of distress may emerge early in relationships when spouses have fundamental incompatibilities that are not amenable to treatment.

### **Inconsistent predictors of outcomes across follow-ups**

Equally striking as the consistent statistical significance of associations involving number of years married is the inconsistency with which a number of other variables are associated with response to treatment across outcomes in this sample. Husband sexual satisfaction was associated with response to treatment at post-therapy, and wife vocally encoded arousal and hard influence tactics were associated with treatment response at the 2-year follow-up; additionally, pre-treatment severity was associated with response to treatment at both post-treatment and 2-year assessments (Atkins et al., 2005; Baucom et al., 2010). However, none of these variables were associated with response to treatment at the 5-year follow-up.

These inconsistencies are perhaps not surprising given similar inconsistencies in existing work examining short- and long-term predictors of treatment outcomes (Snyder et al., 1993). However, existing work as well as the current findings offer little insight into why these inconsistencies emerge. One possible explanation is that short- and long-term outcomes may represent fundamentally different forms of response to treatment. For example, the treatment outcome literature on depression has benefitted from carefully distinguishing between remission, recovery, relapse, and recurrence as conceptually distinct and empirically distinguishable clinical outcomes (e.g., Frank et al., 1991). No such distinction has been made in the treatment outcome literature for couple therapy, and it is likely that future work would benefit from taking a more nuanced approach to defining treatment outcomes over time. A second possible explanation is that it may be easiest to predict response to treatment at the point at which treatments have their strongest impact. The longer the time period between predictor and outcome, the more life experiences couples have subsequent to therapy and the more likely their outcomes are going to diverge and be difficult to predict. Findings reported in Christensen et al. (2010) suggest that couples continued to benefit from both treatments until approximately 2.5 years after treatment termination and that IBCT couples improved significantly more than TBCT couples up to the 2-year follow-up but not during the subsequent follow-ups. These findings suggest that the impact of the two therapies was greatest up to the 2-year follow-up. Predictors of differential response to treatment across therapies followed a similar pattern with the largest number of treatment by predictor interactions emerging at 2-year follow-up. Both of the possibilities are admittedly speculative and in need of examination in future research.

### **Limitations**

There are several limitations to bear in mind when considering the results of the current study. First, many plausible variables were not related to outcome, including variables that are intuitively likely to be related to outcome, such as pretreatment severity. On the one hand, this pattern of findings is positive in that it suggests that a wide range of couples can benefit from couple therapy. On the other hand, it doesn't provide researchers and clinicians with many clues as to which couples will not benefit from and might need different or better services. Second, some couples were excluded from analyses of clinically significant change because of missing data. Significant predictors that emerged in the analyses missing these

couples were highly similar to those that emerged in predicting marital status, which included data from all 134 couples. However, it is possible that omitting these couples from some analyses impacted the results. Third, a large number of variables were examined relative to the available sample size. Bootstrapping resampling procedures were used to assess and to verify the stability of study findings and to increase the likelihood that study findings could be replicated in future research. Fourth, the internal reliability of a small number of predictors (i.e., constructive communication and demand/withdraw behavior) were somewhat low. Though the internal reliabilities for these scales were below .7, they were only slightly lower (e.g., Cronbach's alpha between .67 and .69) and were consistent with earlier work using these variables. Fifth, though a large number of potential predictor variables were examined, it is possible that omitted variables (e.g., observationally coded behavior) could be significant predictors of 5-year outcome. In addition to the theoretical and empirical rationale for the predictors examined in the current study, we decided to limit the variables examined in the current study to those examined in earlier studies of predictors of outcomes at termination and at 2-year follow-up in the same sample, plus one additional variable of emotional acceptance. This decision was made to maximize our ability to compare results of the current study to results of these earlier works. Finally, the demographic characteristics of the sample may restrict the generalizability of the current study's findings. Participating couples were largely middle- to upper-class, Caucasian, and college educated.

### Summary and future directions

The findings of the current study identify two commitment-related variables (number of years married and commitment) as significant and reliable predictors of treatment response five years after treatment termination. Number of years married was also a significant predictor of treatment response at earlier assessment points. The consistency with which this variable is associated with treatment outcomes suggests that it is a particularly important explanatory variable of how couples fare in behaviorally based couple therapies. Aside from this consistent finding, few significant predictors emerged from a relatively large number of candidates. This pattern of findings is similar to existing research that also finds few pre-treatment variables to be associated with longer term outcomes and even fewer to offer information about which couples are best suited for a given therapy (e.g., Snyder et al., 1993). This general lack of significance is most likely related to the huge variability in conditions that couples experience outside of therapy and in the years following the termination of therapy which may resemble a random walk and limits prediction even under the best of circumstances (e.g., Bandura, 1982). However, prediction might be improved by widening the list of pre-treatment predictors examined. Lists of pre-treatment predictors have frequently been compiled using empirical evidence from treatment outcome studies and naturalistic longitudinal work as well as from relationship theory; this approach was used in the current manuscript. Despite efforts to include a wide and representative range of such predictors, some variables that are known to be associated with the longitudinal course of relationship functioning, such as spouses' physiological response during conflict (Gottman & Levenson, 1992), have yet to be examined as predictors of treatment outcome. Examining previously untested predictors of treatment outcomes is an important direction for future research. Another way that prediction could be improved is by refining the

definitions of types of outcome (i.e., remission, recovery, relapse, and recurrence), which would likely help provide a stronger statistical signal for prediction and a cleaner conceptual interpretation of findings. In addition to refining the list of variables considered and the definition of long-term outcomes, another important avenue for future research would be to examine a similar set of variables as predictors of short- and long-term treatment outcomes within a cross-validation framework. As other authors have noted (e.g., Heyman & Smith Slep, 2001), the analyses in the current study are conducted knowing the outcome for every couple with available data, and significant predictors in these models are variables which are best able to account for variance in these known outcomes. However, results of this kind of statistical approach should not be understood as correctly predicting how couples would respond to treatment when outcomes are unknown or have not yet occurred. Cross-validation methods, which assess the accuracy of prediction equations using an unknown outcomes perspective, are required for such an interpretation to be warranted. Cross-validation has been used to examine prediction of treatment response in only one study of couple therapy to date (Crane, Soderquist, & Frank, 1995), and application of this alternative statistical approach would be valuable in future research. Replication of the consistency with which number of years married predicts treatment response over multiple time points is also warranted. Examination of treatment response across multiple and extended time-points has been rare, and replication of such findings would help increase our understanding of the dynamics of couples' responses to treatment over time. Though replication and extension of the current study's findings would be valuable in several respects, the findings of the current study are valuable in their own right as they identify predictors of response to behaviorally based couple therapies over the longest time interval examined to date.

## Acknowledgments

This manuscript was supported in part by start-up funding from the University of Utah awarded to Brian Baucom. The randomized clinical trial data on which this manuscript is based was supported by grants from the National Institute of Mental Health awarded to Andrew Christensen at UCLA (MH56223) and Neil S. Jacobson at the University of Washington (MH56165) as well as a methodological supplement awarded Andrew Christensen and David C. Atkins.

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Table 1

Means, standard deviations and correlations for predictors

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	25	26	27	
1	42.6	8.3																									
2	17.0	2.6	-0.03																								
3	3.7	3.2	0.01	.21*																							
4	0.4	0.4	-0.13	-.21*	0.05																						
5	0.7	0.5	-0.16	-0.09	-0.02	.20*																					
6	10.1	7.6	.61**	-0.09	0.04	-0.06	0.09																				
7	4.2	3.7	0.10	-0.05	0.09	.18*	-0.04																				
8	2.8	2.6	0.14	.19*	0.09	-0.02	0.13	0.02	0.10																		
9	3.2	3.7	0.12	0.05	.53**	0.01	-0.03	0.18	.27**	0.04																	
10	51.5	8.4	-0.17	0.04	-0.05	0.03	-0.08	-0.15	-0.05	-0.14	-0.06																
11	61.5	6.4	0.04	0.16	0.01	0.00	0.11	0.04	-0.06	0.10	-0.02	-.55**															
12	0.2	0.3	-0.06	-0.07	0.13	-0.09	-0.12	-0.02	-0.01	-0.09	0.01	.45**	-.58**														
13	55.8	6.1	-0.01	0.02	0.01	.28**	0.04	-0.11	-0.05	0.03	0.08	0.17	-0.10	0.10													
14	31.0	4.6	-0.01	-0.15	-0.08	-0.02	0.12	0.03	0.03	0.14	-0.07	-0.07	0.07	-0.06	-0.09												
15	60.3	7.9	0.17	-0.05	-0.20*	-0.02	0.03	0.14	.18*	-0.01	0.03	-0.06	-0.07	-0.08	0.01	0.00											
16	4.0	2.4	-0.17*	-0.11	0.05	0.15	0.10	-0.07	-0.01	-0.10	0.00	0.14	-.25**	.23**	0.04	-.29**	0.15										
17	40.4	6.4	-0.15	0.02	0.07	0.06	-0.03	-0.10	-0.04	0.21	-0.15	0.14	0.05	-0.10	-0.09	-0.11	-0.09										
18	-2.5	7.4	0.01	0.07	-0.10	-0.14	-0.18	-0.06	-0.06	0.02	-0.13	-0.13	-0.08	-0.10	0.00	-.30**	-0.17										
19	63.4	5.0	0.16	-0.06	-0.10	-0.11	.23*	.20*	-0.06	0.06	-0.10	0.07	-0.02	-0.13	-.07	.29**	.40**	-0.11	-.40**								
20	17.9	4.4	-0.01	-0.07	0.08	0.09	0.05	0.11	-0.09	0.04	.179*	-.26**	0.14	0.11	0.16	0.04	0.00	0.09	-.28**	0.02							
21	12.8	4.9	-0.10	0.04	-0.07	0.04	-0.01	-0.07	0.06	-.21*	-0.10	-0.01	0.05	0.02	-.20*	-0.05	0.09	0.05	-.20*	0.08	-.50**						
22	43.1	15.8	-.25**	0.02	-0.05	-0.09	0.08	-0.13	-0.06	-0.01	0.14	0.15	-0.02	-0.08	-0.04	0.01	-0.03	0.05	0.03	-0.04	0.03	0.13					
23	0.0	1.0	.20*	.22*	0.05	0.00	0.03	0.08	0.04	-0.02	-0.08	-0.06	0.02	0.03	-0.07	0.04	0.10	-0.05	0.03	0.06	0.06	-0.02	-0.08				
24	0.0	1.0	.29**	0.10	-0.02	0.01	-0.13	0.10	0.00	-0.06	-0.03	0.01	-0.14	0.16	.20*	.20*	0.13	-0.07	-.015	.25**	0.17	-0.01	-0.07	.70**			
25	-0.6	0.5	-0.09	-0.05	-0.02	0.01	-0.16	-0.05	-0.08	0.00	-0.10	0.00	0.13	-0.05	0.02	-.005	-.027*	-.021*	-.038*	-0.13	0.08	0.06	0.00				

	Mean	S.D.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	25	26	27
26	0.5	0.5	0.02	0.01	-0.14	0.11	0.19	0.00	0.11	0.01	-0.04	0.13	-0.16	0.02	0.07	-0.13	0.11	0.46**	-0.09	-0.40**	0.52**	0.13	0.05	-0.06	0.05	-0.38*	0.13	
27	0.5	0.5	-0.06	-0.03	-0.07	-0.03	0.01	-0.04	-0.12	-0.04	-0.05	0.08	-0.02	0.16	0.13	-0.05	-0.10	-0.12	0.15	0.14	-0.09	0.03	-0.01	0.11	0.12	0.13	0.10	-0.16

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Note.

\*  $p < .05$ ,

\*\*  $p < .01$ ,

\*\*\*

$p < .001$ ; 1=age; 2=education; 3=income; 4=parental marital status; 5=presence of children; 6=years married; 7= difference in age; 8= difference in education; 9= difference in income; 10=neuroticism; 11=mental health index; 12=DSM-IV diagnosis; 13= family history of distress; 14=closeness/independence; 15=sexual dissatisfaction; 16=commitment; 17=influence in decision making; 18=constructive communication; 19= affective communication; 20=wife demand/husband withdrawal; 21=husband demand/wife withdraw; 22=encoded arousal; 23=soft influence tactics; 24=hard influence tactics; 25=acceptance, 26=pre-treatment severity; 27=therapy

**Table 2**

Parameters for Significant Predictors of Treatment Response Category

Variable name	B	SE	OR	95% CI for OR	% selection	
Therapy	0.09	0.47	1.09	0.44	2.74	67.76
Pre-treatment severity	-0.25	0.56	0.78	0.26	2.36	84.80
Therapy X Pre-treatment severity	-2.05*	1.04	0.13	0.02	0.99	66.54
Number of years married	0.10*	0.04	1.11	1.03	1.19	68.92
Commitment	-0.09	0.11	0.91	0.74	1.13	36.34
Commitment X Pre-treatment severity	0.26	0.21	1.30	0.87	1.94	22.76
Wife desired closeness	-0.05	0.05	0.95	0.87	1.04	69.10
Wife desired closeness X Therapy	0.12	0.08	1.13	0.96	1.33	63.06
Wife desired closeness X Pre-treatment severity	0.02	0.09	1.02	0.86	1.20	63.72
Wife desired closeness X Therapy X Pre-treatment severity	-0.44*	0.16	0.65	0.47	0.88	62.20
Wife affective communication	-0.03	0.04	0.97	0.90	1.04	17.96
Husband affective communication	-0.07	0.04	0.93	0.87	1.00	22.64

Note.

\*  $p < .05$ ,

\*\*  $p < .01$ ,

\*\*\*  $p < .001$ . Percent selection refers to the average percentage of resamples in which the predictor was selected by the automated variable selection analysis across the 5 imputed data sets.

**Table 3**

Parameters for Significant Predictors of Marital Status at 5-Year Follow-up

Variable name	B	SE	OR	95% CI for OR	% selection (SD)
Intercept	-1.47***	0.30	0.23	0.13	0.41
Therapy	0.25	0.53	1.29	0.46	3.62
Pre-treatment severity	-0.07	0.56	0.93	0.31	2.79
Therapy X Pre-treatment severity	-1.27	1.04	0.28	0.04	2.16
Number of years married	-0.12**	0.04	0.89	0.82	0.96
Commitment	0.31**	0.11	1.36	1.09	1.70
Wife desired closeness	-0.01	0.05	0.99	0.90	1.08
Wife desired closeness X Therapy	-0.14	0.09	0.87	0.72	1.04
Wife desired closeness X Pre-treatment severity	-0.01	0.09	0.99	0.83	1.18
Wife desired closeness X Therapy X Pre-treatment severity	0.36*	0.18	1.43	1.00	2.04
Wife constructive communication	-0.02	0.03	0.98	0.92	1.04
Wife constructive communication X Therapy	-0.09	0.06	0.91	0.81	1.03
Wife constructive communication X Pre-treatment severity	0.06	0.06	1.07	0.95	1.20
Wife constructive communication X Therapy X Pre-treatment severity	-0.13	0.13	0.88	0.69	1.13
Wife affective communication	0.05	0.04	1.05	0.97	1.15
Wife sexual dissatisfaction	0.05	0.02	1.05	1.00	1.10
Wife education	0.05	0.08	1.05	0.90	1.23
Wife education X Therapy	-0.23	0.16	0.80	0.58	1.09

Note.

\*  $p < .05$ ,

\*\*  $p < .01$ ,

\*\*\*  $p < .001$ .

Percent selection refers to the average percentage of resamples in which the predictor was selected by the automated variable selection analysis across the 5 imputed data sets.