Neuroticism, Marital Interaction, and the Trajectory of Marital Satisfaction

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Theories of how initially satisfied marriages deteriorate or remain stable over time have been limited by a failure to distinguish between key facets of change. The present study defines the trajectory of marital satisfaction in terms of 2 separate parameters—(a) the initial level of satisfaction and (b) the rate of change in satisfaction over time—and seeks to estimate unique effects on each of these parameters with variables derived from intrapersonal and interpersonal models of marriage. Sixty newlywed couples completed measures of neuroticism, were observed during a marital interaction, and provided reports of marital satisfaction every 6 months for 4 years. Neuroticism was associated with initial levels of marital satisfaction but had no additional effects on rates of change. Behavior during marital interaction predicted rates of change in marital satisfaction but was not associated with initial levels.

Despite the relative happiness and optimism reported by most newlyweds, more than 60% of first marriages in the United States end in divorce or permanent separation (Castro-Martin & Bumpass, 1989), and the rate of dissolution for remarriages is even higher (Cherlin, 1992). These statistics suggest that newlyweds undergo a significant change over time. Thoughts and feelings that initially draw two people together apparently transform, in a majority of cases, into thoughts and feelings that push those same two people apart. Given the social, moral, and economic pressures on couples to resist such a change, how does this transformation occur? How does an initially satisfying marriage deteriorate or remain stable over time?

A basic premise of this article is that answering these questions involves two related tasks: (a) describing how feelings about the relationship evolve over the course of a marriage and then (b) explaining why different couples develop differently. To date, marital research has devoted considerable attention to the second question, exploring a variety of independent variables for their ability to account for variability in how marriages change. The more fundamental task of description, however, has frequently been overlooked, and as a result crucial issues in the conceptualization and operationalization of change in marriage remain unexamined (Karney & Bradbury, 1995a). The first goal of our research was to address this gap in the literature by specifying and describing the trajectory of marital satisfaction as a refined dependent variable for longitudinal research on marriage. The second goal was to examine the associations between the trajectory of marital satisfaction and marital dissolution, the other frequently examined dependent variable in this literature.

A more thorough understanding of the dependent variables in marital research provides an opportunity to reconsider our understanding of important independent variables. For example, the two most frequently studied independent variables in research on how marriages change are neuroticism, an intrapersonal variable (Kelly & Conley, 1987; Kurdek, 1991), and marital interaction, an interpersonal one (e.g., Noller, Feeney, Bonnell, & Callan, 1994; Smith, Vivian, & O'Leary, 1990). Yet, despite competing claims about the relative importance of intrapersonal and interpersonal variables to understanding marriage (Gottman, 1994; Kelly & Conley, 1987), we are aware of no research that has examined the relative effects of neuroticism and marital interaction within a single study. The third goal of our study was to illuminate their unique effects on the trajectory of marital satisfaction over time, by examining neuroticism and marital interaction simultaneously.

Trajectories of Marital Satisfaction: Refining the Dependent Variable

Writing about marriage is replete with the language of change and development. Marital theorists often refer to the "course" of a relationship and try to account for "growth," "maintenance," "deterioration," and "decline" (Gottman, 1994; Kelley et al., 1983; Markman, Floyd, & Dickson-Markman, 1982; Vangelisti & Huston, 1994). Nevertheless, attempts to describe change in marriage empirically have been rare. The earliest attempts to assess the normative course of marital satisfaction were based on cross-sectional data from spouses at varying marital durations (e.g., Rollins & Feldman, 1970). These studies suggested that marital satisfaction follows a curvilinear path, declining

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from high levels of satisfaction in the early years of marriage and then returning to near newlywed levels in later years. Spanier, Lewis, and Cole (1975) were among the first to question the strategy of drawing conclusions about change from cross-sectional data, calling for longitudinal studies to confirm or refute the curvilinear hypothesis. To date, longitudinal research has failed to find evidence for curvilinear change in marital satisfaction over the life span. Indeed, Vaillant and Vaillant (1993), in a 40-year study of college men and their wives, found that, whereas spouses' retrospective accounts of the course of their marital satisfaction followed a curvilinear path, their prospective reports of marital satisfaction declined monotonically throughout the marriage.

Despite an increasing amount of longitudinal research appearing in the marital domain (Berscheid, 1994), further studies have yet to expand our understanding of the course of marital satisfaction beyond this general pattern of mean decline (e.g., Huston & Vangelisti, 1991; Johnson, Amoloza, & Booth, 1992; Markman, Floyd, Stanley, & Storaasli, 1988). One reason for the lack of elaboration is that the data analytic techniques commonly used in this research do not address individual change directly. For example, correlations and multiple regression, the most frequently used techniques in longitudinal research on marriage (Karney & Bradbury, 1995b), provide estimates of longitudinal effects without quantifying how individual marriages are changing. Thus, even when researchers have reported mean changes over time, individual differences in change within longitudinal samples often go unreported.

The limitations of this view of change in marriage are illustrated in Figure 1. The figure presents, for 2 husbands, eight waves of self-reported marital satisfaction on a scale from 15 to 105, plotted against the time of each assessment measured in weeks. The timelines thus describe the trajectory of marital satisfaction for each husband across the first 4 years of marriage. As depicted in Figure 1, the trajectories of the 2 husbands differ in at least two important aspects. First, the initial satisfaction of Husband A is higher than that of Husband B, and subsequently higher at every time point. Second, the satisfaction of Husband A declines more rapidly over 4 years than the satisfaction of Husband B. Comparing these 2 husbands on only one of these



Figure 1. Four years of marital satisfaction for two husbands.

dimensions would present an incomplete and possibly misleading picture of how these marriages differ. A focus on levels of satisfaction would suggest that Husband A has a more successful marriage than Husband B, but a focus on rates of change in satisfaction would suggest that Husband B is more successful than Husband A. An accurate understanding of how these marriages are developing must account for the complete trajectory of marital satisfaction, and thus requires that each aspect of the trajectory be described and analyzed separately.

This multifaceted view of the trajectory draws attention to theoretically significant questions about the course of marital satisfaction that have been overlooked by previous longitudinal research on marriage. For example, what is the relationship between spouses' marital satisfaction near the start of the marriage and their subsequent changes in satisfaction over time? Waller (1938) observed that the struggle of early marriage is to maintain idealized, positive beliefs about one's partner in the face of the realities of day-to-day life. More recently, Murray, Holmes, and Griffin (1996) demonstrated that spouses do idealize their partners and that idealization is associated with higher levels of satisfaction cross-sectionally. A general tendency to idealize one's romantic partner early in the relationship has two possible implications for the subsequent course of marital satisfaction. One possibility is that spouses who are highly satisfied at the start of their marriage are especially vulnerable to disillusionment and so should experience greater declines in marital satisfaction over time; we refer to this as the disillusionment hypothesis. A rather different possibility is that spouses who are highly satisfied at the start of their marriage should be especially motivated and able to maintain their positive beliefs, and so should experience less decline in marital satisfaction over time; we call this the maintenance hypothesis. Evaluating these competing hypotheses requires estimating and correlating initial levels of satisfaction and rates of change in satisfaction for each individual in a sample, but most current approaches to longitudinal data do not address both aspects of the trajectory simultaneously.

Recent advances in using multiwave longitudinal data to estimate and analyze trajectories do offer a means of describing the full course of marital satisfaction and exploring relationships between different aspects of the trajectory. In general, these techniques proceed in two stages. The first stage is a withinsubjects analysis, in which longitudinal data for each individual are used to estimate a trajectory summarizing the full course of that individual's data over the measurement period. The second stage is a between-subjects analysis, in which the parameters of the trajectory are treated as new dependent variables to be explained by other variables. This approach, known most generally as growth curve analysis (GCA), has several advantages over conventional methods of analyzing data in marital research.¹ First, whereas correlations and multiple regression can

¹ Many terms have been used to refer to these techniques, including hierarchical linear modeling (Bryk & Raudenbush, 1987, 1992), random coefficients modeling (de Leeuw & Kreft, 1986), and mixed linear modeling (Goldstein, 1986). We refer to this approach by its most general title to emphasize the individual time paths that have been called "the proper focus for the measurement of individual change" (Rogosa, Brant, & Zimowski, 1982, p. 728).

make use of only two waves of data at a time, the withinsubjects stage of a growth curve analysis can use many waves of data simultaneously. Second, because the analysis proceeds in two stages, defining and describing change over time is a necessary first step before attempting to account for variance in change between individuals. Finally, by operationally defining trajectories in terms of several parameters, the GCA approach emphasizes that the dependent variable in longitudinal research is multifaceted. Understanding the trajectory of marital satisfaction thus requires that "vague questions about interindividual differences in growth . . . be replaced by *specific* questions about interindividual differences in the individual growth parameters" (Willett, 1988, p. 393).

GCA has been applied to questions of change in psychotherapy (Barkham, Stiles, & Shapiro, 1993) and family functioning (Willett, Ayoub, & Robinson, 1991), but researchers have only recently begun to exploit these procedures to illuminate change in relationships (cf. Barnett, Raudenbush, Brennan, Pleck, & Marshall, 1995; Belsky & Rovine, 1990; Bolger, Foster, Vinokur, & Ng, 1996; Karney & Bradbury, 1995a; Kurdek, 1995; Newton & Kiecolt-Glaser, 1995; Raudenbush, Brennan, & Barnett, 1995; Rusbult, 1983). Accordingly, the first goal of our study was to apply GCA to multiwave longitudinal data from a sample of newlyweds and thereby provide a detailed description of the trajectory of marital satisfaction as a refined dependent variable for longitudinal research on marriage.

Trajectories Toward Marital Dissolution

The trajectory of marital satisfaction can continue through the lives of the partners, or it can end in marital dissolution, that is, the point at which the marriage terminates in permanent separation or divorce. How does the course of marital satisfaction distinguish between marriages that do and do not dissolve? Marital dissolution has been the dependent variable in nearly half of the longitudinal research on marriage (Karney & Bradbury, 1995b), and these studies have revealed a wide variety of variables that predict whether or not a marriage is likely to endure or dissolve. Yet the ability to predict the final outcome of a marriage is not the same as explaining the developmental process through which initially satisfied couples may reach that decision. As Gottman (1994) observed: "What researchers need to know is whether there are specific *trajectories* [italics added] toward marital dissolution or marital stability" (p. 6).

In fact, there is little longitudinal research documenting the course of marital satisfaction in marriages that end in separation or divorce. Instead, researchers have examined the association between marital satisfaction measured at one time point and spouses' subsequent decisions to end the marriage (e.g., Gottman, 1993b; Kurdek, 1993; Terman, 1950). A recent metaanalysis of these studies (Karney & Bradbury, 1995b) confirmed that lower levels of marital satisfaction at one time are associated with greater risks of marital dissolution later in the marriage (aggregate effect-size rs range from .14 to .42). Such associations are difficult to interpret, however, because these studies generally do not distinguish between initial levels of marital satisfaction and rates of change in satisfaction.

Considering both of these aspects of the trajectory, the associations between marital satisfaction and marital dissolution obtained in prior research could have arisen from several different types of effects. For example, couples who are less satisfied at the start of marriage may be more likely to end the marriage, regardless of their change in satisfaction over time. Referring to Figure 1, this effect suggests that Husband B, with lower levels of marital satisfaction from the beginning of the marriage, is at greater risk for marital dissolution than Husband A. A second explanation for the association between lower marital satisfaction and subsequent marital dissolution is that spouses who experience greater declines in satisfaction may be more likely to end the marriage, regardless of their marital satisfaction overall. This effect suggests that Husband A in Figure 1 is at greater risk of marital dissolution than Husband B, despite the fact that Husband A reports higher satisfaction at every time point. Whereas the above two hypotheses describe independent effects for initial levels and rates of change in marital satisfaction, there are also at least two ways that these aspects of the trajectory could combine to predict marital dissolution. One possibility is a moderating relationship, such that declines in satisfaction are especially predictive of dissolution if initial levels of satisfaction were low. A second possibility is a mediating relationship, such that lower initial marital satisfaction predicts dissolution through its association with declining marital satisfaction over time.

Each of these possible effects would account for the findings of prior research, but each describes a distinct way that the trajectory of marital satisfaction leads to marital dissolution. Evaluating the evidence for each of these effects requires estimating the unique associations between variation in marital dissolution and each aspect of the trajectory of marital satisfaction, controlling for other aspects of the trajectory. The second goal of our study was to use GCA to estimate these effects and to determine the trajectory of marital satisfaction associated with marital dissolution in the first years of marriage.

Neuroticism and Marital Interaction: Reexamining the Independent Variables

Once the trajectory of marital satisfaction has been defined and described in detail, hypotheses about the longitudinal effects of important independent variables can be examined more precisely. In our study, we compared hypotheses derived from the two major competing explanations of how marriages change.

Intrapersonal and Interpersonal Models of Marriage

The first attempts to explain how marriages change were guided by intrapersonal models (Adams, 1946; Burgess & Cottrell, 1939; Terman, 1948). According to these models, individuals' responses to important social stimuli are largely determined by their enduring characteristics and personality traits. In marriage, the stable factors that each spouse brings to the relationship are thought to affect spouses' reactions to each other and to influence the course of marriage indirectly by giving rise to important variables such as educational attainment and economic status (e.g., Caspi, 1987). Of all such factors, neuroticism, or negative affectivity, defined as the traitlike tendency "to report distress, discomfort, and dissatisfaction over time and regardless of the situation" (Watson & Clark, 1984, p. 483), has demonstrated the most consistent associations with marital outcomes over time. Without exception, higher levels of neuroticism have been associated with poorer marital satisfaction and higher rates of marital dissolution (aggregate effect-size *rs* range from .13 to .22; Karney & Bradbury, 1995b). These findings hold true across recent cohorts (Bentler & Newcomb, 1978; Kurdek, 1993) and older ones (Adams, 1946), as well as in one study that assessed marital outcomes across five decades (Kelly & Conley, 1987).

Although intrapersonal models continue to influence marital research, a second prominent perspective has drawn attention to interpersonal variables (Doherty & Jacobson, 1982; Gottman, 1979; Raush, Barry, Hertel, & Swain, 1974). Interpersonal models of marriage suggest that the important phenomena of relationships emerge from the interaction between partners. With respect to marital satisfaction, this approach assumes that spouses learn from their experiences with each other whether or not they are in a satisfying relationship (Gottman, 1990; Jacobson & Margolin, 1979; Markman, 1984), and these judgments are presumed to influence subsequent behaviors (Bradbury & Fincham, 1991). Thus, "to the extent that normal marital disagreements are not handled well, unresolved negative feelings start to build up, fueling destructive patterns of marital interaction and eventually eroding and attacking positive aspects of the relationship'' (Markman, 1991, p. 422).

The most frequently studied interpersonal aspect of marriage has been marital interaction, in particular the behaviors that spouses exchange during problem-solving discussions (for reviews, see Baucom & Adams, 1987; Bradbury & Karney, 1993; Weiss & Heyman, 1990). Observational research supports the premise that behavior affects marriage longitudinally, but there has been some inconsistency in the literature about the direction of these effects. Whereas a recent meta-analysis (Karney & Bradbury, 1995b) determined that, across studies, couples who are more negative during their interactions are more likely to experience poorer marital outcomes over time (e.g., Filsinger & Thoma, 1988; Gottman, 1993a; Noller et al., 1994; Smith et al., 1990), some individual studies have shown sharply contrasting results. For example, Gottman and Krokoff (1989) found that some negative behaviors, although negatively associated with marital satisfaction cross-sectionally, were positively associated with changes in marital satisfaction over 3 years (see also Heavey, Layne, & Christensen, 1993). Such counterintuitive results have been questioned on methodological grounds (cf. Gottman & Krokoff, 1990; Woody & Costanzo, 1990), but the fact that they have appeared in more than one study raises the possibility that negative behaviors may have beneficial effects on marital outcomes in some circumstances.

Comparing Intrapersonal and Interpersonal Models

Despite a movement toward integrating intrapersonal and interpersonal models of marriage and close relationships (e.g., Baucom & Epstein, 1990; Bradbury, Campbell, & Fincham, 1995; Kelley et al., 1983; Kurdek, 1993), intrapersonal and interpersonal variables have rarely been examined in the same investigation, possibly because each model assigns a relatively minor role to variables from the other model. For example, intrapersonal models of marriage acknowledge that marital interaction plays a role in the development of the relationship, but suggest that "patterns of communication and behavior exchange . . . may be seen as the outgrowths of the personality characteristics of the partners" (Kelly & Conley, 1987, p. 36). Thus, spouses' behaviors may merely mediate the broader effects of spouses' personalities on the course of the relationship. In contrast, interpersonal models generally view the effects of personality as minimal relative to the effects of behavior and cognition at the interpersonal level (e.g., Smith et al., 1990). In defense of this view, Gottman (1994) recently wrote "It seems that research based on an individual psychopathology model, particularly one that is global, and not specific, has little to say about the possible mechanisms that lead to marital dissolution" (p. 87).

Evaluating the evidence for each of these views requires estimating the unique effects of both types of variables within a single study. Thus, the third goal of our study was to compare intrapersonal and interpersonal models of marriage by estimating the unique effects of neuroticism and marital interaction on the trajectory of marital satisfaction. Two patterns of results would lend support to the intrapersonal perspective. First, the unique importance of intrapersonal factors would be demonstrated if neuroticism were associated with the trajectory of marital satisfaction controlling for marital interaction. Second, the idea that behavior mediates the effects of personality would receive support if (a) neuroticism accounted for significant variation in the trajectory when examined by itself, (b) neuroticism were significantly associated with marital interaction behaviors, and (c) the association between neuroticism and the trajectory were significantly reduced when controlling for marital interaction (see Baron & Kenny, 1986). The interpersonal perspective would receive support if marital interaction behaviors were significantly associated with the trajectory of marital satisfaction controlling for neuroticism. Given the lack of prior research examining these two variables simultaneously, we made no predictions about which of these positions would be supported in our data. It should be noted, however, that prior theoretical positions have assumed that change in marriage can be captured with a single statistic. The multifaceted view of change adopted here offers the possibility that different independent variables will have a different effect on each aspect of the trajectory.

Overview of Our Study

How do some initially satisfied marriages deteriorate and dissolve, whereas other marriages endure stably over time? To document this process and integrate previous attempts to explain it, we used GCA to examine the associations between neuroticism, marital interaction, and the trajectory of marital satisfaction over 4 years in a sample of newlywed couples. We studied newlyweds for several reasons. First, selecting newlyweds ensured that all couples were at a similar marital duration throughout the study. Second, because newlyweds tend to be happy with their marriages, factors that give rise to distress were less likely to be confused with factors that maintain distress in unhappy couples (see Bradbury, Cohan, & Karney, in press; Monroe, 1982). Third, because more than one third of divorces in the United States occur among couples married less than 5 years (Cherlin, 1992), selecting newlyweds permitted us to study couples during a high-risk period for marital dissolution.

The analyses proceeded in three stages corresponding to the three goals of the study. First, within each couple, we estimated trajectories of marital satisfaction for husbands and wives. To evaluate the trajectory as a dependent variable, we examined the appropriateness of a linear model of change, the reliability of different measures of marital satisfaction, variability in individual change across spouses, and the relationship between parameters of the trajectory within and between spouses. Most noteworthy among these associations was the relationship between spouses' initial levels of marital satisfaction and their subsequent rates of change. Second, we examined the associations between the trajectory of marital satisfaction and marital dissolution during the first 4 years of marriage. Finally, we examined neuroticism and marital interaction to determine the unique influence of each variable on the trajectory of marital satisfaction.

Method

Participants

To obtain the initial sample, we placed classified advertisements offering \$50 to "newlywed couples interested in participating in a study of marriage" in major newspapers, free local newspapers, and college newspapers around the Los Angeles area in the early summer of 1991. Couples responding to the advertisements were screened in a telephone interview to determine whether (a) this was the first marriage for both spouses, (b) the couple had been married less than 6 months, (c) neither partner had children, (d) both partners were over 18 years old and wives were less than 35 years old (to allow the possibility that all couples might become parents over the course of the study), (c) both spouses spoke English and had received at least a 10th grade education (to ensure comprehension of questionnaires), and (f) the couple had no immediate plans to move away from the area. More than 350 couples responded to the advertisements; the first 60 eligible couples comprised the initial sample.²

At the time of initial data collection, couples had been married an average of 12.0 (SD = 6.2) weeks (variation in marital duration at Time 1 was not associated with any of the effects reported here). Husbands averaged 25.4 (SD = 3.4) years of age, had 15.3 (SD = 2.2) years of formal education, and reported an average annual income of \$20,000-\$30,000. Wives averaged 24.0 (SD = 2.9) years of age, had 15.5 (SD = 1.6) years of formal education, and reported an average annual income of \$10,000-\$20,000. Seventy percent of the sample cohabited premaritally; cohabitation was not associated with any of the effects examined here. Seventy-five percent of husbands and wives were white.³

Procedure

telephone contact and in a cover letter to complete their forms independently. Our analyses examined eight waves of measurement, covering approximately the first 4 years of marriage.

Measures

Marital satisfaction. Although the most frequently administered measures of marital satisfaction are omnibus measures that ask spouses to evaluate multiple aspects of the marriage, some have argued for conceptually clearer measures that assess global sentiments toward the marriage exclusively (Fincham & Bradbury, 1987; Huston, McHale, & Crouter, 1986; Norton, 1983). To evaluate the longitudinal implications of this distinction, one omnibus measure and three different global measures were administered at each wave of data collection.

The omnibus measure was the Marital Adjustment Test (MAT; Locke & Wallace, 1959), a widely used scale that assesses spouses' global evaluations of the marriage, the amount of disagreement across different areas of possible conflict, and aspects of conflict resolution, cohesion, and communication. Yielding scores ranging from 2 to 158, the MAT demonstrates adequate cross-sectional reliability (split half = .90) and discriminates between nondistressed spouses and spouses with documented marital problems (Locke & Wallace, 1959).

The first global measure was the Quality Marriage Index (QMI; Norton, 1983), a six-item scale asking spouses to rate the extent to which they agree with general statements about their marriage (e.g., "We have a good marriage" and "I really feel like part of a team with my partner"). The QMI yields scores from 6 to 45 and demonstrates high internal consistency in this sample (across waves of measurement, coefficient alpha averaged .97 for husbands and .98 for wives).

The second global measure was the Kansas Marital Satisfaction scale (KMS; Schumm et al., 1986), a three-item instrument asking spouses to rate their satisfaction with their marriage, their spouse, and their relationship with their spouse on 7-point scales, yielding scores from 3 to 21. The internal consistency of the KMS is high (across waves of measurement, coefficient alpha averaged .95 for husbands and .96 for wives).

Finally, spouses completed a version of the Semantic Differential (SMD; Osgood, Suci, & Tannenbaum, 1957), a method of quantifying evaluations of concepts by asking participants to rate their perception of that concept on 7-point scales between two opposite adjectives. In the current study, spouses rated how they felt about their marriage on 15 adjective pairs (e.g., "Bad–Good", "Dissatisfied–Satisfied", and "Unpleasant–Pleasant"), yielding scores from 15 to 105. The internal consistency of this measure is high (across waves of measurement, coefficient alpha averaged .97 for husbands and .97 for wives).

Couples meeting all eligibility criteria were scheduled to attend a 3hr laboratory session and were mailed a packet of questionnaires to complete at home and bring with them when they attended their session. Spouses were instructed over the phone and in a letter accompanying the questionnaires to complete their forms independently of one another. During the laboratory session, spouses completed additional questionnaires, were interviewed individually, and participated in audiotaped dyadic interaction tasks.

At approximately 6-month intervals subsequent to the initial assessment, couples were mailed additional packets of questionnaires along with postage-paid return envelopes. At each follow-up, couples were offered \$35 to continue participating in the study and were reminded in

² Other published articles analyzing portions of this data set are: Bradbury, 1994; Karney et al., 1995; Miller & Bradbury, 1995; Sullivan & Bradbury, 1997. This is the only study to address all 4 years of data inclusively.

³ Over the 4 years of the study, 17 couples became parents for the first time. However, the transition to parenthood had no measurable effects on the trajectory of marital satisfaction. That is, the trajectories of couples who did and did not become parents in the first 4 years of marriage did not differ significantly between couples, nor was the birth of the first child associated with elevations or dips in the trajectories within couples. We reconcile these findings with prior research on the transition to parenthood by noting that prior studies typically have sampled wives when they have just become pregnant, possibly a time of elevated marital satisfaction. The recorded declines after the pregnancy may simply be a return to prepregnancy levels. In light of these findings, and because parenthood did not correlate with any of the variables examined in the current study, we omit further consideration of this variable.

Marital dissolution was also assessed at each phase of measurement. A marriage was defined as dissolved if either spouse reported, either on a questionnaire or over the telephone, that the marriage had ended in divorce or permanent separation since the previous assessment period. In all analyses, dissolution was dummy coded as a dichotomous variable such that 0 = intact and 1 = divorced or permanently separated. At each wave of assessment, marital satisfaction data were entered only for couples who were intact.

Neuroticism. At Time 1 and Time 2, neuroticism was assessed with the Neuroticism scale of the Eysenck Personality Questionnaire (EPQN; Eysenck & Eysenck, 1978), a 23-item measure asking spouses to answer yes or no questions about their negative affectivity (e.g., "Are you a worrier?" "Does your mood go up and down often?"). Yielding scores ranging from 0 to 23, the EPQN has demonstrated high internal consistency (.84; Eysenck & Eysenck, 1978), and in this sample 6-month test-retest reliability was .74 for husbands and .75 for wives. In light of the stability of neuroticism scores over time, we analyzed only initial scores in our study.

Marital interaction. As part of the Time 1 laboratory session, couples were assisted in identifying an area of difficulty in their marriage and were left alone "to work towards some resolution or agreement" in a 15-min interaction. Using the Verbal Tactics Coding Scheme (VTCS; Sillars, 1982; Sillars, Coletti, Parry, & Rogers, 1982), trained raters coded audiotapes of these interactions to assess the amount of negative and positive behavior displayed by each spouse during these discussions. For each 5 s of the interaction, a speaker received a negative code on the VTCS if he or she was (a) explicitly faulting, rejecting, or criticizing the partner (direct negative) or (b) indirectly criticizing the partner through presumptive attributions or demands that the partner change (indirect negative). A speaker received a positive code if he or she was discussing the problem in a nonevaluative manner or advancing the discussion toward a mutually satisfying resolution. To assess interrater reliability, we chose 25% of the interactions at random to be coded by a second observer. Mean percentage agreement was quite high (86%). Because the amount of positive and negative behaviors displayed by each spouse was highly correlated in this sample (-.46 for husbands and -.62 for wives), we computed a total score for each spouse by subtracting the number of positive codes received from the total number of negative codes received. This produced a variable capturing the overall negativity of each spouse's behavior during the interaction, such that higher scores indicated more negative (or less positive) interactions and lower or negative values indicated less negative (or more positive) interactions. Whereas scores for the individual behavior codes were skewed and weakly correlated with marital satisfaction, total scores computed in this way were normally distributed and negatively correlated with marital satisfaction at Time 1 (aggregate r for husbands = -.26, p < .05 and for wives = -.30, p < .05), supporting the validity of this index.

Data Analysis

We conducted growth curve analyses using hierarchical linear modeling (HLM; Bryk & Raudenbush, 1992) and the HLM/2L computer program (Bryk, Raudenbush, & Congdon, 1994), for several reasons. First, unlike other approaches to analyzing trajectories (e.g., structural equation modeling), HLM does not assume that data sets are perfectly balanced; that is, HLM does not assume that all data are collected simultaneously from all subjects at equally spaced intervals. Instead, HLM uses all available data from each participant to estimate a trajectory for that participant, controlling for the timing of that individual's measurements. Thus, trajectories could be computed even for couples that separated or divorced, as long as the couple had provided multiple waves of data before dissolving. Second, HLM provides maximally efficient estimates of trajectories by weighting individual parameter estimates by their precision, according to empirical Bayes theory (Box & Tiao, 1973). When the trajectory of an individual can be estimated precisely, the final estimate relies heavily on the individual data. When the trajectory of an individual can not be estimated precisely, the final estimate relies more heavily on the mean of the sample. Because the most precise estimates therefore contribute more to the final estimated variance of the sample, variances estimated in this way tend to be smaller and more conservative than those obtained through traditional optional least squares (OLS) methods. Third, HLM computes effects on each parameter through simultaneous equations; thus effects on other parameters of change are estimated controlling for effects on other parameters of change. Throughout the study, we conducted analyses separately for each of the four measures of marital satisfaction.

Results

Data Profile and Correlations Among Measures

At the eighth wave of data collection, approximately 4 years after the initial assessment, marital status was known for 56 (93%) of the original 60 couples (see Table 1). Eighteen of those couples (32%) had experienced divorce or permanent separation. More than one wave of data could be collected for 16 of the 18 dissolved marriages; thus analyses involving multiple waves of data have a sample size of 54 couples.

Table 2 presents the mean marital satisfaction scores for each measure at each phase of measurement. For both spouses and all measures, mean marital satisfaction decreased and variability increased over the first 4 years of marriage. Husbands' and wives' marital satisfaction scores were correlated at each time point (rs range from .33 to .78 across measures and measurements), and at no point do the mean scores for husbands and wives differ significantly. Although Table 2 presents the means derived from all intact spouses at each wave of measurement, the pattern does not change when only those couples who provided data at all waves of measurement are examined. At Time 1, intercorrelations among the marital satisfaction measures are high, ranging between .70 and .90 for husbands and between .74 and .86 for wives. Results for each measure are nevertheless presented separately, to facilitate comparisons among studies conducted with specific instruments.

Correlations among neuroticism, behavior, and marital dissolution are presented in Table 3, along with the means and standard deviations for spouses' neuroticism and behavior. The neuroticism of husbands and wives at Time 1 was not significantly correlated, r(53) = .08; ns. Although wives on average reported higher levels of neuroticism at Time 1 than husbands, this difference was not statistically significant. In contrast, the behavior of husbands and wives within the problem-solving discussion

Table 1

Timing of Marital Dissolution and Withdrawal Across the First 4 Years of Marriage

Couples	Approximate number of months of marriage							
	6	12	18	24	30	36	42	48
Intact	60	56	55	49	47	46	4 4	38
Dissolved	0	2	3	8	10	11	13	18
Withdrawn	0	2	2	3	3	3	3	4

Spouse	Time 1	Time 2	Time 3	Time 4	Time 5	Time 6	Time 7	Time 8
			Marital	Adjustment	Test			
Husbands								
M	117.23	118.31	111.77	113.69	108.08	107.64	107.95	108.71
SD	20.95	17.12	20.93	20.44	22.30	26.80	28.66	24.24
Wives								
М	118.27	118.38	110.55	114.71	110.14	105.76	110.37	113.24
SD	18.06	22.38	24.43	21.42	25.00	30.00	25.16	23.81
• • •			Quality	/ Marriage I	ndex			
Husbands								
М	39.22	39.40	37.11	38.71	36.40	36.27	36.19	36.29
SD	6.12	5.12	7.30	6.42	8.19	7.88	8.88	8.42
Wives								
М	38.98	38.04	36.24	37.24	36.45	33.74	35.98	35.29
SD	6.34	6.75	8.80	7.62	7.84	9.42	8.50	8.51
		I	Kansas Mari	tal Satisfact	ion Survey			
Husbands								
М	18.52	18.63	17.45	18.10	17.40	17.00	17.21	17.05
SD	2.89	2.39	3.24	2.97	3.35	3.51	3.81	3.18
Wives								
М	18.38	17.89	16.62	16.94	16.45	15.46	16.44	16.32
SD	2.69	2.73	3.70	3.78	3.96	4.40	3.69	3.88
			Sema	ntic Differer	ntial			
Husbands								
М	91.60	93.13	87.00	89.49	86.70	86.22	86.45	85.84
SD	13.28	9.86	16.00	14.79	16.80	16.99	19.28	16.69
Wives								
М	90.17	89.42	85.58	89.44	85.43	81.17	85.88	83.84
SD	12.56	15.36	17.75	16.36	17.30	20.71	18.17	17.69

Mean Marital Quality Scores Across Four Measures and Eight Waves of Measurement, for Husbands and Wives

Table 2

was highly correlated, r(53) = .56; p < .001. The negative means for spouses' behavior scores indicate that on average spouses were more positive than negative during the problemsolving discussion. This is to be expected given that the discussions took place while all couples were newlyweds and generally satisfied. However, the large standard deviations for the behavior scores indicate that even these newlywed couples differed widely in the behaviors they displayed during their interactions.

Given that neuroticism and behavior have been linked to marital dissolution in prior research, it is noteworthy that neither variable was directly associated with each other or with marital dissolution in the current sample. The lack of associations with dissolution may be a consequence of examining first-married couples in the early years of marriage. Whereas 4 years may be long enough to examine how neuroticism and behavior affect the development of satisfaction in a relationship, 4 years may not be long enough to detect direct effects on the final decision to separate or divorce. Indeed, the two prior studies establishing a link between negative behavior and divorce both examined marriages of longer duration (Buehlman, Gottman, & Katz, 1992; Gottman & Levenson, 1992), and the most well-known study linking neuroticism to divorce examined couples across 40 years (Kelly & Conley, 1987). For the purposes of the current study, the lack of association between marital dissolution, neuroticism, and behavior in this sample supports the strategy of looking at each of these variables for unique associations with the trajectory of marital satisfaction.

Thus far, the results presented indicate that the pattern of overall decline in mean marital satisfaction revealed by previous research was replicated here and that all measures were performing generally as expected. Before we examined the associations between each independent variable and change over time, our first goal was to describe change in marital satisfaction more precisely. Toward this goal, we submitted the eight waves of marital satisfaction data to a GCA.

Assessing the Trajectory of Marital Satisfaction

Modeling change. To determine a function that accurately and parsimoniously summarized how individual marital satisfaction changed over time in this sample, we estimated and compared linear and curvilinear models of change using GCA. Each model can be understood as a within-subjects regression of an individual's marital satisfaction scores onto time of assessment. Time was defined as the date of receipt of the individual's data at each wave of data collection, measured in weeks since the

 Table 3

 Descriptive Statistics and Correlations Among

 Independent Variables

Variable	Husbands' neuroticism	Wives' neuroticism	Husbands' behavior	Wives' behavior
Marital	09	07	11	21
Husbands' neuroticism		.08	.15	.21
Wives' neuroticism			.18	.09
Husbands' behavior			_	.56***
М	8.16	11.48	-82.66	-81.75
SD	4.98	4.96	38.53	43.91

Note. Numbers in the top half of the table represent correlation coefficients. Neuroticism was measured with the Eysenck Personality Questionnaire (Eysenck & Eysenck, 1978). Behavior was coded with the Verbal Tactics Coding Scheme (Sillars, 1982). *** p < .001.

initial assessment (divided by 10 so that the range of the time variable was similar to the other variables). To evaluate the linear model, we specified the following function to describe the satisfaction of each individual:

$$\mathbf{Y}_{ij} = \boldsymbol{\beta}_{0j} + \boldsymbol{\beta}_{1j}(\text{Time}) + \boldsymbol{r}_{ij}, \tag{1}$$

where Y_{ij} is the marital satisfaction of individual j at Time *i*; β_{0j} is the marital satisfaction of individual j at Time 0 (i.e., the initial marital satisfaction of individual *j*); β_{1j} is the rate of the linear change in marital satisfaction for individual *j*; and r_{ij} is the residual variance in repeated measurements for individual j, assumed to be independent and normally distributed across subjects.

To evaluate the curvilinear model, we added a quadratic term to the above model such that

$$Y_{ij} = \beta_{0j} + \beta_{1j} (\text{Time}) + \beta_{2j} (\text{Time}^2) + r_{ij}, \qquad (2)$$

where β_{2j} represents acceleration or deceleration in the rate of change over time. For both functions, husbands' and wives' parameters were estimated simultaneously in a single couple-level model, following procedures outlined by Raudenbush et al. (1995).

We estimated both models successfully using each of the four measurement instruments, but aspects of the curvilinear model raised questions about the need for a quadratic term in these analyses. Although estimates of the quadratic parameter did vary significantly across spouses, the mean quadratic term in this sample was not significantly different from zero. Thus, even when a curvilinear model was specified, the average trajectory was linear. In the interests of parsimony, we decided to drop the quadratic term from the model and restrict these analyses to the parameters of the linear model.⁴ Typically, the linear model is thought to describe the trajectory of each individual with two parameters: an intercept, capturing the initial level of the trajectory, and a slope, capturing the subsequent rate of change in the trajectory across time.⁵

Reliability of parameter estimates. In GCA, the reliability of a parameter estimate is defined as the proportion of observed variance in that parameter that can be treated as true variance. This definition of reliability is conceptually distinct from the cross-sectional definition of reliability typically assessed with coefficient alpha; thus these values are not expected to be as high as alpha coefficients often are (Bryk & Raudenbush, 1987; Tate & Hokanson, 1993). Given ongoing debates about assessing marital satisfaction, it is worth assessing whether measures that tap global evaluations of the marriage exclusively provide more or less reliable estimates of trajectory than omnibus measures.

To answer this question, we computed the reliabilities of the slopes and intercepts for husbands and wives for each of the four measures of marital satisfaction administered in this study. Although the content areas assessed by the two types of measures were quite different, there were no consistent differences in reliability between measures. With respect to the intercepts, approximately two thirds of the observed variance in intercepts could be treated as true variance; this figure did not differ substantially across measurement instruments or spouses (average reliability across spouses and measures = .67, range = .59 to .74). With respect to the slopes, reliabilities were similarly consistent across measures and spouses; slightly less than two thirds of the observed variance could be attributed to true variance in rate of change (average reliability across spouses and

⁴ It is possible that a quadratic term would be required to describe change in marital satisfaction over longer periods of time. For example, whereas the current study found mean declines in satisfaction in the first 4 years of marriage, Kurdek (1995), in an analysis of couples in their 5th and 6th years of marriage, reported that 80% of husbands and 81% of wives reported no change in marital satisfaction over those years. Thus, the two studies suggest that on average marital satisfaction may decline over the first 4 years of marriage and then stabilize over the next two years. To describe the apparent deceleration in the mean rate of change across 6 years would indeed require a quadratic term. Over the 4 years of the current study, however, the redundancy between the quadratic and linear terms supports the view of Rogasa et al. (1982) that a straight line model provides an adequate approximation of change even if the true change function is more complex.

⁵ We suggested recently that trajectories with identical intercepts and slopes may also be distinguished by how much the reports of marital satisfaction at each time point vary from the straight regression line (Karney & Bradbury, 1995a). We hypothesized that this variability may be associated with neuroticism, such that spouses higher in neuroticism would react more strongly to the inevitable vicissitudes of married life and so report more variable marital satisfaction over time, independent of their initial satisfaction or rate of change. In the current study, we used the natural log of the residual variance from within-subjects regressions computed separately for husbands and wives as a rough estimate of this aspect of the trajectories. Using Bartlett's test for homogeneity of variance (Guilford, 1956), we determined that spouses in this sample did not differ significantly along this dimension of their trajectories, and thus hypotheses about this aspect of the trajectories could not be tested further. The lack of individual differences in variability may be due to the 6-month measurement interval that we used; studies examining similar aspects of trajectory with more frequent assessments have found significant effects (e.g., Barkham et al., 1993).

measures = .60, range = .50 to .67). Because HLM bases analyses on the true variance only, the reliabilities of the parameter estimates from all four measures were adequate for the current purposes.

Describing the trajectory of marital satisfaction. Describing the change in this sample requires specifying an unconditional between-couples model in which the parameters of the within-couples model are allowed to vary randomly. Estimating the unconditional model allowed us to obtain unbiased estimates of the population mean and the population variance of the slopes and intercepts for husbands and wives. Table 4 presents restricted maximum-likelihood estimates of the mean and standard deviation of each parameter. The hypothesis that the mean of each parameter differs significantly from zero was tested using a t test, a relatively conservative test recommended by Bryk and Raudenbush (1992) when sample sizes are small. The heterogeneity of the variance of each parameter was tested with a chisquare.

With respect to the intercept, the means reported in Table 4

 Table 4

 Parameters of Change in Marital Satisfaction

Measure	М	SD	ť	Chi-square test of variance
		Interco	ept	
МАТ				
Husbands	117.94	2.12		157.95***
Wives	117.93	2.43	_	205.76***
OMI				
Husbands	39.19	0.66		109.26***
Wives	38.59	0.80		169.76***
KMS				
Husbands	18.41	0.31	—	133.97***
Wives	18.03	0.33	_	163.13***
SMD				
Husbands	91.58	1.45		125.60***
Wives	90.20	1.78		198.56***
		Slop	e	
МАТ				
Husbands	-0.91	0.21	-4.32***	182.37***
Wives	-0.78	0.19	-4.00***	165.02***
QMI				
Husbands	-0.28	0.06	-4.56***	139.87***
Wives	-0.31	0.06	-5.10***	152.87***
KMS				
Husbands	-0.11	0.02	-4.47***	133.19***
Wives	-0.15	0.03	-5.55***	145.66***
SMD				
Husbands	-0.54	0.14	-3.94***	148.06***
Wives	-0.58	0.14	-4.05***	166.30***

Note. For t tests, df = 53; for chi-square tests, df = 53, N = 54 couples. MAT = Marital Adjustment Test (Locke & Wallace, 1959); QMI = Quality Marriage Index (Norton, 1983); KMS = Kansas Marital Satisfaction Survey (Schumm et al., 1986); SMD = Semantic Differential (Osgood et al., 1957).

^a The t test of the intercepts addresses the hypothesis that the intercepts differ significantly from zero. Because the lowest possible score on each of these measures is greater than zero, these tests are not meaningful and hence are not reported.

*** p < .001.

suggest that on average husbands and wives report relatively high marital satisfaction as newlyweds (between 75% and 86% of the highest possible score on each measure). Comparison of Table 4 with Table 1 reveals that the mean intercept for each measure is very close to the mean at Time 1 for each measure (correlations between intercepts and Time 1 marital satisfaction range from .60 to .78 across spouses and measures). This is to be expected, given that the intercept is an estimate of the starting point of each person's trajectory. However, the standard deviation of the intercept is noticeably less than the standard deviation of the observed scores at Time 1. This follows from the Baysian estimation, which by correcting for varying reliability among individuals tends to produce more precise and less variable estimates than OLS estimation. Nevertheless, the variance of the intercept is clearly significant on each measure, indicating that substantial individual differences exist in the level of marital satisfaction reported by husbands and wives at the start of their marriages.

With respect to the slopes, the means reported in Table 4 reveal that on average the marital satisfaction of husbands and wives declined linearly over time, consistent with prior studies of mean change in marital satisfaction. The t values reported in column 4 indicate that this slope is negative and significantly different from zero for each of the four measures. Slopes vary across measures because the measures have different ranges. To compare how scores on each measure were changing relative to the range of that measure, we divided the mean slope of each measure by its total range. The resulting proportion showed that the relative rate of change on the four measures was very similar, with the mean scores of husbands and wives declining between 3% and 4% of the total range of each measure each year. The variance of the slope was also significant for each measure, suggesting that individual differences exist in how rapidly marital satisfaction changed over the 4 years. The examination of the individual slopes revealed that marital satisfaction did not decline for all spouses. Across measures, about 10% of spouses had positive slopes, indicating that in some couples satisfaction improved over the first years of marriage.

Multivariate tests indicated that the trajectories of husbands and wives did not differ significantly from each other on three out of four measures. On the KMS, however, the difference between husbands' and wives' slopes was marginally significant, $\chi^2(1, N = 54) = 3.41, p = .06$, with wives' slopes being more negative than husbands' slopes. Both parameters of husbands' and wives' trajectories were significantly correlated with each other on all measures. For intercepts, between-spouse correlations ranged from .59 to .81 across measures (all significant at p < .001). For slopes, between-spouse correlations were nearly perfect, ranging from .97 to .98 across measures. Because husbands' and wives' trajectories were estimated within the same model, the HLM program controlled for the nonindependence of husbands and wives' trajectories in all subsequent analyses.

Initial status and rates of change. Obtaining reliable estimates of the intercepts and slopes of husbands and wives allowed us to examine the relationship between initial marital satisfaction and subsequent rates of change in marital satisfaction over time. Do spouses who report higher initial levels of marital satisfaction experience greater declines over time (the disillusionment hypothesis), or is high initial satisfaction associated

with more stable satisfaction throughout the marriage (the maintenance hypothesis)? Addressing this relationship has often been problematic for longitudinal researchers because the sample correlation between observed initial status and observed rate of change is frequently a negatively biased estimator of the true relationship between these parameters (Bradbury & Karney, 1996; for a detailed explantion, see Rogosa, 1988; Rogosa, Brant, & Zimowski, 1982). Table 5 illustrates the severity of this problem. The top half of Table 5 presents the correlation between Time 1 marital satisfaction and the raw difference between Time 1 and Time 8 marital satisfaction in the current sample. This correlation is negative for all measures, significantly so for husbands' KMS scores and wives' MAT scores. These sample correlations suggest that higher initial levels of marital satisfaction are associated with steeper declines in marital satisfaction over time, lending support to the disillusionment hypothesis of change in marriage. In contrast, the correlations between the empirical Bayes estimates of the slope and intercept are presented in the bottom half of Table 5. These correlations, based on estimates of slope and intercept that have been corrected for sampling error, are significantly positive for wives on two out of four measures and significantly positive for husbands on three out of four measures. The positive correlations indicate that higher initial levels of marital satisfaction are in fact associated with less steep declines in marital satisfaction over time, supporting the maintenance hypothesis.

Trajectories of Satisfaction and Marital Dissolution

How is the trajectory of marital satisfaction associated with whether or not a marriage dissolves or remains intact over the first 4 years? Do slopes and intercepts have independent effects on whether or not marriages end? Or do the parameters of the trajectory combine to predict the final outcome of the marriage? As a preliminary step in addressing these questions, we ran a conditional model in which the within-subject function was the same as that specified in Equation 1, but the between-subject

Table 5

Observed and Adjusted Correlations Between Initial Marital Satisfaction and Subsequent Change Over Time

Correlation	MAT	QMI	KMS	SMD
Between Time 1 marital				
satisfaction and raw				
difference between Time				
1 and Time 8				
satisfaction $(n = 38)$				
Husbands	25	05	40*	23
Wives	38*	08	28^{+}	23
Between intercept and slope				
(n = 54)				
Husbands	.06	.65***	.46***	.40**
Wives	.05	.36**	.28*	02

Note. MAT = Marital Adjustment Test (Locke & Wallace, 1959); QMT = Quality Marriage Index (Norton, 1983); KMS = Kansas Marital Satisfaction Survey (Schumm et al., 1986); SMD = Semantic Differential (Osgood, Suci, & Tannenbaum, 1957).

 $\dagger p < .10. * p < .05. ** p < .01. *** p < .001.$

Table 6

Associations Between Marital Dissolution and Parameters of Change in Marital Satisfaction

	Inta $(n =$	ct 38)	Dissol $(n =$	lved 16)		
Measure	М	SD	М	SD	t.	r
		I	ntercept			
MAT						
Husbands	119.92	2.52	114.80	4.67	-1.10	15
Wives	120.15	2.91	115.01	5.32	-0.96	13
OMI						
Husbands	40.23	0.76	37.22	1.42	-2.12*	28
Wives	39.55	0.95	37.12	1.74	-1.39	19
KMS						
Husbands	18.81	0.36	17.67	0.67	-1.69	23
Wives	18.35	0.40	17.68	0.73	-0.92	13
SMD						
Husbands	92.52	1.76	90.59	3.26	-0.59	08
Wives	91.56	2.15	88.59	3.93	-0.75	10
			Slope			
MAT						
Husbands	-0.49	0.20	-2.38	0.48	-3.97***	48
Wives	-0.34	0.18	-2.41	0.43	-4.74***	55
QMI						
Husbands	-0.17	0.06	-0.64	0.15	-3.17**	40
Wives	-0.18	0.06	-0.76	0.14	-4.12***	50
KMS						
Husbands	-0.07	0.02	-0.25	0.06	-2.75**	36
Wives	-0.10	0.03	-0.38	0.06	-4.54***	53
SMD						
Husbands	-0.26	0.13	-1.55	0.32	-4.06***	49
Wives	-0.29	0.13	-1.71	0.32	-4.42***	52

Note. For all *t* tests, df = 52. MAT = Marital Adjustment Test (Locke & Wallace, 1959); QMI = Quality Marriage Index (Norton, 1983); KMS = Kansas Marital Satisfaction Survey (Schumm et al., 1986); SMD = Semantic Differential (Osgood, Suci, & Tannenbaum, 1957). * p < .05. ** p < .01. *** p < .001.

function included a categorical variable indicating whether or not the marriage dissolved over the course of the study. HLM provides t tests of the significance of the coefficients of the dissolution variable to indicate whether slopes and intercepts differ between intact and dissolved couples. We computed the effect size rsassociated with each t statistic to aid in interpreting the strength of the association between each parameter and marital dissolution.⁶ The results of these analyses are presented in Table 6.

With respect to initial levels of satisfaction, Table 6 reveals few significant differences between intact and dissolved couples controlling for rates of change. As a group, wives in marriages that dissolved had lower and more variable intercepts on all four measures, but neither the mean nor the variance of the two groups differed significantly on any measure. Husbands in marriages that dissolved also had lower and more variable intercepts on all four measures, and these differences were also nonsignificant for three out of four measures. Across spouses

⁶ To compute the effect-size r associated with each t, we used the following formula (Rosenthal & Rosnow, 1984): $r = \sqrt{t^2/(t^2 + df)}$

and measures, the mean effect size associated with these differences was -.13, classified by J. Cohen (1977) as a small effect. Thus, spouses whose marriages end within the first 4 years seem to begin their marriages reporting similar degrees of marital satisfaction as spouses whose marriages remain intact.

Controlling for initial levels of satisfaction, the trajectories of marriages that did and did not end within the first 4 years were more strongly distinguished by differences in their slopes. Across measures and spouses, marital satisfaction declined more steeply in marriages that dissolved than in marriages that remained intact (see Table 6). The effect-size rs associated with these differences were substantially larger than the effects associated with the intercepts, ranging from -.36 to -.55. In stable marriages, change in marital satisfaction was still significantly negative, declining by about 3% of the total range of each measure each year. In unstable marriages, satisfaction declined by 15% to 20% of the total range of each measure each year. For the MAT, the QMI, and the SMD, both spouses' slopes were also significantly more variable in the dissolved marriages than in the intact marriages. For the same three measures, differences between intact and dissolved marriages did not interact with gender, according to multivariate hypothesis tests conducted within HLM.7

The correlation between intercept and slope did not reliably distinguish between couples that dissolved and those that remained intact. For husbands, intercepts and slopes were significantly positively correlated on three out of four measures in both groups. For wives, intercepts and slopes were significantly positively correlated on two out of four measures in both groups. Differences between the correlations in the two groups were tested through r-to-z transformations; none of these tests proved significant.

The analyses described so far addressed the unique associations between each parameter and marital dissolution. To determine the combined influence of each aspect of the trajectory, we conducted a logistic regression for each spouse, treating marital dissolution as a dichotomous dependent variable. Intercepts were entered into the equation first. Without controlling for slopes, intercepts were significant or marginally significant predictors of marital dissolution (across measures, effect-size rs ranged from -.14 to -.30for husbands and from -.08 to -.23 for wives). After slopes were entered into the equation, however, the effect of the intercept was reduced to nonsignificance across spouse and measures (all effect-size rs < .01), whereas slopes demonstrated unique associations with dissolution as above (across measures, effect-size rs ranged from -.17 to -.34 for husbands; from -.29 to -.36 for wives). This pattern of results is consistent with a mediation model in which spouses' initial levels of satisfaction lead to declines in marital satisfaction, which then lead directly to marital dissolution. In a third step, an interaction term (Intercept \times Slope) was entered into the equation. Across spouses and measures, this term accounted for no additional variance in marital dissolution, indicating that the association between change in satisfaction and marital dissolution is not moderated by initial level of satisfaction.

Effects of Neuroticism and Marital Interaction on the Trajectory of Marital Satisfaction

What are the effects of neuroticism and marital interaction on the course of marital satisfaction over time? To estimate the

unique associations between neuroticism, marital interaction, and each parameter of the trajectory of marital satisfaction, we proceeded in three steps. First, we examined a model in which both spouses' neuroticism were entered into the between-subjects equations. Second, we examined a model in which both spouses' behavior scores were entered into the between-subject equations. Finally, we examined a combined model in which neuroticism and behavior scores were entered simultaneously. Because neither variable was directly associated with marital dissolution (see Table 3), and because the trajectories of marriages that did and did not dissolve had been shown to differ from each other, marital dissolution was entered into the equations first in all models as a control variable.8 Thus, the estimated effects of each variable represent the association between that variable and the course of marital quality over 4 years, controlling for whether or not the marriage ended during that time and, as noted above, controlling for all the other effects in the model.

Contrary to intrapersonal and interpersonal models of marriage, none of the effects of neuroticism or behavior were substantially altered when both variables were examined simultaneously. That is, neither variable accounted for the associations between the other variable and the trajectory of marital satisfaction. Therefore, Table 7 presents effect size rs derived from the third model, which examined both variables simultaneously.

Examination of Table 7 reveals that neuroticism and marital interaction appear to have unique effects on different parameters of the trajectory of marital satisfaction. Neuroticism had its largest effects on spouses' intercepts. Husbands' and wives' neuroticism scores were significantly associated with husbands' intercepts, such that higher levels of both spouses' neuroticism were associated with lower initial levels of satisfaction for husbands. The effects on wives' initial satisfaction were also negative but nonsignificant, although effects on husbands' and wives' intercepts were not significantly different from each other. The unique effects of neuroticism on spouses' slopes were noticeably smaller, and were nonsignificant across measures for both spouses.

⁸ To ensure that controlling for whether or not couples remained intact was not masking possible interactions between marital dissolution and the independent variables, we examined the significance of these interactions directly. Four interaction terms were created: Dissolution \times Husbands' Neuroticism, Dissolution \times Wives' Neuroticism, Dissolution \times Husbands' Behavior, and Dissolution \times Wives' Behavior. After accounting for the main effects of each variable, none of the interaction terms approached significance (all *t* values were less than 1.14 across spouses and measures, and most were half that large). Thus, whether or not a marriage ends in separation or divorce within the first 4 years does not appear to moderate the effects of neuroticism or behavior in this sample.

⁷ To address the possibility that differences between the slopes of the two groups were due to especially low scores in the final data points obtained from couples who dissolved, we reran these analyses examining the first three waves of data only from couples who remained intact through at least Time 4, that is, the 1st year of data from couples who remained intact and couples who did not dissolve until at least 2 years into the study (49 couples). Each of the results reported here was obtained on the restricted data set. Spouses in marriages that dissolved within 4 years experienced greater declines in satisfaction during the 1st year of marriage than couples who remained intact across 4 years, controlling for initial levels of marital satisfaction and excluding the data points immediately before the end of the marriage.

 Table 7

 Unique Effects of Neuroticism and Behavior on the Trajectory

 of Marital Satisfaction for Husbands and Wives

Measure	Husbands' neuroticism	Wives' neuroticism	Husbands' behavior	Wives' behavior
		Intercept		
Husbands				
MAT	21	29*	17	11
OMI	34*	38**	03	13
KMS	28*	39**	01	08
SMD	41**	30*	03	16
Wives				
MAT	07	20	.06	19
QMI	18	21	.11	18
кмs	18	20	.01	20
SMD	19	24†	.12	29*
		Slope		
Husbands				
MAT	17	13	09	.20
QMI	21	02	20	.20
KMS	14	.01	18	.33*
SMD	12	11	10	.26†
Wives				
MAT	04	02	25†	.28†
QMI	12	05	30*	.21
KMS	08	13	25†	.29*
SMD	12	06	27^{+}	.28*

Note. The numbers in the table represent effect-size rs. Neuroticism was measured with the Eysenck Personality Questionnaire (Eysenck & Eysenck, 1978). Behavior was coded with the Verbal Tactics Coding Scheme (Sillars, 1982). MAT = Marital Adjustment Test (Locke & Wallace, 1959); QMI = Quality Marriage Index (Norton, 1983); KMS = Kansas Marital Satisfaction Survey (Schumm et al., 1986); SMD = Semantic Differential (Osgood, Suci, & Tannenbaum, 1957). $\dagger p < .10$. *p < .05. **p < .01.

Marital interaction, in contrast, had its largest effects on spouses' slopes. Although both spouses' negative behaviors at Time 1 were associated with lower initial marital satisfaction, these effects were nonsignificant on all measures for husbands and all but one measure for wives. However, husbands' and wives' behavior had significant unique effects on wives' slopes. On all four measures, the association between husbands' behavior and wives' slopes was significant or marginally significant, such that husbands' negativity during a problem-solving discussion predicted more rapid declines in wives' marital satisfaction over the first 4 years of marriage, controlling for wives' initial level of satisfaction. The effect of husbands' behavior on their own slopes was also negative but was smaller and nonsignificant across measures.

The association between wives' behavior and wives' slopes was also significant or marginally significant on three out of four measures, but the direction of this effect was positive. The effect of wives' behavior on husbands' slopes was also positive, and significant or marginally significant on two out of four measures. The positive associations indicate that, controlling for the associations between wives' behavior and spouses' intercepts, wives' more negative behavior predicted less rapid declines in husbands' and wives' marital satisfaction over the first 4 years of marriage. The differences between husbands' and wives' effects was significant (chi-squares with 1 df ranged between 4.5 and 5.3 across measures, ps ranged between .03 and .02). To confirm that the reversed direction of the effect was not an artifact of controlling for husbands' behavior in the same equation, we examined a model in which only wives' behavior was entered into the between-subject equations; the positive associations between wives' negativity and spouses' slopes remained. The implications of this finding are considered in the Discussion section.⁹

In an exploratory analysis, four different interaction terms representing the combined effects of husbands' and wives' neuroticism and interaction behaviors were added to the combined model one at a time. None accounted for significant additional variance in any parameter of the trajectory (all ps > .50).

Discussion

Rationale, Strengths, and Limitations

The dependent variable implicit in many discussions of change in marriage is the trajectory of marital satisfaction, or the full course of spouses' feelings about their relationship from the beginning of the marriage. One implication of a focus on trajectory is that describing change over time requires describing effects on the initial level of satisfaction separately from effects on the rate of change in satisfaction over time. Because prior studies of marriage have used data analytic techniques that are unable to distinguish between these effects, basic questions about the course of marital satisfaction have been overlooked. In our study we applied GCA to eight waves of marital satisfaction data, which allowed us to describe and examine effects on each aspect of spouses' marital satisfaction over time. Describing change in this way provided an opportunity to elaborate intrapersonal and interpersonal models of marriage and, in particular, to specify the unique effects of neuroticism and marital interaction on the longitudinal course of marriage.

A number of strengths of our study enhance our confidence in the results. First, whereas the average rate of attrition in prior longitudinal research on marriage is 31% (Karney & Bradbury, 1995b), during the 4 years of our study attrition was relatively low (7%), reducing the likelihood that these results have been affected by attrition bias. Second, whereas prior longitudinal research on marital outcomes has been limited by low rates of marital dissolution (e.g., 12.5% over 4 years; Gottman & Levenson, 1992), the rate of marital dissolution in this sample was relatively high (32%), facilitating comparisons between couples that did or did not dissolve. Third, all spouses entered the study as newlyweds, avoiding the possibility that important effects have been masked by differences associated with varying marital duration (see Booth, Johnson, White, & Edwards, 1985; South & Spitze, 1986). Fourth, whereas the majority of longitudinal research on marriage has collected and analyzed two

⁹ When the final model was run on a restricted sample including only couples that remained intact over the first 4 years of marriage (n = 38), all effects were in the same direction and virtually the same magnitude as those reported for the full sample.

waves of data, we collected eight waves of data and analyzed all eight simultaneously by using GCA.

Despite these strengths, several factors may nevertheless limit the interpretation of the present findings. First, although the present sample compares favorably in size with other observational studies of marriage, the power to detect effects on different parameters of trajectory would be greater with larger samples. Second, the current sample may be more at risk for marital instability than samples recruited through different procedures (see Karney et al., 1995). Until these results are replicated on independent samples of newlyweds, generalizations should be made with caution. Third, although the fact that data were collected from both spouses should have reduced the temptation for spouses to distort their descriptions of the marriage, the possibility remains that social desirability concerns influenced responses to the marital satisfaction measures for some couples. Fourth, although the longitudinal design of the current study allows us to make tentative causal statements, this research is nonetheless correlational; alternative explanations for these associations cannot be ruled out. In particular, whereas behavior has been described as acting on change in marital satisfaction, behavior was assessed only once in the current study. Without data on how marital interactions change over time relative to antecedent changes in marital satisfaction, it is impossible to rule out the alternative hypothesis that spouses' behaviors are products of their developing marital satisfaction rather than causes (see Bradbury & Karney, 1993).

Describing the Trajectory of Marital Satisfaction

The first goal of the current study was to describe the trajectory of marital satisfaction in the early years of marriage. Replicating the findings of prior longitudinal research, eight waves of data from the first 4 years of marriage revealed that on average spouses begin marriage reporting relatively high levels of marital satisfaction and then report gradually declining marital satisfaction over time. Through GCA, that basic finding was then elaborated in several ways. First, the shape of the trajectory was specified precisely such that the eight waves of data from each spouse were summarized in terms of two parameters: an intercept, capturing each spouse's initial level of marital satisfaction, and a slope, capturing the rate of linear change in each spouse's marital satisfaction across 4 years. This model proved an adequate description of the trajectories in this sample, and each parameter was estimated reliably. Second, because parameters were estimated for each spouse, the samplewide variance in those parameters could be reported, revealing a more complex picture of the trajectory than the one described by the mean pattern of change. For example, although spouses begin their marriages with high satisfaction on average, the variance in this parameter indicates that significant individual differences exist even within 6 months of the wedding. The significant variance of the slopes similarly suggests that a linear decline may not describe all couples, and in fact closer inspection revealed that a minority of couples in this sample reported increasing satisfaction over the course of the study.

Finally, because the parameters of the trajectory were estimated free of sampling error, valid estimates of the correlation between initial levels of marital satisfaction and rates of change in marital satisfaction could be obtained. Whereas the observed correlation between initial values and rates of change is often negative (Rogosa, 1988), the correlation between the corrected estimates was significantly positive, suggesting that newlyweds who begin their marriages with higher initial levels of marital satisfaction experience less steep declines in marital satisfaction over time. Given recent research demonstrating that intimate partners idealize their partners early in the relationship (Murray & Holmes, 1993; Murray et al., 1996), this finding suggests that, rather than leaving spouses vulnerable to future disillusionment, initially idealized beliefs may provide spouses with the motivation or the tools to maintain those beliefs over time.

Throughout these analyses, husbands' and wives' trajectories were estimated within a single couples-level model, allowing multivariate tests of the between-spouse differences. With rare exceptions, spouses' trajectories did not differ: The mean and variance of each parameter were similar for husbands and wives, and parameter estimates for each spouse correlated very highly. The lack of significant differences between the course of marital satisfaction for husbands and wives suggests reexamining Barnard's (1982) often-repeated idea that there exist two marriages, his and hers. In fact, it may be more accurate to say that, in terms of marital satisfaction, there is one marriage, but the factors that influence that marriage may differ for each spouse.

With respect to ongoing debates about measuring marital satisfaction (Fincham & Bradbury, 1987; Heyman, Sayers, & Bellack, 1994; Norton, 1983), it is noteworthy that in general the properties of the slope and intercept did not differ depending on the type of instrument used to measure marital satisfaction. The lack of consistent differences between omnibus and global measures suggests that distinctions between types of measures of marital satisfaction may have little practical significance in a longitudinal context. Consistent with the idea of sentiment override (Weiss, 1984), spouses' global sentiments about their relationships may in large part drive responses to both types of instruments. Thus, as global sentiments develop over time, measures that assess slightly different aspects of those sentiments may develop in similar ways. In this light, the issue of what measure to use to assess change appears to be less important to the results of longitudinal research than how frequently and over what duration the measurement occurs (see P. Cohen, 1991; Collins & Graham, 1991).

Describing the Trajectory Toward Marital Dissolution

The second goal of our study was to determine the unique roles of initial level of satisfaction and rate of change in satisfaction in predicting whether or not a marriage will dissolve within the first 4 years. When slopes and intercepts are examined simultaneously, significant differences between intact and dissolved couples emerge only on slopes. Whereas satisfaction declines significantly in intact couples, declines appear to be several times greater in couples that ultimately dissolve, controlling for rates of change, intercepts were not significantly related to marital dissolution. However, a logistic regression analysis revealed that intercepts do have marginally significant associations with marital dissolution when examined alone, such that spouses who begin their marriage with lower marital satisfaction have slightly higher rates of separation and divorce. The addition of slopes to the regression equations reduces the association between intercepts and marital dissolution to nearly zero, indicating that the effect of initial satisfaction is accounted for by the relationship between marital dissolution and the slope. Together these findings support a mediational model, in which initial levels of marital satisfaction predict marital dissolution indirectly, through their association with rates of change over time. Thus, spouses who start their marriages with lower levels of satisfaction experience steeper declines in satisfaction, which ultimately lead to the end of the marriage.

The unique role played by rates of change in predicting marital dissolution may shed light on the kinds of information spouses use to assess their relationships. Prominent approaches to close relationships, such as interdependence theory (Rusbult & Buunk, 1993; Thibaut & Kelley, 1959), suggest that partners evaluate their relationships mostly through processes of social comparison. Thus, a marriage should be judged as satisfying to the extent that the net rewards obtained in the relationship compare favorably to spouses' personal standards, and decisions to leave the marriage should depend on how the net rewards obtained in the relationship compare with the net rewards available outside of the relationship. The current findings, however, do not support this view. The fact that initial levels of marital satisfaction had no unique associations with marital dissolution suggests that absolute levels of satisfaction may not play a large role in decisions to separate or divorce. Instead, the importance of the slope suggests that spouses may evaluate the future of their relationships by using temporal comparison processes (Albert, 1977). That is, spouses may decide whether or not to remain in the marriage by comparing their current level of satisfaction with their own satisfaction at some point in the past, rather than with any absolute or external standard. The original formulation of interdependence theory (Thibaut & Kelley, 1959) noted the possibility of temporal comparisons, but to date these processes have received no empirical attention. Although in our study we did not probe comparison processes directly, these data suggest that these processes may warrant greater scrutiny. A task for future research is to determine the extent to which spouses are sensitive to rates of change in their own judgments of marital satisfaction.

The idea that initial levels of marital satisfaction affect marital dissolution indirectly has important implications for efforts to prevent divorce (see Bradbury & Fincham, 1990). Low initial levels of satisfaction appear to lead to dissolution only to the extent that such marriages are more likely to experience steeper declines in satisfaction over time. Thus, preventing further declines and teaching couples to maintain their current levels of satisfaction may be more important to efforts at preventing divorce than trying to increase satisfaction in less satisfied couples.

Unique Effects of Neuroticism and Marital Interaction

The third goal of our study was to evaluate intrapersonal and interpersonal models of marriage by estimating the effects of neuroticism and marital interaction on the trajectory of marital satisfaction. Contrary to the predictions of the two models, neither variable accounted for the significant effects of the other.

Nor were neuroticism and marital interaction correlated within or between spouses, ruling out the possibility that either variable mediates the effects of the other. Thus neuroticism and marital interaction were presumed to have independent effects on the trajectory of marital satisfaction and were examined simultaneously. Previous longitudinal research on neuroticism and on negativity during marital interaction has suggested that these variables have similar detrimental effects on marital satisfaction over time. By specifying separate effects on each parameter of the trajectory, the results of our study suggest an alternative. Neuroticism and marital interaction appear to have distinct effects on the course of marital satisfaction, with each variable exerting its strongest effects on different parameters of the trajectory. Neuroticism was associated most strongly with spouses' initial levels of marital satisfaction, such that spouses scoring higher on neuroticism reported lower marital satisfaction from the start of the marriage. Controlling for these associations, neuroticism had no additional significant effects on spouses' rates of change. Interaction behaviors, in contrast, were only weakly associated with initial levels of marital satisfaction. Controlling for these associations, however, revealed that behaviors exchanged during problem-solving discussions were significantly associated with spouses' rates of change.

Once it is clear that different variables can affect each aspect of the trajectory independently, there are reasons to expect that intrapersonal and interpersonal variables should have different effects. Because intrapersonal variables, such as personality or family history, endure stably over time (Conley, 1985; Stevens & Truss, 1985), the effects of these variables should be relatively constant throughout a marriage. Thus, a personality trait like neuroticism may be associated with lower marital satisfaction at all times, but may not have independent associations with the changes in satisfaction experienced by different couples.¹⁰ In contrast, interpersonal processes, reflected in variables such as marital interaction, are likely to develop over time as marital satisfaction develops (Markman, 1991; Weiss & Heyman, 1990). These variables should therefore be related to changes in marital satisfaction over time, even if they are unrelated to marital satisfaction early in the marriage. Results from several previous longitudinal studies are consistent with this idea, finding that behaviors that are uncorrelated with marital satisfaction early in the marriage are correlated with marital satisfaction measured several years later (Filsinger & Thoma, 1988; Markman, 1981).

If independent variables that are constant and those that vary over time are shown to have distinct effects on each aspect of the trajectory, then other types of variables may be associated with still different effects on the trajectory. For example, discrete stressful events, such as a serious illness or the loss of one's job, may be associated with temporary or nonlinear declines or elevations in marital satisfaction. Discrete stressors have rarely

¹⁰ Recent research by Bolger and his colleagues (e.g., Bolger & Schilling, 1991; Bolger & Zuckerman, 1995) suggests that individuals who are higher in neuroticism experience greater distress in their daily lives because they react poorly to stressful situations when they occur. This research suggests that, whereas rates of change in marital satisfaction are not associated with neuroticism alone, rates of change might be associated with the interaction between neuroticism and stressful events.

been studied in longitudinal studies of marriage, yet their contribution to marital trajectories, and their association with intrapersonal and interpersonal variables, is an important topic for future research (e.g., Conger et al., 1990).

Although the current findings indicate that problem-solving behaviors are linked to change in marital satisfaction, our study also echoes prior findings by showing that this association is not always in the expected direction. Whereas the negativity of husbands' behavior was associated with more negative slopes for wives, the negativity of wives' behavior was positively associated with both spouses' slopes. This suggests, counterintuitively, that wives' negativity or lack of positivity during conflict may benefit marriages over time. When other researchers have presented similar findings (Gottman & Krokoff, 1989; Heavey, Layne, & Christensen, 1993), those findings have been questioned on the grounds that change scores based on two waves of data may be unreliable indicators of true change (cf. Gottman & Krokoff, 1990; Woody & Costanzo, 1990). In our study, however, change was estimated from eight waves of data and examined independently of overall levels of marital satisfaction, suggesting that the revealed associations are not the result of measurement error. Rather, it appears that negative behavior in marital interaction can be harmful to marriage in some circumstances and beneficial to marriage in others.

When might behaviors initially coded as negative be beneficial or harmful to a marriage over time? We speculate that some behaviors reflective of poor problem-solving skills may also reflect a spouse's commitment to confronting and resolving marital difficulties. The nature of these behaviors may vary by gender. For example, we examined marital interactions for signs of blaming and criticism. For husbands, such behaviors may indicate a reluctance to accept responsibility for relationship difficulties. For wives, however, because they are traditionally thought to avoid direct criticism of their husbands (Tannen, 1990), the same behaviors may indicate a willingness to face difficult relationship issues. Over time, the commitment to the relationship that such behaviors represent may be more important to the health of the marriage than the specific problemsolving skills themselves. Differences in the systems used to code marital interaction in different studies unfortunately limit our ability to generalize further about when negative behavior is good or bad for marriage. One task for future research may be to develop coding systems that clearly separate when a spouse's negativity during a marital interaction is directed at the partner and when it is directed toward resolving problems. In general, the present findings highlight a gap in our current understanding of the relationship between marital interaction and marital satisfaction. What is the mechanism through which behaviors exchanged between partners affect their evaluations of the relationship? A further challenge for future research is to specify how the behaviors spouses exchange become internalized to determine how thoughts and feelings about the marriage change over time.

Conclusion

In our view, the current study advances the understanding of how marriages change in several important ways. First, these findings establish that change in marital satisfaction can effectively be understood as a multifaceted dependent variable and that a complete investigation of change needs to examine each facet separately. Second, by examining the relationship between marital dissolution and each facet of the trajectory of marital satisfaction, these findings suggest that rates of change in satisfaction may be more important than the initial level of satisfaction in determining the ultimate outcome of the marriage. Third, in our study we refined intrapersonal and interpersonal theories of marriage by reexamining the longitudinal effects of the two most frequently studied and most frequently discussed independent variables in this literature. Whereas previous research has suggested that neuroticism and marital interaction have comparable effects on marriage over time, in our study we questioned this view. Specifically, these findings reveal that neuroticism is more strongly associated with spouses' initial levels of marital satisfaction than with rates of change in marital satisfaction over time. Problem-solving behavior, in contrast, is more strongly associated with rates of change in marital satisfaction, independent of initial levels of satisfaction. In evaluating these results, we recognize that we have examined only two of the myriad theoretical perspective that have been applied to marriage. However, the results nonetheless demonstrate that future progress in understanding how marriages achieve different outcomes will require continued refinement and integration of the independent and dependent variables in marital research.

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