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I am submitting herewith a thesis written by Carolyn A. Wenner entitled “Is Sex Important to Marital Satisfaction or Is Marital Satisfaction Important to Sex? Top-down and Bottom-up Processing in the Bedroom.” I have examined the final electronic copy of this or thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Arts with a major in Psychology.

James K. McNulty, Major Professor

We have read this thesis
and recommend its acceptance:

Lowell Gaertner

Michael Olson

Accepted for the Council:

Carolyn R. Hodges

Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)

Is Sex Important to Marital Satisfaction or is Marital Satisfaction Important to Sex?

Top-down and Bottom-up Processing in the Bedroom.

A Thesis Presented for

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Carolyn A. Wenner

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Abstract

How do people determine satisfaction in their relationships? One way may be to engage in bottom-up processing and rely on sexual satisfaction to arrive at an overall evaluation of the relationship. Another way may be to engage in top-down processing and allow the overall relationship satisfaction to color the perceptions of sexual satisfaction. The current study more rigorously examined the causal relationship between sexual and marital satisfaction through multilevel cross-lagged regression analyses of 8 waves of marital and sexual satisfaction reported by 72 newlywed couples over the first five years of marriage. Consistent with bottom-up processing, initial sexual satisfaction predicted subsequent marital satisfaction. Also, consistent with top-down processing, initial marital satisfaction predicted subsequent sexual satisfaction. The current findings extend theoretical perspectives on the relationship between sexual satisfaction and suggest that both causal paths be considered in future research and clinical practice.

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Introduction

In what way is satisfaction determined in a relationship? There is evidence that specific aspects of the relationship, sex, may lead to more global sentiments, relationship satisfaction. For example, daily evaluations of relationship behaviors serve to predict more global evaluations of the relationship (McNulty & Karney, 2001). However, there is also evidence that mental representations can color the interpretation of specific relationship aspects. For instance, some people are more likely to rely on their evaluation of the relationship when making judgments of their partner (Fincham, Garnier, Gano-Phillips & Osborne, 1995).

Given that the association between specific components of the relationship and evaluations of that relationship may be bidirectional, the causal association between sexual and relationship satisfaction may be bidirectional as well. As with other partner behaviors, or interactions, the perceptions of events may shape evaluations of the relationship and evaluations of the relationship as a whole may affect the perceptions of events. In terms of sexual and marital satisfaction, partners may link their specific partner perceptions of their sexual behavior in such a way that it boosts their marital satisfaction. Additionally, partners may rely on their relationship satisfaction in determining their perceptions of their sexual interactions.

There is some evidence to support the notion that, through bottom-up processing, sexual satisfaction leads to marital satisfaction. According to Karney & Bradbury's (1995) review of longitudinal marital research, sexual satisfaction was more strongly correlated to marital satisfaction than many other variables. Indeed, McNulty & Karney (2001) found that daily sexual satisfaction correlated with daily evaluations of the marriage as a whole, (effect sizes were .59 for husbands, and .62 for wives). The association between sexual satisfaction and

relationship satisfaction has been demonstrated in a variety of samples, including premarital individuals and couples (Sprecher, 2002), newlywed couples (Henderson-King & Veroff, 1994; Oggins, Veroff, & Leber, 1993; Young, Denny, Luquis & Young, 1998), and couples in more established marriages (Yeh, Lorenz, Wickrama, Conger & Elder, 2006).

Nevertheless, the correlational nature of these studies precludes any conclusions regarding the direction of the association between sexual satisfaction and overall satisfaction with the relationship. The goal of the current study is to examine the direction of causation between sexual and relationship satisfaction. Accordingly, the rest of the introduction will be broken down into four sections. The first section reviews research consistent with the possibility that sexual satisfaction may cause relationship satisfaction. The second section reviews evidence consistent with the possibility that relationship satisfaction may cause sexual satisfaction. The third section critiques both existing bodies of research. The fourth section reviews potential gender differences in the association between sexual and relationship satisfaction. Finally, the fifth section describes the present study in which newlywed couples reported sexual frequency, sexual satisfaction, and marital satisfaction up to eight times over the course of five years that tests the causal direction between sexual and marital satisfaction.

Sexual and Relationship Satisfaction: Bottom-up Processing

According to expectancy-value theory (Fishbein & Ajzen, 1975), it makes sense that intimates' evaluations of their sexual relationship should predict their evaluations of their relationship as a whole. Expectancy value theory posits that people's evaluations of an object are a function of their beliefs, on average, about that object. Consequently, more positive beliefs

about the specific aspects of a relationship, such as the sexual aspect of that relationship, should lead to more positive evaluations of that relationship.

Theoretical perspectives of relationships are consistent with this expectancy-value framework (Lawrence & Byers, 1995; Rusbult, 1980; Thibaut & Kelley, 1959). According to social exchange theory (Thibaut & Kelley, 1959), for example, people evaluate their relationships by weighing their beliefs about the rewards of those relationships against their beliefs about the costs of those relationships. When intimates' beliefs about the rewards of a relationship exceed their beliefs about the costs of that relationship, people are more likely to be satisfied with that relationship. Conversely, when intimates' beliefs about the costs of the relationship exceed their beliefs about the rewards of that relationship, people are less likely to be satisfied with their relationship.

Empirical evidence is consistent with these ideas (McNulty & Karney, 2001; Neff & Karney, 2002 & 2005; Wills, Weiss & Patterson, 1974). Rusbult (1983), for example, reported that increasing rewards over time in a relationship predicted increases in satisfaction with that relationship. Specifically, undergraduates reported the rewards and costs in their romantic relationships over the course of an academic year. Rewards were positively associated with initial measures of satisfaction and commitment, as well as with changes in satisfaction and commitment.

Some empirical research suggests that intimates' perceptions of the quality of their sexual relationships may shape their evaluations of the quality of their relationships in the same way. Specifically, several longitudinal studies have predicted changes in relationship satisfaction from sexual satisfaction (Byers, 2005; Sprecher, 2002; Yeh et al., 2006). Using a sample of

established marriages from the Iowa Youth and Families Project (IYFP) who also completed follow-up measures as part of the Iowa Midlife Transitions Project (IMTP) in 2001, Yeh et al. (2006) demonstrated that sexual satisfaction predicted marital satisfaction over five waves of data collection spanning 1991 to 2000. Using a sample of community members and university alumni and employees in heterosexual couples, Byers (2005) measured sexual and relationship satisfaction at baseline and an 18-month follow-up among individuals who had been in a relationship for at least one year and found that sexual satisfaction predicted changes in relationship satisfaction. However, these findings were based on people who experienced decreases in relationship satisfaction from Time 1 to Time 2.

Nevertheless, other longitudinal research has failed to document links between initial sexual satisfaction and changes in relationship satisfaction. Sprecher (2002) conducted a longitudinal study on sexual and relationship satisfaction in premarital couples. Although sexual and relationship satisfaction were consistently positively associated, earlier sexual satisfaction did not explain any unique variance in later relationship satisfaction. Also, Henderson-King & Veroff (1994) were unable to find that sexual satisfaction at Time 1 (first year of marriage) predicted marital affirmation or tension at Time 2 (third year of marriage) in their sample of newlywed couples. Likewise, Byers (2005) was unable to find that sexual satisfaction predicts relationship satisfaction from baseline to the 18-month follow up for the overall sample and for people whose relationship satisfaction had increased.

Sexual and Relationship Satisfaction: Top-down Processing

In contrast to the idea that the cross-sectional associations demonstrated between sexual and relationship satisfaction stem from the influence sexual satisfaction has on global satisfaction,

there are theoretical perspectives that suggest the sexual and relationship satisfaction are correlated because greater relationship satisfaction leads to greater sexual satisfaction.

Specifically, theory and research in social cognition (Fiske & Taylor, 2008) suggest that general beliefs can shape specific perceptions. Research on perceptual confirmation (Miller & Turnbull, 1986), for example, demonstrates that people may selectively attend to and interpret events in a manner that is consistent with their prior beliefs and expectations.

Theoretical perspectives of relationships are consistent with this expectancy confirmation framework (Fincham, et al., 1995; McNulty & Karney, 2002 & 2004; Weiss, 1980). According to Weiss (1980), for example, couples may experience sentiment override in their relationships, such that intimates' overall evaluations of their relationships influence the way they evaluate the specific qualities of their relationships. When people are satisfied with their relationships, for example, they may rely on their positive evaluations of the relationship to evaluate the specific qualities of their relationships and thus evaluate those qualities more positively. When people are not satisfied with their relationships, in contrast, they may rely on their negative evaluations of the relationship to evaluate the specific qualities of their relationships and thus evaluate those qualities more negatively.

Empirical evidence is consistent with this possibility (Downey, Frietas, Michaelis & Khouri, 1998; Drigotas, Rusbult & Verette, 1999; McNulty & Karney, 2001, 2002, McNulty & Fisher, 2008; Murray, Holmes, & Griffin, 1996a & 1996b; Rusbult, Kumashiro, Stocker, Kirchner, Finkel, & Coolsen, 2005). Consistent with perceptual confirmation, for example, Murray and colleagues (1996a) reported that seeing one's partner through the lens of the rosier image of the ideal partner was positively associated with relationship satisfaction. Specifically,

heterosexual married and dating couples reported their perceptions of the interpersonal qualities of themselves, their partner, and their ideal partner, as well as their satisfaction with their relationship. People who were more satisfied with their relationship tended to rate their partners' attributes more positively than did people who were less satisfied with their relationship. Additionally, using multiple regression analyses, Byers (2005) found that relationship satisfaction predicted changes in sexual satisfaction. However, these findings were based on people who experienced increases in sexual satisfaction from Time 1 to Time 2.

Nevertheless, evidence that initial satisfaction with the relationship predicts subsequent evaluations of the sexual relationship is rather weak. First, two longitudinal studies failed to demonstrate a significant association between initial marital satisfaction and changes in sexual satisfaction. Although Yeh et al. (2006) demonstrated that initial sexual satisfaction predicted subsequent marital satisfaction, they failed to demonstrate that initial marital satisfaction predicted subsequent sexual satisfaction. Likewise, just as Sprecher (2002) was unable to demonstrate a significant association between initial levels of sexual satisfaction and subsequent relationship satisfaction, she was also unable to demonstrate a significant association between initial relationship satisfaction and subsequent sexual satisfaction. Further, Byers (2005) was unable to demonstrate that initial relationship satisfaction predicted subsequent sexual satisfaction for the entire sample or for people who experienced decreases in relationship satisfaction or increases in sexual satisfaction.

Critique of the Existing Research

There are several possible explanations for this limited evidence of the link between initial relationship satisfaction and changes in sexual satisfaction and the link between initial

sexual satisfaction and future sexual satisfaction. First, the two studies that failed to demonstrate effects of initial sexual satisfaction on future marital satisfaction or initial marital satisfaction on future sexual satisfaction (Henderson-King & Veroff, 1994; Sprecher, 2002) only analyzed sexual and relationship satisfaction at two time points. As Karney and Bradbury (1995) argued, however, such methods may fail to accurately model the actual change that takes place over the course of a relationship. Second, the one study that demonstrated the effect of initial sexual satisfaction on initial marital satisfaction but no effect of initial marital satisfaction on sexual satisfaction (Yeh et al., 2006) sampled from couples in established rather than new marriages. As Pasch and Bradbury (1998) note, however, studies of established marriages may fail to capture important variability in changes in relationship satisfaction, as nearly 20% of first marriages end in divorce during the first five years of marriage (Bramlett & Mosher, 2002). Finally, the one study that was able to find both that initial sexual satisfaction predicted subsequent relationship satisfaction and that initial marital satisfaction predicted subsequent sexual satisfaction only did so with subsets of the entire sample (Byers, 2005). The sample utilized in the study by Byers (2005) reported a wide range of relationship duration, from 1 to 35 years, and the majority of the sample, but not the entirety, was married. Newlywed samples provide the opportunity to study changes in these variables at time when change is most likely to occur (Pasch & Bradbury, 1998); hence studies employing newlywed samples may have an advantage in that couples are in similar stages of their relationships and are likely to capture change in satisfaction variables (Karney & Bradbury, 1997).

Gender Differences

There are both socio-cultural and biological reasons to expect women to rely on top-down processing more than men in determining their sexual satisfaction. Socio-culturally, Baumeister (2000) argued that women exhibit a higher erotic plasticity than men, such that their sexual attitudes and behaviors are more likely to vary with contextual factors, such as education level and religiosity. Biologically, Diamond (2003) argued that neural mechanisms of the sexual and attachment systems overlap more strongly among women than men. Specifically, Diamond describes evidence from research on non-human animals that oxytocin mediates attachment behaviors as well as sexual behaviors (Carter, 1992). Crucially, oxytocin's effects are estrogen dependent, suggesting that women, who are generally higher in estrogen than men, are biologically more likely to link sex and love. Consistent with the idea that women's cognitions may have a stronger influence on their evaluations of their sexual relationships than do men's, McNulty & Fisher (2008) recently reported that women's, but not men's, sexual satisfaction expectancies predicted changes in their sexual satisfaction over six months.

There are also reasons to expect men, more than women, to engage in bottom-up processing in determining their relationship satisfaction. Men tend to define sexual desire in terms of the physical pleasure it provides rather than the opportunity to connect intimately with a committed partner (Peplau, 2003). Also, men's sexual fantasies tend to be centered on fulfillment of lust, and as such contain depersonalized sexual objects and place less importance on the context and feelings of sexual interactions (Ellis & Symons, 1990). Consistent with this evidence, men tend to prefer sexual aids (e.g., pornography) that emphasize physical acts themselves over the contexts in which such interactions occur (Ellis & Symons, 1990). In agreement with the notion that men place more emphasis on the sexual aspects of the relationship when determining

satisfaction, McNulty & Fisher (2008) found that, for men, previous sexual satisfaction and changes in sexual frequency were significantly associated with later reports of sexual satisfaction, whereas women's sexual expectations predicted later reports of sexual satisfaction.

Overview

The present study aims to more clearly define the direction of the association between sexual satisfaction and relationship satisfaction. Specifically, we assessed marital satisfaction, sexual satisfaction, and sexual frequency eight times over approximately six-eight months intervals in a sample of 72 first-married newlywed couples. Newlyweds are an appropriate sample to employ due to the unique opportunity to study change in satisfaction, both sexual and relational, at a time where change is most likely (Henderson-King & Veroff, 1994; Karney & Bradbury, 1997). We tested the following predictions.

Hypothesis 1

Consistent with bottom-up processing, current levels of sexual satisfaction should predict future levels of marital satisfaction, controlling for current levels of marital satisfaction.

Hypothesis 2

Consistent with top-down processing, current levels of marital satisfaction should predict future levels of sexual satisfaction, controlling for current levels of sexual satisfaction.

Method

Participants

Participants were newly married couples from north-central Ohio. Couples were recruited using two methods. The first was to place advertisements in community newspapers in bridal shops offering payment to couples willing to participate in a longitudinal study of newlyweds.

The second was to send invitations to eligible couples who had completed marriage license applications in nearby counties. All couples responding to either solicitation were screened for eligibility in an initial telephone interview. Inclusion criteria included: (a) this was the first marriage for each partner, (b) the couple had been married less than 6 months, (c) each partner was at least 18 years of age, (d) and each partner spoke English and had completed at least 10 years of education (to ensure comprehension of the questionnaires). Eligible couples were scheduled to attend an initial laboratory session and mailed a packet of survey measures.

On average, husbands were 24.9 years old ($SD = 4.4$) and had completed 14.2 years ($SD = 2.5$) of education. Seventy-four percent were employed full time and 11% were full time students. Wives averaged 23.5 years ($SD = 3.8$) of age and had completed 14.7 years ($SD = 2.2$) of education. Forty-nine percent were employed and 26% were full time students. The average combined income of couples was less than \$35,000 per year. Reporting of race and religion was optional, and the great majority of those who reported this information were Caucasian and Christian.

Procedure

As part of a larger study on marriage, couples recruited for the study attended an initial laboratory session and completed a packet of questionnaires that contained a consent form approved by the local human subjects review board, self-report measures of marital satisfaction, sexual satisfaction, sexual frequency, satisfaction with specific qualities of the relationship other than sex, and neuroticism measures, and a letter instructing couples to complete all questionnaires independently of one another and to bring their completed questionnaires to their upcoming laboratory session. Couples were paid \$80 for participating in this phase of the study.

At approximately six- to eight-month intervals subsequent to the initial assessment, couples were re-contacted by phone and again mailed marital satisfaction, sexual satisfaction, sexual frequency, and relationship quality measures, along with postage-paid return envelopes and a letter of instruction reminding couples to complete forms independently of one another. After completing each phase, couples were mailed a \$50 check for participating.

Measures

Marital Satisfaction. Marital satisfaction was assessed every six months. To ensure that global sentiments toward the relationship were not confounded with sexual satisfaction (see Fincham & Bradbury, 1987), marital satisfaction was assessed with the Quality of Marriage Index (QMI; Norton, 1983). The QMI contains five items that ask spouses the extent to which they agree or disagree with general statements about their marriage (e.g., “We have a good relationship,” “My relationship with my partner makes me happy”) on a scale of 1 (“Very Strong Disagreement”) to 7 (“Very Strong Agreement”), and one item that asks spouses to answer the question “All things considered, how happy are you with your marriage?” on a scale of 1 (Very Unhappy) to 10 (Perfectly Happy). Thus the scores on the QMI could range from 6 to 45, with higher scores indicating greater relationship satisfaction. Internal consistency of this measure was high (coefficient alpha = .93 for husbands and .94 for wives).

Sexual Satisfaction. The degree of spouses’ sexual satisfaction was assessed with the Index of Sexual Satisfaction (ISS; Hudson, 1998). The ISS measures intimates’ satisfaction with their sexual relationships by asking them to indicate the extent to which 25 statements describe their current sexual relations with their partners (e.g., “I think that our sex is wonderful,” “Our sex is monotonous”) on a scale of 1 (none of the time) to 7 (all of the time). Responses to these

items were reversed when appropriate and summed to form an index of sexual satisfaction that ranged from 25 to 175, with higher scores indicating higher levels of sexual satisfaction. Internal consistency of this measure was high in the current sample (coefficient alpha = .92 for husbands and .93 for wives).

Sexual Frequency. Each spouse provided an estimate of the number of times they engaged in sexual intercourse over the past 30 days as well as the past six months. Sexual frequency was included as a control of particular interest to the top-down processing test.

Marital Quality. Because satisfaction with other, non-sexual aspects of the relationship are likely to also be associated with global marital satisfaction (McNulty, O'Mara & Karney, 2008; McNulty & Russell, 2010), we assessed and controlled for participants reports of the quality of the non-sexual domains of their relationships using a modified version of the Inventory of Marital Problems (IMP; Geiss & O'Leary, 1981). This version lists 18 non-sexual domains (e.g., money management, trust, making decisions, in-laws, showing affection, drugs and alcohol) and asks participants to rate each item on a scale from 1 (not a problem) to 11 (major problem). Spouses' ratings of each item were averaged to form an index of average problem severity that could range from 1 to 11. Given that spouses reporting one area of the relationship to be a problem should not necessarily be expected to report other areas of the relationship to be a problem, internal consistency is not reported.

Neuroticism. Because neuroticism is associated with both sexual and marital satisfaction (Fisher & McNulty, 2008), it was used as a control in all analyses. In order to measure participants' neuroticism, the neuroticism subscale of the Big Five Personality Inventory (BFPI; Goldberg, 1999) was used. This instrument consists of 10 statements with which the participant

indicates extent of agreement on a scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree), with higher scores indicating a greater degree of neuroticism. Sample items include “I get upset easily” and “I change my mood a lot.” Internal consistency was high (coefficient alpha was .90 for husbands and .88 for wives).

Overview of Data Analyses

Hypotheses were tested through 3-level growth curve modeling (Bryk & Raudenbush, 1987), using the HLM 6.08 computer program (Bryk, Raudenbush, & Congdon, 2004). Specifically, to examine whether initial sexual satisfaction predicted subsequent marital satisfaction through bottom-up processing, spouses’ reports of marital satisfaction at the next wave of measurement were regressed onto sexual satisfaction assessed at the previous wave of measurement in the first level of the model, controlling for month of assessment, marital satisfaction at the previous assessment, marital quality at the previous assessment, and frequency of sex reported over the intervening six month interval. Also, to examine whether initial marital satisfaction predicted subsequent sexual satisfaction through top-down processing, spouses’ reports of sexual satisfaction at the next wave of measurement were regressed onto marital satisfaction at the previous wave of measurement in the first level of the model, controlling for month of assessment, sexual satisfaction at previous assessment, marital quality at the previous assessment, and the frequency of sex reported over the intervening six month interval. In both analyses, neuroticism and a dummy code for sex were controlled in the second level of the model, and the non-independence of husbands’ and wives’ data was controlled in the third level of the model with a randomly varying intercept.

Results

Correlations among the variables are presented in Table 1. As can be seen there, own sexual and marital satisfaction were positively associated at every wave of data collection for both husbands and wives, with the exception that the correlation did not reach significance at Time 2 among husbands. Likewise, own reports of sexual frequency were positively associated with both husbands' and wives' sexual satisfaction, although more consistently among husbands. Interestingly, sexual frequency was not associated with marital satisfaction but was positively associated with sexual satisfaction at most time points. All cross-spouse correlations were significant for each wave of data collection, excluding the correlation between husbands' and wives' sexual satisfaction at Time 8.

Describing Trajectories of Satisfaction and Frequency

Descriptive statistics for marital satisfaction, sexual satisfaction, sexual frequency and marital quality at every assessment are presented in Table 2. As would be expected among newlyweds, both husbands and wives reported relatively high levels of marital satisfaction, sexual satisfaction, and sexual frequency, in the initial stages of the study, on average. Nevertheless, among both husbands and wives, both types of satisfaction as well as sexual frequency appeared to decline over the course of the study, on average. A paired-samples t-test indicated that wives ($M = 30.2$, $SD = 7.6$) reported higher levels of neuroticism than husbands ($M = 23.7$, $SD = 8.3$), $t(71) = 5.0$, $p < .001$).

The changes in marital and sexual satisfaction were estimated statistically through growth curve modeling (e.g., Bryk & Raudenbush, 1987). First, we estimated changes in marital satisfaction by estimating the parameters of the following first level of a 3-level model:

$$Y_{ij} \text{ (Future Marital Satisfaction)} = \pi_{0ij} \text{ (Intercept)} + \pi_{1ij} \text{ (Time)} + e_{ij}$$

[Equation 1]

Accordingly, Y_{ij} is the marital satisfaction of individual j at Time i ; π_{0ij} is the marital satisfaction of individual j at Time 0 (i.e., the initial satisfaction for individual j); π_{1ij} is the rate of linear change in marital satisfaction of individual j ; and e_{ij} is the residual variance in repeated measurements for individual j , assumed to be independent and normally distributed across spouses. This model can be understood as a within-subjects regression of an individual's marital satisfaction onto time of assessment, where time is defined as wave of assessment, the autocorrelation due to repeated assessments was controlled in the second level of the analysis, and the shared variance between husbands' and wives' data was controlled in a third level of the analysis. Notably, because trajectories could be computed for all spouses who participated in two or more assessments, all 144 individuals were included in the analyses.

Fitting the model to the data provided generalized least squares estimates of the average intercept and slope of marital satisfaction for participants and estimated the variances of these parameters using restricted maximum-likelihood estimates. Regarding the intercept, participants reported relatively high levels of marital satisfaction, on average ($B = 40.73$, $SE = 0.46$, $t(71) = 88.09$, $p < .001$, $r = .99$). Notably, husbands and wives do not differ in initial levels of marital satisfaction ($B = 0.21$, $SE = 0.54$, $t(142) = 0.39$, $p = .70$, $r = .03$). Regarding the slopes, the sample experienced systematic declines in marital satisfaction over time, on average. ($B = -0.08$, $SE = 0.02$, $t(71) = -5.02$, $p < .01$, $r = .51$). Again, husbands and wives do not differ in changes in marital satisfaction ($B = -0.01$, $SE = 0.01$, $t(142) = -0.34$, $p = .73$, $r = .03$). The goal of the primary analysis was to test the hypothesis that initial levels of sexual satisfaction accounted for some of the change in marital satisfaction that was captured by this model.

Next, we estimated changes in sexual satisfaction by estimating the parameters of the following

first level of a 3-level model:

$$Y_{ij} \text{ (Future Sexual Satisfaction)} = \pi_{0ij} \text{ (Intercept)} + \pi_{1ij} \text{ (Time)} + e_{ij}$$

[Equation 2]

Accordingly, Y_{ij} is the sexual satisfaction of individual j at Time i ; π_{0ij} is the sexual satisfaction of individual j at Time 0 (i.e., the initial sexual satisfaction for individual j); π_{1ij} is the rate of linear change in sexual satisfaction of individual j ; and e_{ij} is the residual variance in repeated measurements for individual j , assumed to be independent and normally distributed across spouses. This model can be understood as a within-subjects regression of an individual's sexual satisfaction onto time of assessment, where the autocorrelation due to repeated assessments was controlled in the second level of the analysis, and the shared variance between husbands' and wives' data was controlled in a third level of the analysis. All 144 individuals were included in this analysis as well.

Fitting the model to the data provided generalized least squares estimates of the average intercept and slope of sexual satisfaction for participants and estimated the variances of these parameters using restricted maximum-likelihood estimates. Regarding the intercept, participants reported relatively high levels of sexual satisfaction, on average ($B = 140.26$, $SE = 1.99$, $t(71) = 70.35$, $p < .01$, $r = .99$). As was the case with marital satisfaction, husbands and wives do not differ in initial levels of sexual satisfaction ($B = 1.28$, $SE = 2.52$, $t(142) = 0.51$, $p = .61$, $r = .04$). Regarding the slopes, the sample experienced systematic changes in sexual satisfaction over time, on average ($B = -0.205$, $SE = 0.06$, $t(71) = -3.94$, $p < .001$, $r = .42$). Also, husbands and wives do not differ in changes in sexual satisfaction ($B = 0.04$, $SE = 0.08$, $t(142) = 0.56$, $p = .58$, $r = .05$).

Does Initial Sexual Satisfaction Predict Subsequent Marital Satisfaction?

The first primary analysis tested the hypothesis that initial sexual satisfaction accounted for

subsequent marital satisfaction, controlling for initial marital satisfaction, the frequency of sex between initial and future reports of satisfaction, evaluations of specific aspects of the relationship other than sex, neuroticism, participant sex, and the extent to which both types of satisfaction changed over time due to various other factors. This hypothesis was evaluated by estimating the following equation in the first level of a 3-level model:

$$Y_{ij} \text{ (Marital Satisfaction at Next Assessment)} = \pi_{0ij} \text{ (Intercept)} + \pi_{1ij} \text{ (Time)} + \pi_{2ij} \text{ (Marital Satisfaction at Previous Assessment)} + \pi_{3ij} \text{ (Sexual Satisfaction at Previous Assessment)} + \pi_{4ij} \text{ (Previous Satisfaction with Specific Aspects of the Marriage Other than Sex)} + \pi_{5ij} \text{ (Frequency of Sex Between Assessments)} + e_{ij}$$

[Equation 3]

where neuroticism and gender were controlled in the second level of the model and the non-independence between husbands and wives data was controlled in the third level of the model.

The results of this analysis are reported in the first set of columns in Table 3. As can be seen there, initial levels of marital satisfaction were negatively associated with neuroticism, and marginally associated with current sexual satisfaction. But controlling for those associations, consistent with predictions, initial levels of sexual satisfaction were positively associated with future marital satisfaction. That is, in line with theories of bottom-up processing, initial satisfaction with the sexual relationship predicted subsequent satisfaction with the relationship in general, independent of the other qualities of the relationship.

Does the extent to which sexual satisfaction predicts marital satisfaction differ for men and women?

Given theoretical reasons why the association between initial sexual satisfaction and future marital satisfaction may differ across men and women, we next tested whether this association differed for men and women by entering a dummy code for sex to account for between person differences in the association at level 2. That analysis revealed that men and women did not differ in the extent to which sexual satisfaction predicts marital satisfaction ($B = 0.02$, $SE = 0.02$, $t(142) = 1.26$, $p = .21$, $r = .11$).

Does Initial Marital Satisfaction Predict Future Sexual Satisfaction?

The second primary analysis tested the hypothesis that changes in marital satisfaction accounted for changes in sexual satisfaction, controlling for initial sexual satisfaction, the frequency of sex between initial and future reports of satisfaction, evaluations of specific aspects of the relationship other than sex, neuroticism, participant sex, and the extent to which both types of satisfaction changed over time due to various other factors. This hypothesis was evaluated with the following first level of a 3-level model:

$$Y_{ij} \text{ (Sexual Satisfaction at Next Assessment)} = \pi_{0ij} \text{ (Intercept)} + \pi_{1ij} \text{ (Time)} + \pi_{2ij} \text{ (Marital Satisfaction at Previous Assessment)} + \pi_{3ij} \text{ (Sexual Satisfaction at Previous Assessment)} + \pi_{4ij} \text{ (Previous Satisfaction with Specific Aspects of the Marriage Other than Sex)} + \pi_{5ij} \text{ (Frequency of Sex Between Assessments)}$$

$$e_{ij}$$

[Equation 4]

where neuroticism and gender were controlled in the second level of the model and the non-independence between husbands and wives data was controlled in the third level of the model.

The results of this analysis are reported in the second set of columns in Table 3. As can be seen there, initial levels of sexual satisfaction were positively associated with future levels of sexual satisfaction, as was gender, neuroticism, and sexual frequency. But controlling for those

associations, consistent with predictions, current levels of marital satisfaction were positively associated with future sexual satisfaction. That is, consistent with top-down processing, independent of the sexual frequency of the relationship, the quality of the marital relationship predicted future satisfaction with the sexual relationship.

Does the extent to which marital satisfaction predicts sexual satisfaction differ for men and women?

Given theoretical reasons why the association between initial marital satisfaction and future sexual satisfaction may differ across men and women, we next tested whether this association differed for men and women by entering a dummy code for sex to account for between person differences in the association at level 2. That analysis revealed that men and women did not differ in the extent to which marital satisfaction predicts sexual satisfaction ($B = -0.12$, $SE = 0.31$, $t(142) = -0.40$, $p = .69$, $r = .06$).

Discussion

Study Rationale and Summary of Results

Sexual and relationship satisfaction have been connected in numerous cross-sectional studies (Byers, 1005; Henderson-King & Veroff, 1994; McNulty & Fisher, 2008; Sprecher, 2002; Yeh et al, 2006; Young et al, 1998). Nevertheless, prior research has been inconsistent in demonstrating the direction of that relationship. The current longitudinal study was the first to provide evidence for the bidirectional association between sexual satisfaction and relationship satisfaction. Specifically, initial sexual satisfaction predicted later marital satisfaction, controlling for concurrent marital satisfaction, and initial marital satisfaction predicted later sexual satisfaction, controlling for concurrent sexual satisfaction.

Interestingly, we were unable to find gender differences in either effect. Specifically, existing theory suggests that women may demonstrate stronger associations between initial relationship satisfaction and future sexual satisfaction, as they tend to rely more heavily on context especially when determining sexual satisfaction (Baumeister, 2000; Diamond 2003). In contrast, existing theory suggests that men may demonstrate stronger associations between initial sexual satisfaction and future marital satisfaction, as they tend to rely more strongly on their sexual relationships to evaluate their relationships (e.g., McNulty & Fisher, 2008). However, we were unable to find any gender differences in the likelihood to engage in top-down or bottom-up processing. Perhaps this is evidence for a lack of differences in the ways in which men and women evaluate their sexual and relationship satisfaction (Byers, 2005) as there is some evidence for the lack of gender differences in sexual behavior itself (Alexander & Fisher, 2003).

Theoretical and Practical Implications

The current findings have important theoretical and practical implications. Theoretically, our findings demonstrate the importance of considering both top-down and bottom-up processing in relationship development. Consistent with top-down processing, people did allow their sentiments toward their partner to spill over into their evaluations of specific sexual interactions, as demonstrated by the significant association between initial marital satisfaction and future sexual satisfaction. But consistent with bottom-up processing, people also based their evaluations of their relationship as a whole on their evaluations of specific sexual interactions, as demonstrated by the significant association between initial sexual satisfaction and future marital satisfaction. Previous research on relationship development has tended to consider the influence of one type of processes while neglecting the influence of the other. For instance, there has been

a focus on the reliance on positive illusions partners rely on and how those illusions allow partners to perceive a rosier image of their each other and their relationship (Murray et al., 1996b). Although such work helps us understand how and why relationship beliefs may be relatively stable, it does not provide much insight into why relationships change. In contrast, the interdependent nature of relationships have been confirmed in that the satisfaction partners hold with their relationship is a result of the kinds of behaviors partners exchange (Huston & Vangelisti, 1991). Although such work provides an understanding of how relationships may change, it provides little information about how partners' existing beliefs may influence the way they may perceive one another's behaviors.

Theories that provide the most comprehensive description of change and stability will be those that incorporate aspects of both top-down and bottom-up processing. Considering social exchange theory (Thibaut & Kelley, 1959), research typically tests that exchange variables lead to satisfaction. However, the findings presented here demonstrate that the reverse is also true, that satisfaction leads to the exchange variables themselves. Consistent with sentiment override (Weiss, 1980), it was certainly the case that people allowed their global sentiments to affect their specific ratings. But evidence was also found for the reverse direction of influence, that sexual satisfaction, a specific rating, affected marital satisfaction, a global evaluation. Importantly, the context of the relationship is a factor to consider in determining when it is beneficial to engage in top-down or bottom-up processing. Considering the context of problem severity, for couples who possess problem solving skills and face less severe problems in their relationship engaging in top-down processing, by holding more positive expectations (McNulty & Karney, 2004) or relying on benevolent attributions for their partner (McNulty et al., 2008), may be beneficial as

these couples have the ability to reach the goals that these positive thought processes provide. In contrast, for couples who have more severe problems addressing specific aspects of the relationship that are a matter of concern and engaging in bottom-up processing may be most beneficial (McNulty & Russell, 2010).

Practically, our findings may inform interventions with couples. If there are problems in the sexual relationship, practitioners may guide clients to focus on resolving problems in that area, which through bottom-up processing might improve the evaluation of the relationship as a whole. However, it could also be beneficial to advise couples to consider their overall relationship evaluations, which through top-down processing might improve evaluations of the sexual relationship. Indeed, Jacobson, Christensen, Prince, Cordova, and Eldridge (2000) propose that couples focus on the emotional responses to marital problems in addition to the problems themselves. This method of therapy, Integrated Behavioral Couples Therapy (IBCT), was developed out of the Behavioral Marital Therapy tradition (Jacobson et al., 2000). IBCT involves promoting acceptance of the partner and relationship problems in such a way that the acceptance becomes a building block for intimacy and closeness in the relationship. Jacobson et al. (2000) speculate that incorporating elements of acceptance may improve relationship satisfaction and may be more successful at bringing about spontaneous change in relationship problems than focusing work on the problems alone. By highlighting the emotional responses, or general sentiments, to marital problems while incorporating behavioral therapy techniques IBCT is a method of therapy that incorporates both bottom-up and top-down processing concerns.

Future Directions

Future work in this area may benefit by considering potential moderators of these associations. For example, partners who are motivated to remain married may be more likely to engage in top-down processing. Couples who are more religious may be less likely to leave their marriages as divorce conflicts with their beliefs (Glenn & Supancic, 1984). These individuals may be more motivated to seek out alternatives to divorce, such as couples counseling (Glenn & Supancic, 1984). Hence, these couples may benefit from engaging in top-down processing. If there are problems with specific aspects of their relationship, and divorce is not an option, allowing the positive sentiment about the marriage as a whole to influence specific aspects of the relationship may be most beneficial. Motivation and other potential moderators merit further investigation of top-down and bottom-up processing in relationships.

Strengths and Limitations

There are several strengths of this study worth noting. First, the use of a newlywed sample provides the possibility to study relationships at a time of significant change and adjustment. Thus, we have the opportunity to study change when it is occurring. Second, whereas the average rate of retention in prior longitudinal research on marriage is 69% (Karney & Bradbury, 1995), analyses in the current study were able to use data from 99% of the initial sample, reducing the likelihood that the results may have been influenced by biases due to attrition. Third, the fact that we have a large sample followed over a long period of time and that we used growth curve analysis to examine within and between person change strengthens confidence in these findings. Finally, that we controlled for factors of both marital and sexual satisfaction lowers potential confounds and provides a more conservative test of the effects.

Despite these strengths, several limitations restrict the current findings. First, while a newlywed sample provides a unique opportunity to study change the results reported here may not apply to other samples of married couples, i.e., more established marriages, or more distressed couples. However, these findings replicate and extend those of Yeh et al. (2006) who employed a sample of established marriages, so the results may be the same as found here. As partners are expected to reduce distress by restoring equity in their relationship (Sprecher, 1998) it would be interesting to see if they begin to employ the top-down approach in order to maintain or increase positive sentiments about their marriage. Second, the ability to detect gender effects may be more likely with a larger sample that would have provided more power. Specifically, the top-down effect for wives may have reached significance with a larger sample. Third, the sample is quite homogenous, 90% Caucasian and Christian, so the results may not generalize to other samples. Given the fact that romantic relationships, specifically marriages, differ from non-romantic relationships in that they involve sexual activity, we would expect to find similar results regardless of the cultural make up of the sample. However, in cultures where women have little power we may see more of a gendered divide in information processing; women may need to engage in more schematic processing as they have less control over certain marital behaviors, including sex (Holland, Ramazanoglu, Sharpe & Thomposn, 1994). Finally, even with the longitudinal nature and controls used in the analyses, the current findings are correlational and thus cannot support strong causal conclusions.

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APPENDIX

Table 1. *Correlations among Independent Variables.*

	<u>Time 1</u>			<u>Time 2</u>			<u>Time 3</u>			<u>Time 4</u>		
	1	2	3	1	2	3	1	2	3	1	2	3
Marital Satisfaction (1)	.407**	.536**	.072	.455**	.459**	.005	.398**	.331**	.111	.579**	.435**	.021
Sexual Satisfaction (2)	.489**	.405**	.280*	.179	.389**	.291*	.323*	.481**	.204	.288*	.495**	.118
Sexual Frequency (3)	.081	.291*	.645**	-.158	.345**	.482**	.072	.340*	.563**	.133	.520**	.689**
	<u>Time 5</u>			<u>Time 6</u>			<u>Time 7</u>			<u>Time 8</u>		
	1	2	3	1	2	3	1	2	3	1	2	3
Marital Satisfaction (1)	.390**	.347*	.172	.417**	.631**	.184	.507**	.559**	.054	.635**	.686**	-
Sexual Satisfaction (2)	.349**	.487**	.324*	.615**	.494**	.376*	.684**	.451**	.258	.671**	.524**	-
Sexual Frequency (3)	.069	.329*	.683**	.363	.620**	.679**	.125	.207	.288	-	-	-

Note. Wives' correlations appear above the diagonal, husbands' correlations appear below the diagonal, and correlations between husbands and wives appear on the diagonal in bold.

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

Marital Quality								
<u>Marital Quality</u>								
Husbands								
<i>M</i>	49.50	47.48	32.90	38.87	36.53	38.83	41.77	-
<i>SD</i>	37.68	31.13	30.87	35.35	34.99	38.57	35.61	-
<i>N</i>	72	60	68	54	51	41	44	-
Wives								
<i>M</i>	51.59	45.24	45.05	37.98	40.98	39.24	35.21	-
<i>SD</i>	37.11	28.66	48.51	28.72	39.25	37.84	33.46	-
<i>N</i>	71	66	60	58	54	41	43	-
<u>Marital Quality</u>								
Husbands								
<i>M</i>	3.07	3.12	3.04	3.02	3.14	2.72	2.74	2.75
<i>SD</i>	1.49	1.54	1.34	1.29	1.14	1.07	1.16	1.30
<i>N</i>	72	70	61	57	54	41	36	50
Wives								
<i>M</i>	2.94	3.03	2.96	3.13	3.02	2.94	2.76	2.82
<i>SD</i>	1.15	1.42	1.34	1.59	1.30	1.25	1.20	1.69
<i>N</i>	72	72	64	61	56	41	36	50

Table 3. *Trajectories of Satisfaction.*

Variables	<u>Change in Marital Satisfaction</u>		<u>Change in Sexual Satisfaction</u>	
	<u>B</u>	<u>r</u>	<u>B</u>	<u>r</u>
Intercept ^a	39.42	.99**	132.00	.99**
Gender ^b	0.35	.11	4.21	.29*
Neuroticism ^b	-0.08	.32**	-0.38	.37**
Time ^a	-0.03	.18	-0.01	.03
Current Marital Satisfaction ^a	0.13	.22	0.33	.23*
Current Sexual Satisfaction ^a	0.03	.28*	0.36	.64**
Marital Problems ^{c, d}	-0.41	.19	-0.49	.08
Sexual Frequency ^{c, d}	0.00	.07	0.12	.43**

Note. * $p < .05$, ** = $p < .01$. a $df = 71$. b $df = 141$. For changes in marital satisfaction, c $df = 564$. For changes in sexual satisfaction, d $df = 568$.

VITA

Carolyn Anne Wenner is an alumna of Bellevue Senior High School, in her hometown of Bellevue, Ohio. She completed her baccalaureate degree at the College of Charleston, in Charleston, SC. Post graduation she was employed by the Medical University of South Carolina as part of a nationally grant funded multi-site project researching alcoholism. In 2007 she entered graduate school at the University of Tennessee in the Experimental Psychology program, Social Psychology concentration, studying under James K. McNulty. Her research interests center around the study of marital relationships. Her interest in the study of marriage materializes into a number of specific areas, including, but not limited to, sexual satisfaction as well as gender role correlates in marital relationships, and intercultural marriages.