

Relationship Adjustment, Depression, and Anxiety During Pregnancy and the Postpartum Period

Mark A. Whisman
University of Colorado at Boulder

Joanne Davila
Stony Brook University

Sherryl H. Goodman
Emory University

The associations between relationship adjustment and symptoms of depression and anxiety were evaluated in a sample of pregnant married or cohabiting women ($N = 113$) who were at risk for perinatal depression because of a prior history of major depression. Women completed self-report measures of relationship adjustment, depressive symptoms, and anxiety symptoms monthly during pregnancy and for the first six months following the birth of their child. Multilevel modeling was used to examine concurrent and time-lagged within-subjects effects for relationship adjustment and depressive and anxiety symptoms. Results revealed that (a) relationship adjustment was associated with both depressive symptoms and anxiety symptoms in concurrent analyses; (b) relationship adjustment was predictive of subsequent anxiety symptoms but not subsequent depressive symptoms in lagged analyses; and (c) depressive symptoms were predictive of subsequent relationship adjustment in lagged analyses with symptoms of depression and anxiety examined simultaneously. These results support the continued investigation into the cross-sectional and longitudinal associations between relationship functioning and depressive and anxiety symptoms in women during pregnancy and the postpartum period.

Keywords: pregnancy, depression, anxiety, married, marital, satisfaction

Poor marital functioning is associated with the onset, course, and treatment of depression (for a recent review, see Whisman & Kaiser, 2008). For example, it has been suggested that relationship stress and strain and poor relationship support and coping may increase the likelihood of subsequent depression (Beach, Sandeen, & O'Leary, 1990). In support of this perspective, longitudinal research has shown that poorer marital adjustment at baseline is associated with increases in depressive symptoms (e.g., Beach, Katz, Kim, & Brody, 2003) and onset of depressive disorders (e.g., Overbeek et al., 2006; Whisman & Bruce, 1999) at follow-up. Alternatively, it has been suggested that depression may contribute to poor relationship adjustment through increasing partner burden (e.g., Benazon & Coyne, 2000) or stress generated in a relationship (Davila, Bradbury, Cohan, & Tochluk, 1997). In support of this perspective, longitudinal research has shown that baseline depres-

sive symptoms are associated with later marital stress, which in turn is associated with subsequent depressive symptoms (Davila et al., 1997). Thus, relationship adjustment and depression have been shown to affect one another in a bidirectional, recursive fashion (Whisman & Uebelacker, 2009).

The perinatal period represents a particularly important time in which to study associations between relationship adjustment and depression in women. Depression during pregnancy and the postpartum are common. The average prevalence of depression in the postpartum based on the results of a large number of studies is 13% (O'Hara & Swain, 1996), which is approximately 1.5 times the 12-month prevalence of depression among women based on population-based community samples (e.g., Kessler et al., 2003). Similarly, depression during pregnancy is at least as common as during the postpartum period (Evans, Heron, Francomb, Oke, & Golding, 2001). Furthermore, following the birth of a child there is a reliable, albeit relatively small, decrease in marital adjustment (for a meta-analytic review, see Twenge, Campbell, & Foster, 2003). Thus, examining associations between relationship adjustment and depression during the perinatal period is compelling.

There are a large number of studies that have evaluated the cross-sectional association between relationship adjustment and depressive symptoms following childbirth. For example, meta-analytic studies evaluating the association between relationship adjustment and postpartum depressive

This article was published Online First May 9, 2011.

Mark A. Whisman, Department of Psychology and Neuroscience, University of Colorado at Boulder; Joanne Davila, Department of Psychology, Stony Brook University; Sherryl H. Goodman, Department of Psychology, Emory University.

Correspondence concerning this article should be addressed to Mark A. Whisman, University of Colorado at Boulder, Department of Psychology and Neuroscience, 345 UCB, Boulder, CO 80309-0345. E-mail: mark.whisman@colorado.edu

symptoms have reported weighted mean effect sizes ranging from .35–.39 (Beck, 1996, 2001). However, there have been fewer studies that have evaluated the prospective association between relationship functioning and depression during this time. The studies that have been conducted suggest that poorer relationship functioning during pregnancy is associated with greater likelihood of postpartum depression, measured in terms of depressive symptoms (e.g., Hock, Schirtzinger, Lutz, & Widaman, 1995; Milgrom et al., 2008) and depression diagnosis (e.g., Gotlib, Whiffen, Wallace, & Mount, 1991); poorer relationship functioning following the birth of a child has also been shown to predict onset of major depression during the postnatal period (Boyce & Hickey, 2005). A meta-analysis of risk factors for postpartum depression found a small but statistically significant negative association between relationship adjustment and incidence of postpartum depression (O'Hara & Swain, 1996).

The present study was designed to build on prior studies that have evaluated the longitudinal association between relationship adjustment and depressive symptoms among women during the perinatal period. Specifically, this study expands on prior research in several ways. First, most studies have evaluated the association between relationship functioning and depressive symptoms during the postpartum period. However, depression occurs as frequently during pregnancy as in the postpartum (Evans et al., 2001) and has been shown to be an important predictor of postpartum depression (Milgrom et al., 2008). Although relationship adjustment was found to be associated with depressive symptoms during pregnancy (e.g., Escribè-Agüir, Gonzalez-Galarzo, Barona-Vilar, & Artazcoz, 2008), we are not aware of any longitudinal research that has evaluated the prospective association between relationship adjustment and depressive symptoms during pregnancy.

Second, whereas prior studies on the longitudinal association between relationship adjustment and depressive symptoms during the perinatal period have relied on between-subjects analyses for examining longitudinal effects, the present study used within-subject analyses. Within-subject analyses first estimate the model of change for each variable, and then estimate within-subject associations between changes in one variable and changes in the other variable, controlling for the trajectory of each variable. Results from prior studies using these methods in community samples have found that changes in relationship adjustment and changes in depressive symptoms covary within individuals; at times when an individual's relationship adjustment is lower than usual, that individual's depressive symptoms tend to be higher (e.g., Davila, Karney, Hall, & Bradbury, 2003; Karney, 2001; Whitton, Stanley, Markman, & Baucom, 2008). Furthermore, to examine whether changes in relationship adjustment precede changes in depressive symptoms or if changes in depressive symptoms precede changes in relationship adjustment, temporal relations between variables can be examined by conducting time-lagged analyses. In the one within-subjects study that evaluated the time-lagged effects of relationship adjustment and depressive symptoms in a community sample of women, there

were no significant associations (Whitton et al., 2008). However, the assessments were conducted weekly, which may not have allowed sufficient time between assessments for these variables to effect one another.

Third, the current study builds on prior research that has evaluated the longitudinal association between relationship adjustment and depressive symptoms during the perinatal period by examining anxiety symptoms as well as depressive symptoms. Although there are few theoretical models developed to specifically address anxiety and interpersonal functioning in general and relationship functioning in particular, it has been proposed that many of the interpersonal and relationship models developed for depression may also apply to the potential association between relationship functioning and anxiety (Whisman & Beach, 2010). This perspective is supported by prior research involving community samples, which has shown that marital adjustment is concurrently (Whisman, 2007) and prospectively (Overbeek et al., 2006) associated with anxiety disorders, and that anxiety symptoms predict decline in marital adjustment over time (Dehle & Weiss, 2002). However, we are not aware of any longitudinal research on relationship adjustment and anxiety symptoms during the perinatal period. Furthermore, it is well established that depression often co-occurs with other disorders (e.g., Kessler et al., 2003), particularly anxiety symptoms and disorders (for a recent review, see Watson, 2009). Because of these high rates of comorbidity, it is possible that any observed association between relationship functioning and depression could be due to co-occurring conditions. Results from research conducted on the specificity of the associations between relationship functioning and depression suggests that when controlling for symptoms of anxiety, marital adjustment continues to be significantly associated with depressive symptoms (Whisman, Uebelacker, & Weinstock, 2004). However, we are not aware of any longitudinal studies that have evaluated the specificity of the association between relationship adjustment and depressive symptoms versus anxiety symptoms.

Finally, the present study builds on prior studies that have evaluated the longitudinal association between relationship adjustment and depressive symptoms during pregnancy and the postpartum period by focusing on a group of women at high risk for perinatal depression, defined in terms of a history of major depression. The risk of postpartum depression is high among women with histories of depression, with estimates ranging from 25% to 50% (Alshuler, Hendrick, & Cohen, 1998). Researchers have found differences in risk factors associated with first onset versus recurrences of depression (e.g., Stroud, Davila, & Moyer, 2008). However, with some exceptions (e.g., Overbeek et al., 2006), most studies on relationship functioning and depression have not distinguished between first incidence of depression and recurrence of depression. By limiting our sample to women with a history of depression, we were able to narrow our focus to evaluating changes in (i.e., recurrences of) symptoms of depression among women at risk and to selectively focus on this important group of women.

In summary, the present study was designed to evaluate within-subject associations between relationship adjustment, depressive symptoms, and anxiety symptoms during pregnancy and the postpartum period in a sample of women with a history of major depression. Participants were evaluated monthly during pregnancy from the time of their entry in the study through the first six months following the birth of their child. We predicted bidirectional within-subject effects for relationship adjustment and symptoms of depression and anxiety (i.e., we predicted that changes in relationship adjustment would be associated with deviations from the trajectories of both depressive symptoms and anxiety symptoms, and that changes in depressive symptoms and anxiety symptoms would be associated with deviations from the trajectory of relationship adjustment). We also evaluated time-lagged effects for these variables, to examine whether relationship adjustment or symptoms assessed at time t were associated with changes in symptoms or relationship adjustment at time $t + 1$. We predicted bidirectional within-subject lagged effects between relationship adjustment and symptoms (i.e., we predicted that changes in relationship adjustment would predict subsequent deviations from the trajectories of both depressive and anxiety symptoms, and that changes in depressive and anxiety symptoms would be associated with subsequent deviations from the trajectory of relationship adjustment).

Method

Participants

Inclusion/exclusion criteria. As discussed in greater detail by Goodman and Tully (2009), the primary inclusion criterion was women having met *DSM-IV* criteria for at least one episode of major depression prior to the pregnancy. Further, to be eligible, women must have been pregnant, in a stable living situation, having an uncomplicated pregnancy (e.g., no major medical risks), between the ages of 19 and 40, no more than six months pregnant, and either European American or African American (the major racial/ethnic groups in the geographic area from which we recruited). Women were excluded if they were actively suicidal, met diagnostic criteria for organic mental disorders, substance use disorders, schizophrenia, psychotic disorders, or bipolar disorder, or had a positive urine toxicology screen for drug or alcohol use. The inclusion/exclusion criteria were selected to allow a focus on depression as the primary construct of interest relative to sociodemographic hardships and severe comorbid disorders.

Eligibility. Women were recruited from obstetrical/gynecologists' offices (64.2%) and through media announcements (35.8%). Eligibility was determined using a two-stage process. First, women were interviewed by phone to evaluate inclusion/exclusion criteria. A brief depression screen was used to reveal whether they were likely to have ever experienced a depression episode. The depression screen consisted of two questions from the Diagnostic Interview Schedule (Robins, Helzer, Croughan, & Ratcliff, 1981), asking about lifetime depressed mood and anhedo-

nia. These two items have high sensitivity as screeners for depression, from .83 to .94 across samples (Post, Burnam, & Smith, 1993). Second, following informed consent, eligible women were administered the Structured Clinical Interview for *DSM-IV* (SCID; First, Spitzer, Gibbon, & Williams, 2002) to determine that they met diagnostic criteria for at least one lifetime episode of major depression. In this manner, we avoided multiple potential biases: (1) the inherent biases of recruiting women who self-identify as being depressed; (2) self-selection biases in terms of identifying oneself as having been depressed; and (3) biases of access to care, if one recruits a sample being treated for depression, given that only a minority of pregnant women with depression seek treatment (Marcus, Flynn, Blow, & Barry, 2003).

The current results are based on data from 113 women. Women's pregnancies were between 6 and 27 weeks of gestation at enrollment ($M = 17.09$, $SD = 4.88$). Nearly half (49.4%) were in the first trimester of their pregnancy, 21.7% were in their fourth month, 24.1% in their fifth month, and 4.8% in their sixth month. Participants were broadly of middle socioeconomic status, had a mean age of 29.90 years ($SD = 5.15$; range = 19–42), had a median household income of between \$66,000 and \$70,000 (range \$10,000 to more than \$100,000), and 74% were married, 68.3% were college graduates, 31.4% were Black, and 68.6% were White.

Measures

Structured Clinical Interview for DSM-IV-TR Axis I Disorders, Research Version, Patient Edition (SCID-I/P; First et al., 2002). The SCID-I/P was used to determine women's eligibility for the study. All interviews were conducted by master's level clinicians, a psychiatric nurse, or a social worker, and audiotaped. A licensed clinical psychologist, blind to other information on the participants, listened to all interviews and independently derived diagnoses. Diagnostic decisions ultimately were made by a licensed clinical psychologist based on discussion with the interviewer, a survey of written notes of responses to interview questions, and a review of the tape-recorded interview.

Beck Depression Inventory – Second Edition (BDI-II; Beck, Steer, & Brown, 1997). The BDI-II is a 21-item self-report scale assessing the intensity of depressive symptoms in the previous two weeks; higher scores reveal more severe levels of depression symptoms. There is evidence for its reliability and consistency in clinical and nonclinical samples (e.g., Steer, Ball, Ranieri, & Beck, 1997; Whisman, Perez, & Ramel, 2000). The BDI-II also serves well as a screening test for depression during pregnancy and postpartum (e.g., Steer, Scholl, & Beck, 1990; Su et al., 2007). Coefficient alpha in the current study ranged from .74 to .96.

State-Trait Anxiety Inventory (STAI; Spielberger, Gorsuch, & Lushene, 1970). We used the 20-item state scale of the STAI as a continuous measure of state anxiety. Scores range from 20 to 80, with higher scores indicating greater anxiety. The STAI has adequate concurrent validity and internal consistency (Spielberger et al., 1970). Coefficient alpha in the current study ranged from .89 to .97.

Dyadic Adjustment Scale (DAS; Spanier & Filsinger, 1983).

The women completed the 7-item short form of the DAS (i.e., the DAS-7; Sharpley & Rogers, 1984), which assesses adjustment in married or cohabiting couples' relationships. The scale yields an overall score with a range from 0 to 36. Higher scores indicate greater adjustment. The DAS-7 has demonstrated good criterion-related and construct validity and has high internal consistency. Coefficient alpha in the current study ranged from .78 to .92.

Procedure

As discussed in greater detail by Goodman and Tully (2009), the longitudinal design of the study involved data collection each month from enrollment through delivery and continuing until six months following delivery. Overall, sample attrition was minimal but 78.8% of women missed one or more visits or specific measures within particular months.

Data Analyses

Data were analyzed using multilevel modeling (MLM). Analyses were conducted as 2-level models (repeated measures within participants) using SPSS Mixed. TIME was coded from 0 (T0—the first month of pregnancy) to 14 (T14—the sixth month postpartum) allowing the intercept to represent T0. Both time-varying continuous variables (BDI-II, STAI, and DAS-7) and time-invariant continuous variables (e.g., participant age, length of relationship, and number of months pregnant at study entry) were grand mean centered. The intercept and time-varying predictor variables (except for TIME) were specified as random with unstructured (UN) covariance structure (except in cases of model nonconvergence as noted below). The time variable was specified as repeated with first-order autoregressive (AR1) covariance structure. All predictors were centered variables; outcomes were uncentered variables. Concurrent analyses

were conducted to examine associations between variables at the same time points. Lagged analyses were conducted to examine changes from time point to time point. For example, we predicted BDI-II at time $t + 1$ from DAS-7 at time t , controlling for BDI-II at time t . Although MLM handles missing data well, because there were relatively few participants who were evaluated during the first two months of pregnancy, we reran the analyses dropping these two time points; results were similar to those reported.

As described in the sections to follow, a number of models failed to converge when specified as described above. In those cases, we followed the recommendations of Garson (2009; see also Starr & Davila, 2011) to attempt to reach convergence. First, we changed model estimation parameters (e.g., allowed additional iterations). In no case did this resolve the problem, so this strategy was not used. Second, we changed the covariance structure for random effects from UN to diagonal (DIAG), which is a simpler structure. In all cases, this either resolved the problem on its own or did so when used with the third strategy, which was to drop random effects that approached zero. In all cases, doing so led to model convergence. Moreover, in all cases, the respecified models produced results parallel to the models that did not converge (models that included all random effects with UN covariance structure). As such, we have confidence in the respecified models.

Results**Preliminary Analyses**

The means and standard deviations of the BDI-II, STAI, and DAS-7 at each time point are presented in Table 1. On at least one assessment over the course of the study, 63.7% of the sample scored > 11 on the BDI-II, which is an optimal cutoff for identifying major depressive disorder during pregnancy (Su et al., 2007); 63.7% of the sample scored > 40 on the STAI, which is one standard deviation

Table 1
Means and Standard Deviations of the BDI-II, STAI, and DAS-7 at Each Time Point

Time	BDI-II			STAI			DAS-7		
	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>
T0	11.66	10.02	3	32.00	13.11	3	26.00	6.25	3
T1	10.27	4.67	15	34.00	11.98	15	26.00	6.23	14
T2	11.87	7.04	46	34.86	9.33	44	25.55	5.01	47
T3	9.05	6.75	60	33.85	10.20	59	25.84	4.42	62
T4	9.21	6.81	75	34.91	11.11	70	25.20	5.12	72
T5	8.60	5.87	79	32.87	9.93	71	25.76	5.81	76
T6	8.49	6.14	76	33.20	10.01	75	25.93	6.21	76
T7	8.71	5.58	68	34.96	10.29	67	25.39	6.14	70
T8	8.28	5.50	47	33.45	10.15	44	27.11	4.70	46
T9	9.45	6.17	79	36.71	11.60	78	25.42	6.62	78
T10	7.70	5.80	77	33.72	9.84	72	24.66	5.66	74
T11	7.16	5.82	77	34.88	11.06	74	24.68	6.15	79
T12	6.59	6.08	76	33.49	11.25	68	25.27	5.90	74
T13	6.72	6.12	77	35.09	11.96	69	24.95	6.02	75
T14	5.85	6.20	76	34.74	12.00	76	29.42	6.19	76

Note. BDI-II = Beck Depression Inventory—Second Edition; STAI = State-Trait Anxiety Inventory; DAS-7 = Dyadic Adjustment Scale.

above the general population mean on the STAI (Knight, Waal-Manning, & Spears, 1983); and 31.0% of the sample scored <22 on the DAS-7, which is the optimal cutoff for defining relationship distress (Funk & Rogge, 2007).

Baseline models. In prior research, relationship adjustment has tended to show linear change, whereas depressive symptoms have best been described by a mean and variance model (e.g., Davila et al., 2003; Karney, 2001; Whitton et al., 2008). Examination of the means over time in the present data suggested that the BDI-II shows a general decrease over time, the STAI fluctuates over time with no specific trajectory, and the DAS-7 shows a general decrease followed by an increase over time, particularly at the last time point. Given these potential trajectories, baseline models examining mean/variance, linear, and quadratic models of change were examined for each variable. To determine the best fitting models, we compared Akaike's Information Criterion (AIC) and Schwarz's Bayesian Criterion (BIC) across the three models for each variable. Models with the smallest AIC and BIC were chosen as best fitting. Results are shown in Table 2. As shown, for the BDI-II, the best fitting model included the linear term only, which was then included in all models predicting the BDI-II. For the STAI, the mean/variance model provided the best fit. As such, only the intercept was included in models predicting STAI. For the DAS-7, the best fitting model included both the linear and quadratic terms. Therefore, both were included in models predicting the DAS-7.

Control variables. Analyses were run to determine if any of the following variables were associated with the BDI-II, STAI, or DAS-7: participant age, race (Caucasian = -1, African American = 1), type of relationship (married = 1; not married = -1), length of relationship, first child (yes = 1, no = -1), and number of months pregnant at study entry. None of these variables were significant predictors of the BDI-II or STAI. However, the DAS-7 was significantly predicted by race (African Americans were less adjusted; $B = -2.848$, $\beta = -.424$, $p = .001$), type of relationship (participants who were not married to their partners were less adjusted; $B = 1.282$, $\beta = .179$, $p = .04$), and number of months pregnant at study entry (more months pregnant was associated with less adjustment; $B = -.994$, $\beta = -.191$, $p = .04$). As such, they were controlled in all subsequent analyses predicting the DAS-7.

Models Predicting Depressive Symptoms From Marital Adjustment

Concurrent. As can be seen in Table 3, in the model predicting the BDI-II from concurrent DAS-7, controlling for linear change, the DAS-7 was a significant predictor of the BDI-II. Lower relationship adjustment predicted higher depressive symptom levels.

Lagged. The initial model predicting the BDI-II at time $t + 1$ from the DAS-7 at time t , controlling for the BDI-II at time t , included the BDI-II and DAS-7 (at time t) specified as random variables. This model did not converge. Therefore, the covariance structure for the random effects was changed to DIAG, which allowed for convergence. As shown in Table 3, the DAS-7 was not a significant predictor. Thus, although the BDI-II and DAS-7 are associated concurrently, the DAS-7 did not predict changes in the BDI-II over time.

Models Predicting Anxiety Symptoms From Relationship Adjustment

Concurrent. As shown in Table 4, in the model predicting the STAI from concurrent DAS-7, the DAS-7 was a significant predictor of the STAI. Lower relationship adjustment predicted greater anxiety.

Lagged. The initial model, predicting the STAI at time $t + 1$ from the DAS-7 at time t , controlling for the STAI at time t , included the STAI and DAS-7 (at time t) specified as random variables. This model did not converge. The covariance structure for the random effects was then changed to DIAG, which still resulted in nonconvergence. The strength of the random effects was examined in both models, and both indicated that the random effect of the DAS-7 (at time t) approached zero (.015 in the first model and .000 in the second). Therefore, this random effect was dropped, which allowed for convergence. Table 4 shows results of this final model. DAS-7 was a significant predictor. Lower relationship adjustment predicted increases in anxiety over time.

Models Predicting Marital Adjustment From Symptoms of Depression and Anxiety

Concurrent. This model predicted the DAS-7 from concurrent BDI-II and concurrent STAI, controlling for linear and quadratic change and the other relevant control vari-

Table 2
Baseline Models

Model	BDI-II		STAI		DAS-7	
	AIC	BIC	AIC	BIC	AIC	BIC
Mean/variance	5553.83	5568.34	6306.80	6321.16	4890.39	4904.86
Linear	5513.64	5528.15	6309.78	6324.13	4873.30	4887.77
Quadratic	5520.18	5534.68	6315.26	6329.61	4859.99	4874.46

Note. BDI-II = Beck Depression Inventory—Second Edition; STAI = State-Trait Anxiety Inventory; DAS-7 = Dyadic Adjustment Scale.

Table 3
Models Predicting Depressive Symptoms (BDI-II) From Relationship Adjustment (DAS-7)

	<i>B</i>	β
Concurrent Associations		
Intercept	10.912	0.037**
Linear	-0.355	-0.246**
DAS-7	-0.227	-0.214**
Lagged Associations		
Intercept	8.568	-0.061**
Linear	-0.109	-0.076*
Prior BDI-II	0.596	0.597**
DAS-7	-0.044	-0.042

Note. BDI-II = Beck Depression Inventory—Second Edition; DAS-7 = Dyadic Adjustment Scale.

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

ables. This initial model, which also included the BDI-II and STAI specified as random variables, did not converge. Therefore, the covariance structure for the random effects was changed to DIAG, which allowed for convergence. As shown in Table 5, only the STAI was a unique significant predictor of the DAS-7. Higher levels of anxiety symptoms independently predicted lower relationship adjustment.

Lagged. The initial model, predicting the DAS-7 at time $t + 1$ from the BDI-II at time t and the STAI at time t , controlling for the DAS-7 at time t (and the other relevant control variables), included the DAS-7, BDI-II, and STAI (at time t) specified as random variables. This model did not converge. The covariance structure for the random effects was then changed to DIAG, which still resulted in nonconvergence. The strength of the random effects was examined in both models, and both indicated that the random effects of BDI-II (at time t) approached zero (.014 in the first model and .000 in the second), of STAI (at time t) approached zero (.062 in the first model and .000 in the second), and of DAS-7 (at time t) approached zero (.018 in the first model and .004 in the second). Separate models were run to examine all possible random effect inclusions, with the intention to retain as many random effects as possible. A final model in which the random effects of BDI-II and STAI (but not DAS-7) were dropped reached convergence. Results of this model are shown in Table 5. The BDI-II was a

Table 4
Models Predicting Anxiety Symptoms (STAI) From Relationship Adjustment (DAS-7)

	<i>B</i>	β
Concurrent Associations		
Intercept	34.426	0.004**
DAS-7	-0.459	-0.251**
Lagged Associations		
Intercept	34.297	-0.009**
Prior STAI	0.362	0.362**
DAS-7	-0.208	-0.114*

Note. STAI = State-Trait Anxiety Inventory; DAS-7 = Dyadic Adjustment Scale.

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

Table 5
Models Predicting Relationship Adjustment (DAS-7) From Depressive Symptoms (BDI-II) and Anxiety Symptoms (STAI)

	<i>B</i>	β
Concurrent Associations		
Intercept	24.508	-0.036**
Linear	-0.605	-0.444**
Quadratic	0.046	0.495**
Race	-2.721	-0.425**
Relationship Type	-0.024	-0.003
# Months Pregnant	-0.644	-0.130
BDI-II	-0.054	-0.057
STAI	-0.053	-0.097*
Lagged Associations		
Intercept	28.260	0.120**
Linear	-1.117	-0.780**
Quadratic	0.083	0.844**
Race	-0.615	-0.092**
Relationship Type	-0.041	-0.006
# Months Pregnant	-0.031	-0.006
Prior DAS-7	0.806	0.805**
BDI-II	-0.053	-0.054*
STAI	-0.011	-0.018

Note. DAS-7 = Dyadic Adjustment Scale; BDI-II = Beck Depression Inventory—Second Edition; STAI = State-Trait Anxiety Inventory.

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

significant predictor, but the STAI was not. Thus, only the BDI-II uniquely predicted changes in the DAS-7 over time: greater depressive symptoms predicted decreases in relationship adjustment over time.

Discussion

To expand on prior research on couples' relationship functioning and depression during the perinatal period, we conducted within-subjects analyses to evaluate concurrent and longitudinal associations between relationship adjustment, depressive symptoms, and anxiety symptoms, assessed multiple times during pregnancy and the postpartum period in a sample of women with a history of major depression. Several associations among variables were obtained.

First, with respect to concurrent associations, relationship adjustment predicted both depressive symptoms and anxiety symptoms. That is, when women's relationship adjustment was lower than usual, their depressive symptoms and anxiety symptoms tended to be higher. The concurrent within-subject associations between relationship adjustment and depressive symptom levels replicate studies in community samples (Davila et al., 2003; Karney, 2001; Whitton et al., 2008) and extend these results into a sample of perinatal women at risk for depression. However, when relationship adjustment was predicted from both concurrent depressive symptoms and concurrent anxiety symptoms, only anxiety was uniquely associated with relationship adjustment: when women's anxiety symptoms were higher than usual, their relationship adjustment tended to be lower. We are not aware of any studies that have evaluated within-subject

associations between relationship adjustment and anxiety, and so these results build on prior studies that have found cross-sectional associations between marital adjustment and anxiety symptoms (e.g., Whisman et al., 2004) and anxiety disorders (e.g., Whisman, 2007) assessed at one point in time. As such, these results are important in demonstrating that longitudinal change in relationship adjustment was accompanied by change in anxiety symptoms and that change in anxiety symptoms was accompanied by change in relationship adjustment; this latter association was significant when controlling for change in depressive symptoms. Future research is needed to evaluate whether these within-subject associations will be obtained for men and for women who are not pregnant. Concerning the latter point, examining women who are not pregnant would allow examiners to evaluate whether it is anxiety in general that is associated with relationship adjustment, or whether this association is limited to anxieties associated with pregnancy, such as concerns about weight gain or concerns about household responsibilities.

Second, with respect to lagged effects, when symptoms of both depression and anxiety were included in the same model predicting subsequent relationship adjustment, only depressive symptoms were uniquely predictive of relationship adjustment. That is to say, depressive symptom levels were predictive of subsequent relationship adjustment, over and above any shared covariation with anxiety symptoms. Thus, these results support the specificity of the association between depressive symptoms and later relationship adjustment. Given the well-established association between depression and anxiety (for a review, see Watson, 2009), these results are particularly noteworthy in suggesting that the association between depressive symptoms and relationship adjustment cannot be reduced to shared overlap with anxiety symptoms. That depressive symptoms predicted subsequent relationship adjustment is consistent with the tenets of the stress generation theory of depression, which posits that depressed individuals inadvertently contribute to the occurrence of stress in their lives, including stress in their intimate relationships, which increases the probability for the onset and maintenance of depression (Davila et al., 1997). That anxiety symptoms were not associated with subsequent relationship adjustment in the lagged analysis when controlling for depressive symptoms suggests that anxiety may not be uniquely predictive of changes in relationship quality over time. Alternatively, given the high correlations between measures of depressive and anxiety symptoms (for a review, see Watson, 2009), it is possible that the lack of association between anxiety and subsequent relationship adjustment was partly due to measurement problems in the assessment of anxiety. To test these competing interpretations of the current results, it would be informative for future research to use measures that have been designed to assess specific dimensions of depression and anxiety symptoms and that also possess good convergent and discriminant validity (e.g., Watson et al., 2007).

Third, relationship adjustment was associated with anxiety symptoms in the lagged analyses: lower relationship adjustment in one assessment was associated with higher

anxiety at the next assessment. Women with lower relationship adjustment may worry that their partner will be less available for emotional or instrumental support or will leave them during this transition, resulting in greater anxiety. These results are consistent with prior research, which has shown that lower marital adjustment is prospectively associated with onset of anxiety disorders in individuals not selected for pregnancy status (Overbeek et al., 2006), and supports the need for future research on the role of relationship functioning in the etiology and maintenance of anxiety.

Fourth, results suggest that relationship adjustment was not associated with depressive symptoms in the lagged analyses: relationship adjustment did not predict subsequent depressive symptoms. These results are inconsistent with studies that have used two-panel designs and have found that marital adjustment is associated with subsequent depressive symptoms (e.g., Beach et al., 2003; Whisman & Uebelacker, 2009) and onset of depressive disorders (e.g., Overbeek et al., 2006; Whisman & Bruce, 1999). However, results are consistent with one other study that used a within-subject design and evaluated lagged associations between weekly assessments of marital adjustment and depressive symptoms (Whitton et al., 2008). Because the two-panel longitudinal studies that have found associations between marital adjustment and depression have been separated by greater time intervals, it is possible that longer periods of time between assessments are needed to observe the effects of relationship functioning on individual well-being. Relatedly, within-subject analyses such as those reported in this study examine how *changes* in one variable are associated with changes in the other variable over time. As such, these types of analyses do not evaluate the impact of chronic levels of one variable on changes in the other variable. It may be that lower levels of relationship adjustment exert a greater effect on depression when lower levels of relationship adjustment are chronic. Finally, it should be noted that all women in the study had a history of major depression. Thus, there may be differences between these women and women with no history of depression. For example, according to the kindling theory of depression (Post, 1992), the effect of stressful events such as poor relationship adjustment will be different in direction or magnitude for adults without a history of depression relative to those with a history of depression. Therefore, the association between relationship adjustment and depressive symptoms for women in the current study may be smaller than that which would be expected for women without a history of depression. In support of this perspective, Bruce (1998) found that marital disruption occurring during the previous 12-month period was more strongly associated with major depression during that same 12-month period for people without a history of depression (odds ratio = 18.1), as compared to people with a history of depression (odds ratio = 1.8).

Finally, these findings have implications for treatment. Results from the lagged analysis suggest that treating depression in perinatal women may improve relationship functioning. In addition, because relationship adjustment was concurrently associated with depressive and anxiety symp-

toms, and prospectively associated with anxiety symptoms, couple-based treatment may be effective in reducing anxiety and depression during the perinatal period. Although not studied during the perinatal period, couple therapy has been shown to be effective in reducing depression and improving relationship adjustment in depressed individuals in the general population (Barbato & D'Avanzo, 2008). Couple-based treatments for co-occurring relationship problems and depression or anxiety may be particularly relevant alternatives for women who are pregnant or breastfeeding, as there are concerns associated with fetuses or infants being exposed to antidepressant medications through breast milk and it has been shown that women prefer psychosocial treatments for depression during the perinatal period (Goodman, 2009).

In sum, results suggest that relationship adjustment and symptoms of depression and anxiety are associated in women over time during pregnancy and the postpartum period. Results support continued investigation to further refine our understanding of how these cross-sectional and longitudinal associations develop and affect women during pregnancy and beyond.

References

- Alshuler, L. L., Hendrick, V., & Cohen, L. S. (1998). Course of mood and anxiety disorders during pregnancy and the postpartum period. *Journal of Clinical Psychiatry, 59*, 29–33.
- Barbato, A., & D'Avanzo, B. (2008). Efficacy of couple therapy as a treatment for depression: A meta-analysis. *Psychiatric Quarterly, 79*, 121–132. doi:10.1007/s11126-008-9068-0
- Beach, S. R. H., Katz, J., Kim, S., & Brody, G. H. (2003). Prospective effects of marital satisfaction on depressive symptoms in established marriages: A dyadic model. *Journal of Social and Personal Relationships, 20*, 355–371. doi:10.1177/0265407503020003005
- Beach, S. R. H., Sandeen, E. E., & O'Leary, K. D. (1990). *Depression in marriage: A model for etiology and treatment*. New York: Guilford Press.
- Beck, A. T., Steer, R. A., & Brown, G. K. (1997). *Beck Depression Inventory: 2nd ed.* San Antonio, Texas: The Psychological Corporation.
- Beck, C. T. (1996). A meta-analysis of predictors of postpartum depression. *Nursing Research, 45*, 297–303. doi:10.1097/00006199-199609000-00008
- Beck, C. T. (2001). Predictors of postpartum depression: An update. *Nursing Research, 50*, 275–285.
- Benazon, N. R., & Coyne, J. C. (2000). Living with a depressed spouse. *Journal of Family Psychology, 14*, 71–79. doi:10.1037/0893-3200.14.1.70
- Boyce, P., & Hickey, A. (2005). Psychosocial risk factors to major depression after childbirth. *Social Psychiatry and Psychiatric Epidemiology, 40*, 605–612. doi:10.1007/s00127-005-0931-0
- Bruce, M. L. (1998). Divorce and psychopathology. In B. P. Dohrenwend (Ed.), *Adversity, stress, and psychopathology* (pp. 219–232). New York: Oxford University Press.
- Davila, J., Bradbury, T. N., Cohan, C. L., & Tochluk, S. (1997). Marital functioning and depressive symptoms: Evidence for a stress generation model. *Journal of Personality and Social Psychology, 73*, 849–861. doi:10.1037/0022-3514.73.4.849
- Davila, J., Karney, B. R., Hall, T. W., & Bradbury, T. N. (2003). Depressive symptoms and marital satisfaction: Within-subject associations and the moderating effects of gender and neuroticism. *Journal of Family Psychology, 17*, 557–570. doi:10.1037/0893-3200.17.4.557
- Dehle, C., & Weiss, R. L. (2002). Associations between anxiety and marital adjustment. *Journal of Psychology, 136*, 328–338. doi:10.1080/00223980209604160
- Escribè-Agüir, V., Gonzalez-Galarzo, M. C., Barona-Vilar, C., & Artazcoz, L. (2008). Factors related to depression during pregnancy: Are there gender differences? *Journal of Epidemiology and Community Health, 62*, 410–414. doi:10.1136/jech.2007.063016
- Evans, J., Heron, J., Francomb, H., Oke, S., & Golding, J. (2001). Cohort study of depressed mood during pregnancy and after childbirth. *British Medical Journal, 323*, 257–260. doi: 10.1136/bmj.323.7307.257
- First, M. B., Spitzer, R. L., Gibbon, M., & Williams, J. B. W. (2002). *Structured Clinical Interview for DSM-IV-TR Axis I Disorders, Research Version, Non-patient Edition (SCID-I/NP)*. New York: Biometrics Research, New York State Psychiatric Institute.
- Funk, J. L., & Rogge, R. D. (2007). Testing the ruler with item response theory: Increasing precision of measurement for relationship satisfaction with the Couples Satisfaction Index. *Journal of Family Psychology, 21*, 572–583. doi:10.1037/0893-3200.21.4.572
- Garson, G. D. (2009, December). Linear mixed models: Hierarchical linear, random effects, multilevel, random coefficients, and repeated measures models. Retrieved March 16, 2011, from <http://faculty.chass.ncsu.edu/garson/PA765/multilevel.htm>
- Goodman, J. H. (2009). Women's attitudes, preferences, and perceived barriers to perinatal depression. *Birth, 36*, 60–69. doi: 10.1111/j.1523-536X.2008.00296.x
- Goodman, S. H., & Tully, E. C. (2009). Recurrence of depression during pregnancy: Psychosocial and personal functioning correlates. *Depression and Anxiety, 26*, 557–567. doi:10.1002/da.20421
- Gotlib, I. H., Whiffen, V. E., Wallace, P. M., & Mount, J. H. (1991). Prospective investigation of postpartum depression: Factors involved in onset and recovery. *Journal of Abnormal Psychology, 100*, 122–132. doi:10.1037//0021-843X.100.2.122
- Hock, E., Schirtzinger, M. B., Lutz, M. B., & Widaman, K. (1995). Maternal depressive symptomatology over the transition to parenthood: Assessing the influence of marital satisfaction and marital sex role traditionalism. *Journal of Family Psychology, 9*, 79–88. doi:10.1037//0893-3200.9.1.79
- Karney, B. R. (2001). Depressive symptoms and marital satisfaction in the early years of marriage: Narrowing the gap between theory and research. In S. R. H. Beach (Ed.), *Marital and family processes in depression: A scientific foundation for clinical practice* (pp. 45–68). Washington, DC: American Psychological Association.
- Kessler, R. C., Berglund, P., Demler, O., Jin, R., Koretz, D., Merikangas, K. R., . . . Wang, P. S. (2003). The epidemiology of major depressive disorder: Results from the National Comorbidity Survey Replication (NCS-R). *Journal of the American Medical Association, 289*, 3095–3105. doi:10.1001/jama.289.23.3095
- Knight, R. G., Waal-Manning, H. J., & Spears, G. F. (1983). Some norms and reliability data for the State-Trait Anxiety Inventory and the Zung Self-Rating Depression scale. *British Journal of Clinical Psychology, 22*, 245–249.
- Marcus, S. M., Flynn, H. A., Blow, F. C., & Barry, K. L. (2003). Depressive symptoms among pregnant women screened in obstetrics settings. *Journal of Women's Health, 12*, 373–380. doi: 10.1089/154099903765448880

- Milgrom, J., Gemmill, A. W., Bilszta, J. L., Hayes, B., Barnett, B., Brooks, J., . . . Buist, A. (2008). Antenatal risk factors for postnatal depression: A large prospective study. *Journal of Affective Disorders, 108*, 147–157. doi:10.1016/j.jad.2007.10.014
- O'Hara, M. W., & Swain, A. M. (1996). Rates and risk of postpartum depression—A meta-analysis. *International Review of Psychiatry, 8*, 37–54. doi:10.3109/09540269609037816
- Overbeek, G., Vollebergh, W., de Graaf, R., Scholte, R., de Kemp, R., & Engels, R. (2006). Longitudinal associations of marital quality and marital dissolution with the incidence of *DSM-III-R* disorders. *Journal of Family Psychology, 20*, 284–291. doi:10.1037/0893-3200.20.2.284
- Post, K., Burnam, M. A., & Smith, G. R. (1993). Development of screeners for depressive disorders and substance abuse disorder history. *Medical Care, 31*, 189–200.
- Post, R. M. (1992). Transduction of psychosocial stress into the neurobiology of recurrent affective disorder. *American Journal of Psychiatry, 149*, 999–1010.
- Robins, L. N., Helzer, J. E., Croughan, J., & Ratcliff, K. S. (1981). National Institute of Mental Health Diagnostic Interview Schedule: Its history, characteristics, and validity. *Archives of General Psychiatry, 38*, 381–389.
- Sharpley, C., & Rogers, H. (1984). Preliminary validation of the abbreviated Spanier Dyadic Adjustment Scale: Some psychometric data regarding a screening test of marital adjustment. *Educational and Psychological Measurement, 44*, 1045–1050. doi:10.1177/0013164484444029
- Spanier, G. B., & Filsinger, E. E. (1983). The Dyadic Adjustment Scale. In E. E. Filsinger (Ed.), *Marriage and family assessment: A sourcebook for family therapy* (pp. 155–168). Beverly Hills, CA: Sage.
- Spielberger, C. D., Gorsuch, R. L., & Lushene, R. E. (1970). *Manual for the State-Trait Anxiety Inventory*. Palo Alto, CA: Consulting Psychologists Press.
- Starr, L. R., & Davila, J. (2011). Temporal patterns of anxious and depressed mood in generalized anxiety disorder: A daily diary study. Manuscript submitted for publication.
- Steer, R. A., Ball, R., Ranieri, W. F., & Beck, A. T. (1997). Further evidence for the construct validity of the Beck Depression Inventory-II with psychiatric outpatients. *Psychological Reports, 80*, 443–446.
- Steer, R. A., Scholl, T. O., & Beck, A. T. (1990). Revised Beck Depression Inventory scores of inner-city adolescents: Pre- and postpartum. *Psychological Reports, 66*, 315–320. doi:10.2466/PRO.66.1.315-320
- Stroud, C. B., Davila, J., & Moyer, A. (2008). The relationship between stress and depression in first onsets versus recurrences: A meta-analytic review. *Journal of Abnormal Psychology, 117*, 206–213. doi:10.1037/0021-843X.117.1.206
- Su, K. P., Chiu, T. H., Huang, C. L., Ho, M., Lee, C. C., Wu, P. L., . . . Pariante, C. M. (2007). Different cutoff points for different trimesters? The use of the Edinburgh Postnatal Depression Scale and Beck Depression Inventory to screen for depression in pregnant Taiwanese women. *General Hospital Psychiatry, 29*, 436–441. doi:10.1016/j.genhosppsych.2007.05.005
- Twenge, J. M., Campbell, W. K., & Foster, C. A. (2003). Parenthood and marital satisfaction: A meta-analytic review. *Journal of Marriage and Family, 65*, 574–583. doi:10.1111/j.1741-3737.2003.00574.x
- Watson, D. (2009). Differentiating the mood and anxiety disorders: A quadripartite model. *Annual Review of Clinical Psychology, 5*, 221–247. doi:10.1146/annurev.clinpsy.032408.153510
- Watson, D., O'Hara, M. W., Simms, L., Kotov, R., Chmielewski, M., McDade-Montez, E. A., . . . Stuart, S. (2007). Development and validation of the Inventory of Depression and Anxiety Symptoms (IDAS). *Psychological Assessment, 19*, 253–268. doi:10.1037/1040-3590.19.3.253
- Whisman, M. A. (2007). Marital distress and *DSM-IV* psychiatric disorders in a population-based national survey. *Journal of Abnormal Psychology, 116*, 638–643. doi:10.1037/0021-843X.116.3.638
- Whisman, M. A., & Beach, S. R. H. (2010). Models for understanding interpersonal processes and relationships in anxiety disorders. In J. G. Beck (Ed.), *Interpersonal processes in the anxiety disorders: Implications for understanding psychopathology and treatment* (pp. 9–35). Washington, DC: American Psychological Association.
- Whisman, M. A., & Bruce, M. L. (1999). Marital dissatisfaction and incidence of major depressive episode in a community sample. *Journal of Abnormal Psychology, 108*, 674–678. doi:10.1037/0021-843X.108.4.674
- Whisman, M. A., & Kaiser, R. (2008). Marriage and relationship issues. In K. S. Dobson & D. J. A. Dozois (Eds.), *Risk factors in depression* (pp. 363–384). San Diego: Academic Press.
- Whisman, M. A., Perez, J. E., & Ramel, W. (2000). Factor structure of the Beck Depression Inventory – 2nd ed. (BDI-II) in a student sample. *Journal of Clinical Psychology, 56*, 545–551. doi:10.1002/(SICI)1097-4679(200004)56:4<545::AID-JCLP7>3.0.CO;2-U
- Whisman, M. A., & Uebelacker, L. A. (2009). Prospective associations between marital discord and depressive symptoms in middle-aged and older adults. *Psychology and Aging, 24*, 184–189. doi:10.1037/a0014759
- Whisman, M. A., Uebelacker, L. A., & Weinstock, L. M. (2004). Psychopathology and marital satisfaction: The importance of evaluating both partners. *Journal of Consulting and Clinical Psychology, 72*, 830–838. doi:10.1037/0022-006X.72.5.830
- Whitton, S. W., Stanley, S. M., Markman, H. J., & Baucom, B. R. (2008). Women's weekly relationship functioning and depressive symptoms. *Personal Relationships, 15*, 533–550. doi:10.1111/j.1475-6811.2008.00214.x

Received December 27, 2010

Revision received March 30, 2011

Accepted March 30, 2011 ■