

Sexual and relationship satisfaction associated with shifts in dyadic trajectories of depressive symptoms in German couples across four years.

by

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Abstract

Depression is a pervasive mental health concern; thus, it is important to identify modifiable risk factors associated with reducing depressive symptoms across time. Using 1,946 married and cohabiting German couples assessed annually across 4 years from the Panel Analysis of Intimate Relationships and Family Dynamics (Pairfam) study, we tested if shifts across time in sexual satisfaction and relationship satisfaction were linked with expected shifts in trajectories of depressive symptoms using dyadic time-varying covariate growth models. For both men and women, higher sexual and relationship satisfaction scores across time were significantly associated with decreasing their own depressive symptom trajectories across time, but only relationship satisfaction was linked with a shift in their partners' trajectories of depressive symptoms. Potential clinical implications from these results include the treatment of depressive symptoms by making changes across time in their own relationship satisfaction and sexual satisfaction.

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Dedication

I would like to dedicate this thesis to my wife Ashley and my daughter Brinley.

Chapter 1 - Introduction

Depression is a prevalent mental health concern affecting over 15 million adults in 2014 (Center for Behavioral Health Statistics and Quality, 2015). Although depression symptoms vary in their severity, the majority of those with depression in 2014 experienced severe impairment to their ability to work and to their relationships (Center for Behavioral Health Statistics and Quality, 2015). Depression can negatively affect romantic relationships by taking an emotional toll on the relationship, hindering communication between partners, and creating uncertainty in the relationship (Sharabi, Delaney, & Knobloch, 2016). Concerning the ability to work, the economic cost of depression results in lower productivity and in absenteeism (Birnbaum, Kessler, Kelley, Ben-Hamadi, Joish, & Greenberg, 2010), which increased 24.5% between 2005 and 2010 to an estimated economic cost of \$210.5 billion in 2010 in the U.S. (Greenberg, Fournier, Sisitsky, Pike, & Kessler, 2015). Outside of economic cost, depression has a human cost as depression is closely linked with suicide (Hawton, Comabella, Haw, & Saunders, 2013). Internationally, depression has similar effects on German populations, such as resulting in an increasing economic cost (Kleine-Budde, Muller, Kawohl, Bramseseld, Mook, & Roosler, 2013) and lower physical and social functioning (Maske, Buttery, Bessdo-Baum, Riedel-Heller, Hapke, & Busch, 2016). Due to depression being a pervasive mental health concern, it is important to understand factors that may be associated with declining depressive symptoms.

Romantic relationships and romantic partners are important factors to consider as potential mechanisms associated with less depressive symptoms. Rewarding and positive areas of a romantic relationship, such as sexual satisfaction and relationship satisfaction, may be linked with less symptoms of depression (Beach, Katz, Brody, & Brody, 2003; Nicolosi, Moreira, Villa, & Glasser, 2004). There is ample evidence of the association between relationship satisfaction

and symptoms of depression (e.g., Whisman, 2001), and a small amount of research on the link between sexual satisfaction and depression (e.g., Ganong, & Larsoon, 2011). However, there are even fewer studies that investigate both sexual and relationship satisfaction with depressive symptoms and test these links dyadically across time.

The primary goal of this study was to identify among couples, if changes in scores of sexual satisfaction and relationship satisfaction across time were linked with expected shifts in their own (i.e., actor effect) and their partner's (i.e., partner effect) trajectories of depressive symptoms across 4 years. In other words, were important facets of the romantic relationship associated with changes in depressive symptoms? This was addressed using 1,946 German couples who participated in the Panel Analysis of Intimate Relationships and Family Dynamics (Pairfam) study. This study expands on previous research in two ways. First, this study examined both men's and women's reports of sexual satisfaction, relationship satisfaction, and depressive symptoms at five waves of assessment across 4 years. In this way, changes in trajectories of depressive symptoms across several years in both partners can be assessed. Moreover, covariates of shifts in these expected depressive symptom trajectories can be identified, yielding results that can shed light on innovative treatment and prevention methods of depression. Second, this study adds statistical rigor through the use of time-varying covariate growth models for both men's and women's depressive symptoms across 4 years. We expect that higher sexual and relationship satisfaction scores across time will covary with significant declines in their own and their partner's depressive symptom trajectories across time. These results have important clinical ramifications for the dyadic treatment of depression, and potentially reducing harmful consequences of depression.

Chapter 2 - Theory and Literature Review

Marital Discord Model of Depression

The Marital Discord Model of Depression (MDMD; Beach, Sandeen, & O'Leary, 1990) posits that improved marital or relationship satisfaction is an intervention for depression due to the link between relationship satisfaction and depression. This is because relationship discord and depression both share common symptoms; such as feeling discouraged about the future, disappointment about the relationship, loss of interest in a significant relationship, loss of social support, and isolation (Beach et al., 1990). Theoretically, how couples respond to the marital discord symptoms is directly associated with the depression symptoms worsening or improving. When couples respond to these symptoms with aggression, threats of divorce, criticism, and blaming, the depressive symptoms are expected to worsen. On the other hand, as couples respond to discord with support, closeness, acceptance, healthy coping strategies, and are able to be intimate with each other, the depressive symptoms are expected to decline. Therefore, clinical treatment of depression symptoms may include therapy designed to strengthen couples' relationships and facilitate closeness and connection between partners.

One potential way that couples can respond to marital discord is through intimacy, which includes sharing their innermost thoughts and feelings with each other (Beach et al., 1990). Intimacy can also be expressed in a relationship through sex because it is a shared activity between partners that—in some cases—creates a warm and emotional environment (Beech et al., 1990). In other words, the success of a couple can be a function of a couple's ability to have a warm, safe, and close emotional environment that can include sexual intimacy. It is important to note, however, that sex is not always an intimate experience that enhances the relationship, such as when sex is painful (Rubin & Campbell, 2011) or forced (Campbell & Soeken, 1999). In

many couples, however, a sexual relationship is a rewarding and bonding experience. Therefore, relationship satisfaction and sexual intimacy between partners are theoretically important components when treating depressive symptoms.

Theoretically, improvement in depressive symptoms should be associated with positive changes as couples respond to discord in warm, encouraging, supportive, and intimate ways. In addition, sexual intimacy is an important component to examine when treating relationship discord. The present study aims to investigate how these rewarding and positive aspects (i.e., sexual and relationship satisfaction) of a relationship are linked with shifts in both partners' depressive symptoms across time. Below is a review of the literature on trajectories of depressive symptoms, sexual satisfaction and depressive symptoms, and relationship satisfaction and depressive symptoms.

Trajectories of Depressive Symptoms

When examining depressive symptoms over time, trajectories of depressive symptoms may vary throughout the course of the lifespan (American Psychiatric Association, 2013; Musliner, Munk-Olsen, Eaton, & Zandi, 2016). A review of the literature revealed that changes in depressive symptoms vary over time by level of severity (i.e., low, moderate, high; Musliner et al., 2016). For example, a 23-year longitudinal study of the trajectory of depressive symptoms found that on average, people with low, moderate, and high levels of depressive symptoms declined over time (Cronkite et al., 2013). People with low and high severity levels of depressive symptoms declined slowly over the course of 23 years, whereas those people with moderate levels of depressive symptoms tended to decline more rapidly over the course of 23 years (Cronkite et al., 2013). Thus, on average, we expect in this study that levels of depressive symptoms will decline across time for both men and women.

Age groups. Existing research on the ways depressive symptoms change across the life span is mixed. For example, some scholars have noted that when looking at changes in depressive symptoms across the life span, depressive symptoms are fairly low until the early teens, which is followed by a linear increase up to middle age when it begins to slightly decline into older age (Kessler, 2007; 2010). Conversely, other scholars have observed that depressive symptoms were expressed similarly in several different age groups across the lifespan, rather than varying across the age groups (Mezuk & Kendler, 2013; Musliner, Munk-Olsen, Eaton, & Zandi 2016).

Sex differences. When examining trajectories of depressive symptoms, the literature revealed that depressive symptom trajectories for men and women were similar, with little difference by gender. However, a higher proportion of women reported greater severity of depressive symptoms in comparison to men (Musliner, et al., 2016). This pattern of more severe depressive symptoms across time in women was consistent within both middle-aged adults (Melchior et al., 2013) and older adults (Hsu, 2012; Montagnier, et al., 2014).

Sexual Satisfaction and Depressive Symptoms

Both sexual and relationship satisfaction are important components of a relationship (McNulty, Wenner, & Fisher, 2014) that may be linked to some extent in reducing depressive symptoms over time. Sexual satisfaction is an overall sense of how satisfied one is with their sex life, which is a key factor to one's overall quality of life and in one's marital relationship (Sanchez-Fuentes, Santos-Iglesias, & Sierra, 2014). Although, a variety of factors have been linked with depressive symptom trajectories (e.g., Campbell et al., 2007; Kuchibhatla et al, 2012), we were unable to identify any studies regarding to what extent sexual satisfaction was linked with depressive symptom trajectories. Despite the vast amount of research on sexual

satisfaction, much remains unknown about the link between sexual satisfaction and depressive symptoms. A cross-sectional study that addressed this link within a sample of older-aged adults, found that the actor effects or men's and women's own reports of higher frequency of sexual activity was uniquely associated with less depressive symptoms (Ganong, & Larsoon, 2011). This association remained, even when controlling for a number of relationship characteristics (Ganong, & Larsoon, 2011). Similarly, another cross-sectional study found that an increase in the number of sexual activities was a possible resiliency factor for men with depressive symptoms (Lorenz & Sari van Anders, 2014). In addition, higher reports of sexual satisfaction tended to be associated with reports of less severe depressive episodes (Nicolosi, Moreira, Villa, & Glasser, 2004). Conversely, one longitudinal study found sexual satisfaction to have the opposite effect. Specifically, higher levels of sexual satisfaction predicted higher reports of depression among women a year later (Peleg-Sagy & Shahar, 2013).

These studies provide a framework of supportive evidence that increased sexual satisfaction may be associated with lower levels of depression symptoms. Most of the existing studies examined these associations at a single time point with relatively small samples with only one partner reporting from the couple. The present study builds on this literature by longitudinally examining both partners' sexual and relationship satisfaction in association with changes across time in both partners' depressive symptoms.

Relationship Satisfaction and Depressive Symptoms

Relationship satisfaction refers to the overall level of satisfaction that one has toward his or her relationship with their partner. There is a sizable amount of research on the link between relationship satisfaction and depressive symptoms (Beach & Whisman, 2012; Whisman, 2001; Whisman, 2007; Whisman & Baucom, 2012). Particularly, through the lens of MDMD,

relationship satisfaction was linked with depressive symptoms (Fincham, Beach, Harold, & Osborne, 1997; Hollist, Miller, Falceto, & Fernandes, 2007; Wang, Wang, Li, & Miller, 2014).

Relationship satisfaction and trajectories of depressive symptoms have also been linked, specifically, relationship satisfaction “buffers” couples from depressive symptoms over time (Kouros & Cummings, 2010). Further, when looking at this relationship longitudinally, relationship satisfaction and depressive symptoms covary across time (Gustavson et al., 2012). More specifically, they found that improving relationship satisfaction was associated with positive changes in depressive symptoms (Gustavson et al., 2012). In addition, preliminary studies of clinical interventions for couples as a way to treat depression suggest early evidence that enhancing a couple’s relationship may be a protective factor for depression (Woods, Priest, & Denton, 2015; Denton, Wittenborn, & Golden, 2012). The present study aims to examine if relationship satisfaction scores from both partners across time are associated with expected shifts in their depressive symptom trajectories.

An important and statistically rigorous study examined if marital satisfaction predicted depressive symptoms in both the actor and partner effects of husbands and wives at two time points. They found that marital satisfaction was “a potential point of intervention for the prevention of depressive symptoms for both husbands and wives” (Beach, Katz, Brody, & Brody, 2003, p. 367). Although, the link between marital satisfaction and depression symptoms was significant for both wives and husbands (i.e., actor effects), they found that it was marginally stronger for the wives (Beach et al., 2003). When examining the cross-lag effects between husbands and wives, their earlier reports of marital satisfaction predicted reports of depressive symptoms in their spouse a year later (i.e., partner effects; Beach et al., 2003).

The association between relationship satisfaction and depression symptoms has also been examined cross-culturally in couples. When exploring the association between relationship satisfaction and depression among a Latino sample, it was found that marital satisfaction predicted depression 2 years later (Hollist, Miller, Falceto, & Fernandes, 2007). Among a sample of Chinese couples, husbands' and wives' reports of their own marital satisfaction significantly predicted their own depressive symptoms (Miller et al., 2013). Interestingly, they found inconsistent partner effects in that wives' marital satisfaction was predictive of husbands' depressive symptoms, but husbands' marital satisfaction did not predict wives' depressive symptoms (Miller et al., 2013). In a study of older Chinese couples, only husbands' reports of marital satisfaction was predictive of their wives' depressive symptoms (Wang, et al., 2014). The present study will expand the literature of international couples by investigating this association between relationship satisfaction and depression trajectories within German couples.

The Present Study

The aim of this study is to advance the study of changes in depressive symptoms across time by investigating the potential link among men's and women's reports of sexual and relationship satisfaction with their own and their spouse's reports of depressive symptoms across 4 years. We investigated actor and partner effects. For example, an actor effect is the association between women's own reports of relationship satisfaction and women's reports of depressive symptoms, whereas an example of a partner effect is the association between women's reports of relationship satisfaction with men's (i.e., their partner's) trajectories of depressive symptoms. Based on the literature and the MDMD, we aimed to test whether men's and women's reports of sexual and relationship satisfaction are associated with their own (i.e., actor effects) and their

partner's level (i.e., partner effects) of depression later on, we propose that among German couples:

Hypothesis 1. Higher scores on men's and women's levels of sexual satisfaction across time will be associated with a significant decline in their own depressive symptoms across time, while controlling for their current trajectory of depressive symptoms across 4 years.

Hypothesis 2. Higher scores on men's and women's levels of sexual satisfaction across time will be associated with a significant decline in their partners' depressive symptoms across time, while controlling for their current trajectory of depressive symptoms across 4 years.

Hypothesis 3. Higher scores on men's and women's levels of relationship satisfaction across time will be associated with a significant decline in their own depressive symptoms across time, while controlling for their current trajectory of depressive symptoms across 4 years.

Hypothesis 4. Higher scores on men's and women's levels of relationship satisfaction across time will be associated with a significant decline in their partners' depressive symptoms across time, while controlling for their current trajectory of depressive symptoms across 4 years.

To increase confidence in these results, and to rule out extraneous variation due to confounding variables also associated with depression, these hypotheses were tested while controlling for age (Jothika, Papan, & Rodney, 2011), education (Jinkook, 2011), relationship duration (Schmiederg, & Schroder, 2016; Notara et al., 2015), and religion (Blazer, 2012).

Chapter 3 - Methods

Procedure and Sample

These hypotheses were tested using a nationally representative German sample from the Panel Analysis of Intimate Relationships and Family Dynamics study (Pairfam; release 6.0; Brüderl, et al., 2015; Brüderl, et al., 2015). Pairfam was a long-term funded project by the German Research Foundation that was scheduled to conclude in 2022 with a total of 14 waves. The purpose of the Pairfam study was to collect data on a variety of individual, dyadic, and familial processes that cover key life transitions such as leaving home, partnership formation, and family development (Huinink, & Peter, 2014). To accomplish this purpose, in 2008, the baseline wave sampled three age cohorts: 1971-73, 1981-83, and 1991-93; by an anchor or focal participant and their respective partner(s), children, and parent(s). Anchors were annually interviewed by a computer-assisted interview, whereas partners were assessed annually but via a paper questionnaire that was returned through the mail. In 2008 at Wave 1, a total of 12,402 interviews were conducted with 3,743 of the romantic partners also assessed. Later, 2,688 2,940, 2,732, 2,529, and 2,367 partners returned their questionnaires at Waves 2, 3, 4, 5, and 6 respectively. Supplementary information regarding the methodology and data collection are available in Huinink, et al. (2011) and online at <http://www.pairfam.de/en/study.html>.

The focus of the present study was on the dynamics of couple relationships and depression, therefore, the sample was restricted to married and cohabiting couples with the same partner at each wave. In this way, we were able to study these associations within couples across time. This was accomplished by merging the anchor and partner responses of each wave together, and then merging Waves 2 through 6 together. Wave 1 was excluded because partners were not surveyed on these specific predictor and outcome variables until Wave 2. However,

control variables were assessed at the baseline, at Wave 1. Using these inclusion criteria, we limited our sample from a total sample size of 13,642 adult anchor participants, to only those 3,743 anchors with partners. We then limited the sample to couples who were in the same relationship (including married and cohabiting couples) across the 5 waves, which resulted in a sample size of 1,962 couples. Sixteen same-sex couples were then filtered out, which resulted in a final sample of 1,946 heterosexual couples.

The following sample characteristics were based upon participants' reports at the baseline wave. The average age of women were 31-years-old ($SD = 5.9$) with men reporting an average age of 34-years-old ($SD = 6.8$). The majority of participants (61%) were part of the first cohort (1971 -1973), while 36% were in the second cohort (1981 – 1983) and 3% were in the third cohort (1991 – 1993). On average couples reported being married or in a civil union for 9.17 years ($SD = 5.91$). The majority of the participants reported to be married (63.80%), 19.8% reported that they were cohabitating, and 12.5% that they were a couple but not currently living together (e.g. long distance relationship). The majority of the sample reported some religious affiliation. For women, 28.70% reported Catholicism, 30.30% reported German Protestant, 2.30% reported Islam, .10% reported Judaism, 2.70% reported another Christian religion, .70% reported another religion, and 23.20% reported being not religious. For men, 24.40% reported Catholicism, 23.80% reported German Protestant, 2.30% reported Islam, .10% reported Judaism, 2.30% reported another Christian religion, .50% reported another religion, and 24.40% reported being not religious. The sample was highly educated, 82.60% of women and 85.90% of men completed a 4-year college degree.

Measures

The current study investigated three key variables: depressive symptoms, sexual satisfaction, and relationship satisfaction, which were asked of both partners at all five waves. See Table 1 for descriptions of these three key variables. Note that these assessments were given in the German language, to German-speaking couples. For more information on these measures see Thonnissen, Wilhelm, Fiedrich, Alt, and Walper (2014).

Depressive symptoms. Five items, from the “State-Trait Depression Scales” were used to assess depressive symptoms (Spaderna, Schmukle, & Krohne, 2002). This scale was comprised of five items rated from 1 = *almost never* to 5 = *almost always*, that assessed negative mood in general. The items included (a) “my mood is melancholy,” (b) “I am depressed,” (c) “I am sad,” (d) “I am in desperation,” and (e) “my mood is gloomy.” A higher score corresponds with increased depressive symptoms. A unique depressive symptom variable was computed for men and women at each of the five waves by computing the mean from the items. The inter-item reliability for scales of women’s depressive symptoms was to .84, .85, .81, .86, and .83 for Waves 2, 3, 4, 5, and 6, respectively. The inter-item reliability for men’s depressive symptoms was .85, .81, .78, .87, and .83 for Waves 2, 3, 4, 5, and 6, respectively.

Sexual satisfaction. One item, based from the German version of the Relationship Assessment Scale was used to assess sexual satisfaction, which asked, “How satisfied are you with your sex life?” Respondents rated the item from (0) *very dissatisfied* to (10) *very satisfied*. A unique sexual satisfaction variable was created for men and women at each of the five waves.

Relationship satisfaction. One item from the German version of the Relationship Assessment Scale was used to assess the quality of the romantic relationship. The item asked, “All in all, how satisfied are you with your relationship?” Relationship satisfaction was also

Table 1: *Descriptives of Relationship Satisfaction, Sexual Satisfaction and Depressive Symptom Scales (N = 1,946 Couples)*

Variable	<i>M</i>	<i>SE</i>	Min	Max	Alpha
Women's Depression Symptoms W2	1.57	.01	1	5	.84
Women's Depressive Symptoms W3	1.57	.01	1	5	.85
Women's Depressive Symptoms W4	1.54	.01	1	5	.81
Women's Depressive Symptoms W5	1.54	.01	1	5	.86
Women's Depressive Symptoms W6	1.54	.01	1	5	.83
Women's Sexual Satisfaction W2	6.90	.06	1	10	-
Women's Sexual Satisfaction W3	6.72	.06	1	10	-
Women's Sexual Satisfaction W4	6.40	.07	1	10	-
Women's Sexual Satisfaction W5	6.56	.06	1	10	-
Women's Sexual Satisfaction W6	6.46	.06	1	10	-
Women's Relationship Satisfaction W2	8.16	.05	1	10	-
Women's Relationship Satisfaction W3	8.08	.05	1	10	-
Women's Relationship Satisfaction W4	7.80	.05	1	10	-
Women's Relationship Satisfaction W5	7.87	.05	1	10	-
Women's Relationship Satisfaction W6	7.73	.05	1	10	-
Men's Depressive Symptoms W2	1.47	.01	1	5	.85
Men's Depressive Symptoms W3	1.46	.01	1	5	.81
Men's Depressive Symptoms W4	1.42	.01	1	5	.78
Men's Depressive Symptoms W5	1.43	.01	1	5	.87
Men's Depressive Symptoms W6	1.45	.01	1	5	.83
Men's Sexual Satisfaction W2	6.65	.07	1	10	-
Men's Sexual Satisfaction W3	6.37	.07	1	10	-
Men's Sexual Satisfaction W4	6.14	.07	1	10	-
Men's Sexual Satisfaction W5	6.17	.07	1	10	-
Men's Sexual Satisfaction W6	6.08	.07	1	10	-
Men's Relationship Satisfaction W2	8.26	.05	1	10	-
Men's Relationship Satisfaction W3	8.14	.05	1	10	-
Men's Relationship Satisfaction W4	7.94	.05	1	10	-
Men's Relationship Satisfaction W5	7.89	.05	1	10	-
Men's Relationship Satisfaction W6	7.87	.05	1	10	-

rated from (0) *very dissatisfied* to (10) *very satisfied*. A unique relationship satisfaction variable was created for men and women at each of the five waves.

Controls. Age was assessed by age in years, education was measured by a binary question of whether they had completed a 4-year college degree or not, and religion was recoded to a binary question of whether they identified as religious (i.e., Catholic, German Protestant, Islam, Judaism, other Christian religion, and other religion) or not religious. For these controls, both the anchor and partner responses were merged then separated into men's and women's age, education, and religion. The anchor identified one of the three cohorts they belonged to: 1971-73, 1981-83, or 1991-93. Finally, the anchor also identified the number of months they were in a relationship with their partner.

Analytic Plan

The analytic plan was carried out in three steps. First, with the use of MPLUS 7.11, the trajectories of men's and women's depressive symptoms across 4 years were examined in two latent growth models tested separately due to the complexity of the model and the sample size. Linear rates of change and other rates of change were assessed, such as quadratic and piecewise trajectories to identify the best fitting model to represent how men and women change across time in depressive symptoms. The average intercept (i.e., initial level of depressive symptoms adjusting for measurement error) and slope (i.e., average trajectory of change in depressive symptoms across 4 years) was identified, and variation in these parameters assessed. Once this unconditional measurement growth model was tested, with good model fit representing the rate of change, predictors and control variables were added to create a conditional model to better understand potential predictors of these trajectories. Each partners' relationship satisfaction and sexual satisfaction was entered as predictors of depressive symptoms of each partner at each of

the five waves in a dyadic time-varying covariate growth model (see Figure 1). Relationship satisfaction and sexual satisfaction variables that were significantly associated with depressive symptoms at the various time points are understood as significantly associated with a shift in depressive symptoms, while controlling for the trajectory of depressive symptoms (see Figure 1).

Second, based from results of chi-square difference tests, certain direct effects were constrained to be equal (e.g., all actor-effects from women's relationship quality to women's depressive symptoms at the same wave of assessments at Wave 2, 3, 4, 5, and 6 were constrained to be equal). This allowed a more parsimonious and direct test of which variables from which partners were significantly linked with shifts in depressive symptoms across time.

Third, differences in magnitude of tested associations were further tested with chi-square difference tests; wherein we constrained certain pathways to be equal and examined a difference in chi-square for model fit. Significant chi-square difference tests were understood as a significant difference in the magnitude between the set of tested associations. This allowed a clearer understanding of differences in magnitude of the associations of the predictors to the outcomes.

In addition, good model fit was evaluated by a non-significant χ^2 , root mean square error of approximation (RMSEA) and standardized root mean square residual (SRMR) values less than .05, comparative fit indices (CFI) and Tucker-Lewis Index values greater than .95 (Kline, 2011). Furthermore, regarding the measures, responses of "don't know" and "I don't want to answer that" were coded as missing. To account for missing data, full-information maximum likelihood (FIML) estimation was used in MPLUS 7.11 (Muthen, & Muthen, 1998-

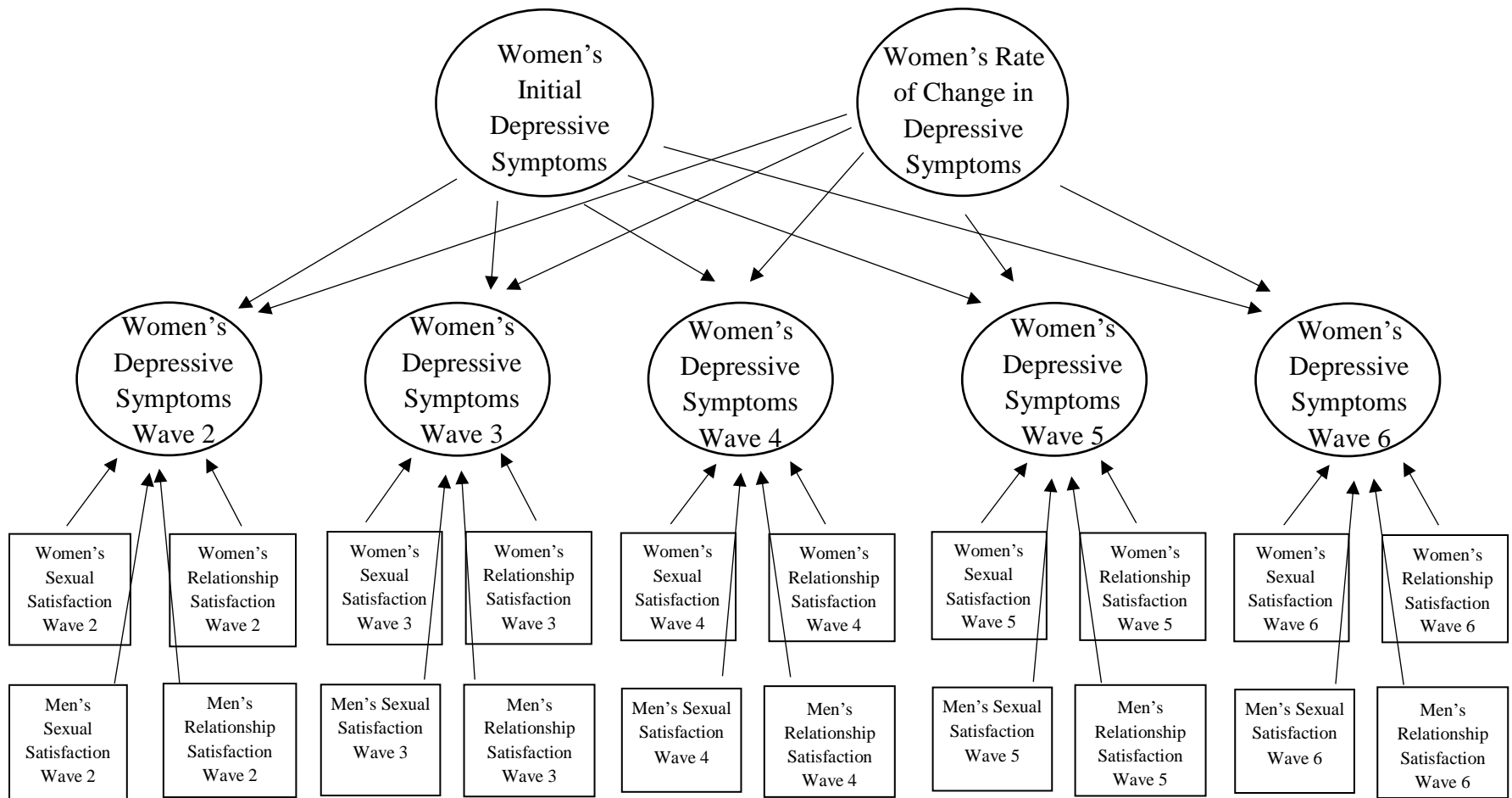


Figure 1: *Women's Time-Varying Covariate Growth Curve Model*

This illustrates the time-varying covariate growth curve model that tests if higher sexual and relationship satisfaction scores across time will be significantly associated with a significant shift in the expected trajectory of depressive symptoms for women. A model for men's trajectory of depressive symptoms was tested in like manner to this model. These models are patterned after the time-varying covariate dyadic growth curve model suggested by Kenny, Kashy, and Cook (2006).

2012), when testing the time-varying covariate growth models. FIML used all the observed information to create parameters of the maximum likelihood estimation for each missing observation (Acock, 2005). The implementation of FIML in the present study most adequately addressed missing data (Acock, 2005).

Chapter 4 - Results

Correlations

Correlations of the predictors and outcome variables revealed several important findings. First, women's and men's sexual satisfaction at each wave were significantly ($p < .01$) negatively correlated with women's depressive symptoms at nearly each wave. Second, women's and men's relationship satisfaction at each wave was significantly ($p < .01$) negatively correlated with women's depressive symptoms at each wave. Third, men's and women's sexual satisfaction at each wave was significantly ($p < .05$) negatively correlated with men's depressive symptoms at each wave. Finally, men's and women's relationship satisfaction at each wave was significantly ($p < .01$) negatively correlated with men's depressive symptoms at each wave. These correlations provide evidence of the interdependence in these variables, and the interdependence between partners.

Unconditional Growth Models

A linear rate of change in depressive symptoms was a good fit to the data for both men: $\chi^2(10) = 49.34, p < .05$; CFI = .99; TLI = .99, RMSEA = .05 (95% confidence interval [.04, .06]), and SRMR = .04; and women: $\chi^2(10) = 38.43, p < .05$; CFI = .99; TLI = .99, RMSEA = .04 (95% confidence interval [.02, .05]), and SRMR = .03. The women's unconditional growth model examined the initial levels of depressive symptoms and the rate at which depressive symptoms changed across 4 years. Women's initial level of depressive symptoms was 1.58 with depressive symptoms significantly decreasing at .01 units ($p < .01$) each year for 4 years. Furthermore, the variances were found to be significant ($p < .01$) for both the initial level and rate of change of women's depressive symptoms. The men's unconditional growth model revealed that men's initial level of depressive symptoms were 1.47 with men's depressive

symptoms significantly declining $-.01$ units ($p < .05$) each year for 4 years. The variances of men's initial level and rates of change were also significant ($p < .01$).

Time Varying Growth Curve Models

Women's depressive symptoms model. Next, we proceeded with creating a growth curve for women's depressive symptoms, adding time-varying covariates of men's and women's reports of sexual satisfaction and relationship satisfaction at each wave. This conditional model also revealed good fit to the data: $\chi^2(221) = 460.81, p < .05$; CFI = .94; TLI = .96, RMSEA = .03 (95% confidence interval [.02, .03]), and SRMR = .05. Based on known connections between these variables, and using the modification indices as a guide, we then correlated the error terms of women's Wave 4 depressive symptoms with the following error terms: men's Wave 4 relationship and sexual satisfaction, women's Wave 4 relationship and sexual satisfactions, women's Wave 5 depressive symptoms, and women's Wave 6 depressive symptoms. This resulted in improved model fit to the data; $\chi^2(215) = 438.72, p < .05$; CFI = .95; TLI = .97, RMSEA = .03 (95% confidence interval [.02, .03]), and SRMR = .05. Table 2 summarizes the results of the model.

Women's sexual satisfaction at each wave was entered as a predictor of women's depressive symptoms at the same wave. Each of these identical path coefficients were constrained to be equal, thus yielding identical estimates in these 5 path coefficients. This same pattern was followed with other predictors as well. Women's sexual satisfaction at each wave was significantly negatively associated with women's depressive symptoms at each wave ($b = -.02, p < .001, \beta = -.12$). More specifically, a one-unit increase in women's sexual satisfaction at each assessment was on average significantly associated with a .02 unit decrease in depressive symptoms in women's depressive symptoms, while controlling for the expected trajectory of

Table 2: *Unstandardized, Standardized, and Significance Levels for Men’s and Women’s Depressive Symptom Models (Standard Errors in Parentheses; N = 1946 couples)*

<i>Parameter Estimate</i>	<i>b (SE)</i>	<i>β</i>
Women’s Sexual Satisfaction → Women’s Depressive Symptoms	-.02(.003)**	-.12
Women’s Relationship Satisfaction → Women’s Depressive Symptoms	-.03(.003)**	-.15
Men’s Sexual Satisfaction → Women’s Depressive Symptoms	-.00(.003)	-.02
Men’s Relationship Satisfaction → Women’s Depressive Symptoms	-.02(.004)**	-.10
Men’s Sexual Satisfaction → Men’s Depressive Symptoms	-.01(.003)**	-.07
Men’s Relationship Satisfaction → Men’s Depressive Symptoms	-.03(.003)**	-.16
Women’s Sexual Satisfaction → Men’s Depressive Symptoms	.00(.003)	-.02
Women’s Relationship Satisfaction → Men’s Depressive Symptoms	-.02(.004)**	-.09

Note: In these two time-varying covariate growth models—see Figure 1—trajectories of women’s depressive symptoms and trajectories of men’s depressive symptoms were modeled in two separate growth curve models. Women’s and men’s relationship satisfaction and sexual satisfaction comprised the four predictors of depressive symptoms at each of the five time point in the growth model, while controlling for the trajectory of depressive symptoms. Instead of having 4 unique parameter estimates from each of the four predictors to depression at each of the five time points, for reasons of parsimony in answering the primary research questions, each of these four predictors were constrained to be equal with the same predictor at all five time points. Thus, there are only four predictors reported for trajectories of women’s depression, and there are only four predictors reported for trajectories of men’s depression. The first line of this table can be interpreted as a one-unit increase in women’s sexual satisfaction at each time point was significantly associated with a .02 unit decrease in women’s depressive symptoms at each time point, while controlling for the current trajectory of women’s depressive symptoms as well as cohort, relationship duration, women’s education, women’s age, and women’s religion.

* $p < .05$. ** $p < .01$ (two-tailed).

depressive symptoms, age, education, religion, cohort, and relationship duration. Alternatively, a one standard deviation unit increase in women's level of sexual satisfaction was linked with a .12 standard deviation unit decrease in women's depressive symptoms at Wave 2, 3, 4, and 5, while controlling for the current trajectory, age, education, religion, cohort, and relationship duration.

Similarly, women's relationship satisfaction was significantly and negatively associated with women's depressive symptom trajectories at each wave ($b = -.03$, $p < .001$, $\beta = -.15$). Also, men's relationship satisfaction was significantly and negatively associated with women's depressive symptom trajectories at each wave ($b = -.02$, $p < .001$, $\beta = -.10$). However, men's sexual satisfaction was not significantly associated with women's trajectories of depressive symptoms.

Furthermore, we tested the direct pathways to investigate the magnitude difference between women's relationship satisfaction and sexual satisfaction with their own trajectories of depressive symptoms. This revealed a significant difference in magnitude between the pathways of women's relationship satisfaction to their own trajectories of depressive symptoms and women's sexual satisfaction to their own trajectories of depressive symptoms ($\Delta \chi^2 (1) = 5.458$, $p < .05$). More specifically, women's relationship satisfaction was significantly more strongly associated with their own trajectories of depressive symptoms in comparison to the association of women's sexual satisfaction to their own trajectories of depressive symptoms. The predictor variables collectively explained approximately two-thirds of the variance in women's depressive symptoms scores across time at Waves 2, 3, 4, and 5 (i.e., 65%, 59%, 60%, 61%, and 68%, respectively).

Men's depressive symptoms model. The same growth curve model for men's depressive symptoms was then tested, with the same time-varying covariates added to the model.

This model adequately fit the data: $\chi^2 (215) = 418.61, p < .05$; CFI = .94; TLI = .97, RMSEA = .03 (95% confidence interval [.02, .03]), and SRMR = .05. In this model, we correlated the error terms of men's Wave 4 depressive symptoms with the following error terms: men's Wave 4 relationship and sexual satisfactions, women's Wave 4 relationship and sexual satisfaction, men's Wave 5 depressive symptoms, and men's Wave 6 depressive symptoms. Table 2 summarizes the results of the model.

Men's sexual satisfaction at each wave was entered as a predictor of men's depressive symptoms at the same wave. Each of these identical path coefficients were constrained to be equal (i.e., in the same manner as was done in the women's model), thus yielding identical estimates in the 5 primary path coefficients tested. This same pattern was followed with the other time-varying predictors as well. Men's sexual satisfaction at each wave was significantly and negatively associated with men's depressive trajectories at each wave ($b = -.01, p < .001, \beta = -.08$). For each respective wave, men's relationship satisfaction was significantly and negatively associated with men's depressive trajectories ($b = -.03, p < .01, \beta = -.16$). Women's relationship satisfaction at each wave was significantly and negatively associated with men's depressive trajectories at their respective wave ($b = -.02, p < .001, \beta = -.10$). Women's sexual satisfaction at each wave was not significantly associated, however, with men's depressive symptom trajectories at their respective waves.

Next, we tested the magnitude difference between men's relationship and sexual satisfaction with their own depressive symptoms. This revealed that the association between men's relationship satisfaction and depressive symptoms was significantly stronger than the association between men's sexual satisfaction and depressive symptoms ($\Delta \chi^2 (1) = 22.158, p <$

.05). The predictor variables explained substantial variation in men's depressive symptoms scores at Waves 2, 3, 4, and 5 (i.e., 72%, 58%, 58%, 66%, and 72%, respectively).

Robustness Check

Literature reveals a bi-directional relationship between relationship satisfaction and depressive symptoms (Peleg-Sagy & Shahar, 2013; Gustavson et al., 2012). Particularly, the stress generational theory (Hammen, 1991) posits that increasing distress from depressive symptoms may reduce men's and women's satisfaction in their relationship and sex life. Because of this, we conducted a robustness check of alternative models with information from the Pairfam dataset. Specifically, we ran similar time-varying covariate models for men's and women's relationship and sexual satisfaction trajectories, instead of men's and women's depressive symptom trajectories. These alternate models kept the same controls and switched men's or women's depressive symptoms with the men's or women's sexual or relationship satisfaction covariate that was being tested as the predictor. This was done to test the plausible model that the direction of effects may be reversed from how it was conceptualized in this study.

When examining men's and women's own responses (i.e., actor effects), higher depressive symptoms across time were linked with declining shifts in relationship satisfaction for men ($b = -.68, p < .01, \beta = -.16$) and women ($b = -.72, p < .01, \beta = -.18$). Depressive symptoms were also linked with declining shifts in sexual satisfaction for men ($b = -.44, p < .01, \beta = -.09$) and women ($b = -.55, p < .01, \beta = -.12$), albeit to a lesser extent. For the partner effects, higher depressive symptoms across time were linked with declining shifts in their partner's relationship satisfaction for men ($b = -.47, p < .01, \beta = -.10$) and women ($b = -.33, p < .01, \beta = -.09$). Men's and women's depressive symptoms were not significantly associated with shifts in their partners' sexual satisfaction.

In comparison to the results of alternative models to the present study models, the standardized estimates of depressive symptoms to relationship and sexual satisfaction were identical or within .02-.03 standardized units of each other. For example, men's depressive symptoms was associated with a declining -.16 standard units in men's relationship satisfaction at each wave while men's relationship satisfaction was associated with a declining -.16 standard units in men's depressive symptoms. Together the alternative models and present study models support a bi-directional relationship between sexual and relationship satisfaction with depressive symptoms. Therefore, caution should be taken when interpreting the direction of effects between these variables as evidence points towards the effects going from depressive symptoms to relationships, and from relationships to depressive symptoms.

Chapter 5 - Discussion

The present study investigated the link between men's and women's reports of sexual and relationship satisfaction with their own depressive symptom trajectories. Several important findings were revealed from the analyses. First, the initial levels of depressive symptoms for both women and men were low. On average, partners rated that they almost never experienced depressive symptoms. However women rated slightly higher initial levels of depressive symptoms than men. Then examining the depressive symptom trajectories, on average both men's and women's depressive symptoms slightly declined over the course of 4 years. Second, these trajectories of depressive symptoms for men and women were then tested to determine if scores in relationship satisfaction and sexual satisfaction across time from either partner were associated with significant shifts in these expected trajectories of depressive symptoms. The actor effects, that is, men's and women's own reports of relationship and sexual satisfaction was found to be linked with a shift in their own depressive trajectories. Third, relationship satisfaction—but not sexual satisfaction—was significantly linked with the depression trajectories of their partner (i.e., partner effect). Forth, for both men and women, the magnitude of the effect of the association between relationship satisfaction and a shift in depressive symptom trajectories was greater than the association between sexual satisfaction and a shift in depressive symptom trajectories. These findings corroborate the MDMD in supporting the link between relationship satisfaction and depressive symptoms provided by the MDMD. The analyses were completed while adjusting for age cohort, age, number of years married or in a civil union, religion, and education. These findings expand the literature by advancing research on the extent to which each partner's perception of the romantic relationship is linked with potential shifts and changes in depressive symptoms across time. These findings suggest that to a

small degree, changing course in depression trajectories for both partners may be a function of each partners' own perceived relationship satisfaction and sexual satisfaction.

Depressive Symptom Trajectories

Average trajectories of change in depressive symptoms decreased for both men and women. This corroborates with the Cronkite et al. (2013) study in that on average men's and women's trajectories of depressive symptoms also decreased over time. The rates of change differ, however, with the findings from Cronkite et al. (2013) in that for our sample the average rate of change in depressive symptoms was a slight or very small decrease over time. This may be due to different depression symptom measures as well as that this study examined German couples. Even though slight, our finding that women reported higher rates of depression symptoms than men is also consistent with the literature (Cronkite et al., 2013; Musliner et al., 2016).

Relationship Satisfaction and Sexual Satisfaction

From these findings, relationship satisfaction was found to "buffer" depressive symptom trajectories over time for both men and women, corroborating this link in other studies as well (Kouros & Cummings, 2010). These findings contribute to a small literature on relationship satisfaction and depressive symptom trajectories. In addition, these findings were consistent with the literature on the general link between relationship satisfaction and depressive symptoms (Beach et al., 2003; Gustavson et al., 2012). For example, these actor effects are consistent with a study on Chinese couples (Miller et al., 2013) where their own reports of relationship satisfaction were associated with their own depressive symptoms. Particularly, the partner effects are also consistent with some of the literature where both men's and women's reports of relationship satisfaction were associated with their partner's reports of depressive symptoms later on (Beach

et al., 2003). These findings on the link between relationship satisfaction and depressive symptoms contributes to the literature on trajectories of depression and expands the literature on depression.

The link between sexual satisfaction and depression trajectories is new, thereby contributing to this literature. This expands the literature on this link by suggesting that higher levels of sexual satisfaction is linked with less depressive symptom trajectories. This is important to understand that changes in sexual satisfaction are linked with shifts in trajectories of depressive symptoms. Comparing these results to the existing literature on the general association between sexual satisfaction and depressive symptoms reveal consistency where sexual satisfaction was associated with less depressive symptoms (Ganong, & Larsoon, 2011; Nicolosi, Moreira, Villa, & Glasser, 2004); and inconsistency with earlier research that found higher sexual satisfaction was associated with greater depressive symptoms (Peleg-Sagy & Shahar, 2013).

The previous literature examined cross-sectional links between sexual satisfaction and depressive symptoms, where our findings expands this link longitudinally and dyadically. Our significant actor effects were consistent with a previous study that found higher sexual activity was linked with lower depressive symptoms for both men and women (Ganong, & Larsoon, 2011), but this link held up across time in our study. To our knowledge, no other study examined partner effects of this link. Therefore, it is surprising that partner's reports of higher sexual satisfaction was not linked with depressive symptoms trajectories, but depressive symptoms was linked with partner's reports of relationship satisfaction. It is unclear why partner's sexual satisfaction was not linked with trajectories of depressive symptoms. As such more research is needed to investigate how sexual satisfaction and depressive symptoms are linked dyadically.

Our findings further revealed that for both men and women, relationship satisfaction has a greater magnitude on trajectories of depressive symptoms in comparison to their own reports of sexual satisfaction and depression symptoms trajectories. Although the analyses revealed a small difference in magnitude, a significant finding suggests that improved relationship satisfaction may be more relevant than sexual satisfaction in attempts to improve depressive trajectories. Interestingly this was consistent within both men's and women's analyses. Thus, improving one's perception of the relationship as a whole may have a greater association with managing depressive symptoms than specifically improving their perception of their sexual relationship. This encourages further research on sexual satisfaction and depressive symptoms, particularly, trajectories of depressive symptoms.

Finally, these analyses provide some support for the MDMD. Specifically, these findings suggest that enhancing a couple's relationship may be associated with less symptoms of depression. This is consistent with Hollist and colleagues (2007) study, in that greater reports of relationship satisfaction was associated with a decline in depressive symptoms. These studies are inconsistent, however, with the Wang and colleagues (2014) study that found no significance in this link. In addition, this study gives small evidence that enhanced intimacy in the couple's relationship is associated with less depressive symptoms. This finding expands the previous literature on MDMD by exploring this component of relationship satisfaction on German couples.

Clinical Implications

Depressive symptoms that one partner may experience (e.g., feeling sad, loss of interest in tasks, loss of appetite, and irritability) can have harmful effects to their relationship, especially when considering that depressive symptoms may persist over time. This can at times present

serious challenges for couples. One solution to this is for the depressed partner to seek out individual therapy (Burns, 1980). Although the partner's depressive symptoms may improve, their relationship may still experience residual challenges. Therefore couples therapy presents as another solution that treats the relationship distress by improving communication and intimacy between partners (Beach et al., 1990). There is early evidence that treatment targeted towards improving the couple's relationship can also treat depression (Denton, Wittenborn, & Golden, 2012; Woods, Priest, & Denton, 2015). Our results imply that the greater satisfaction men and women experienced across time was associated with shifts in lower depression symptoms.

Although, it may be common for mental health professionals to focus on the depressed partner, based on our findings we can speculate the benefits of utilizing interventions that enhance both partner's perspectives of the relationship. For example, solution focused brief therapy for couples (de Shazer et al., 2012; Marzieh, 2015) utilizes techniques that guide the couple to develop solutions that can improve their relationship. As couples implement these solutions, they often experience higher satisfaction in their relationship in a relatively short amount of time. As a result, they are more likely to experience less symptoms of depression. This approach differs from solely focusing on the depressed partner to perceive a more satisfied relationship. Furthermore, our findings suggest that partners play a role in improving depressive symptoms, and that a dyadic approach may be helpful. In other words, based on these results we encourage mental health professionals to help both partners to be more satisfied with their relationship as a mechanism for change in treating depression.

Frequently in therapy, helping a couple improve the sexual aspects of their relationship is relevant to the clinical process. Our findings denote that changes across time in sexual satisfaction was linked with small shifts in trajectories of depressive symptoms. Thus, clinical

interventions and focus on helping couples improve their sex life may not only benefit the marriage, but may also contribute to lowering depressive symptoms across time to a limited extent. However, in terms of effectiveness, our findings suggest that, on average, improving a couples' overall relationship satisfaction had a greater magnitude potential impact on depression than simply improving a couples' sex life. This can help mental health professionals be more effective in their sessions by first emphasizing an improvement in the overall relationship, prior to focusing improvement in the couple's sex life as a means to lower symptoms of depression. Finally, these findings may apply to couples across time, meaning the solutions couples create to have a more satisfied relationship is a pattern that can help them in reducing depressive symptoms as well.

Limitations

There are several limitations to these results. First, although links between sexual and relationship satisfaction and depression trajectories were significant, the estimates were small and correlational, not causal. Second, it should be noted that depressive symptoms and relationship satisfaction were generalized or global measures, whereas sexual satisfaction was a more specific measure. Specifically, relationship satisfaction could be considered the umbrella that encompasses sexual satisfaction. Third, in addition to changes in relationship quality and sexual satisfaction scores across time being linked with changes in depression, other unmeasured variables also changed, that could be driving the associations identified in this study. Finally, these data were collected from 2009 to 2013, which was several years preceding when these data analyses were conducted, thus, these results may be different when compared to modern-day German couples (Johnson & Anderson, 2015). As such, these results may not generalize to the U.S. and other populations.

Conclusion

Depression affects millions of people and many aspects of functioning and quality of life. A couple's relationship, however, may be an intervention point for treating depression. With two time-varying growth curve models, we found that higher relationship satisfaction and sexual satisfaction are linked with a declining shift in depressive symptom trajectories for both men and women. This expands the current literature on depression trajectories by linking it with sexual and relationship satisfaction. Clinical implications from these results point towards the possibility that healing romantic relationships may also be curative in healing depression.

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