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Considering a Relational Model for Depression in Women with Postpartum Depression

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Abstract

Purpose—To extend testing of a relational theory that a low sense of belonging, delayed or impaired bonding, and loneliness are salient risk factors for postpartum depression (PPD) in women.

Methods—Data for this theory-testing analysis came from a larger prospective longitudinal cohort study and included women who were retained to the end of the study at the 6 week postpartum interview ($n=564$). Structural equation modeling was used to test the “fit” of the model and determine significance of direct and indirect paths.

Results—The model explained 35% of the variance in postpartum depression with impaired bonding and loneliness as the strongest indicators. Lower sense of belonging, less perceived social support from a healthcare practitioner and a partner, and lower parenting sense of competence were additional predictors.

Conclusion—Study findings challenge current thinking about the relationship between impaired bonding and PPD as this study raises the possibility that impaired bonding is a risk for PPD as opposed to the reverse relationship. The study provided evidence of the importance of healthcare practitioners’ alliance with patients. This paper contributes to advancing the science of women’s mental health in relation to depression by considering additional predictors which might be amenable to intervention.

Keywords

bonding; conflict; loneliness; postpartum depression; sense of belonging; social support

Introduction

Postpartum depression (PPD) is a serious and complex mood disorder affecting approximately one out of eight (Kendall-Tackett, 2010; Mancini, Carlson, & Albers, 2007) of the more than four million women who give birth in the United States every year (Centers for Disease Control and Prevention, 2010a). This common health issue affects not only the mental well-being of the mother, causing poor postpartum physical health (Beck & Watson-Driscoll, 2006) and bonding problems (McMahon, Barnett, Kowalenko, & Tennant, 2006; Wilkinson & Mulcahy, 2010), but also may have negative effects on the infant including dysregulation patterns that make the infant prone to depression in the future (Beck, 1998; Brennan et al., 2000). The long term effects of PPD in children includes the display of overanxious and depressed symptoms as well as behaviors related to defiance, aggression, and conduct problems (Ashman, Dawson, & Panagiotides, 2008; Murray, Halligan, Adams, Patterson, & Goodyer, 2006).

Evidence has accrued showing that significant predictors of PPD include low social support, life stress, depression history, prenatal anxiety, marital dissatisfaction, infant temperament, maternal childhood maltreatment, PTSD in pregnancy, dissociation in labor, and lower overall quality of life in pregnancy (Beck & Watson-Driscoll, 2006; O'Hara & Swain, 1996; Seng et al., 2013). The work of Hagerty and Williams (1999) on "sense of belonging" in relation to depression has been overlooked in the PPD literature, but seems worthy of consideration, especially in light of the extent to which a woman's social situation is subject to change during the post-birth recovery and early parenting time period. Hagerty and Williams examined the relationship of perceived social support, sense of belonging, conflict, and loneliness on depressive symptoms in a depressed clinical sample and in college students and noted that these variables explained 64% of the variance of depressive symptoms with sense of belonging explaining the most variance ($R^2=.52$) making it the strongest predictor of depressive symptoms (Hagerty & Williams 1999). The impact of sense of belonging on depression had been noted by others as well (Anant, 1967; McLaren & Challis, 2009; Sargent, Williams, Hagerty, Lynch-Sauer, & Hoyle, 2002).

Although changes in hormone levels is a widely accepted view as to why women experience the "baby blues" immediately postpartum, the exact etiology of PPD has not been established and no biological or hormonal cause has been identified (Baker, Mancuso, Montenegro, & Lyons, 2002; Mallikarjun & Oyeboode, 2005). PPD appears to be a complex mood disorder comprised of internal and external factors. It is theoretically possible that psychological and psychosocial interventions may prevent or decrease PPD symptoms (Mallikarjun & Oyeboode, 2005). Considering the limited evidence regarding the use of pharmacological interventions in the treatment of PPD and the concern of the possible effects on newborns, attention to internal and external factors associated with depression that would suggest efficacious psychosocial interventions seems warranted.

The purpose of this research study was to examine the multiple variables of perceived social support, sense of belonging, conflict in relationships, parenting sense of competence, maternal bonding with the infant, and loneliness for their associations in a relational model

for depression with women experiencing PPD (Figure 1). Based on the literature, a hypothesized model is proposed to guide the analysis of the data.

Review of the Literature Based on Model Paths

Perceived Social Support

The concept “social support” has been defined in many different ways however, the most commonly accepted components of social support includes emotional, appraisal, informational, and instrumental support as conceptualized by House and Kahn (1985). Perceived social support is a broad framework of social support that exists in social support research. Cohen (1992) defined perceived social support as “the function of social relationships—the perception that social relationships will (if necessary) provide resources such as emotional support or information” (p. 109).

Researchers tend to emphasize how positive received social support affects health outcomes and tend to focus on the “the bright side” of social support. There are however, occasions when levels of received social support are lacking or contain “costs” that are negative. “The dark side” of social support, as conceptualized by Tilden and Gaylen, includes costs, conflict, reciprocity, and equity (1987).

A cost related to the dark side of social support may include unhappy marriages as Tilden and Nelson state “an unhappy marriage tends to restrict access to other sources of social support because unmarried people often have large networks of supportive friends” (Tilden & Nelson, 1999). The assumption that partnered status conveys greater support has been questioned (Kruse, Low, & Seng, 2012) given knowledge about the lack of equity in household work (Schwartz & Lindley, 2009) and the chronicity of domestic violence against married women (Williams et al., 2008).

Perceived social support and sense of belonging had a positive, moderate correlation in which a consequence of greater sense of belonging resulted in greater perceived social support (Hagerty, Williams, Coyne, & Early 1996; McLaren & Challis, 2009). Dennis and Letourneau (2007) examined global perceptions of support in postpartum depressed women and noted that “sense of belonging” with other women and children was a major predictor of perceived global support.

Banti et al. (2009) reviewed literature related to perinatal mood disorders and anxiety and noted that inadequate social support was almost the strongest predictor of PPD and had a strong-moderate effect size. The only predictor that was stronger was a history of depression in the prenatal or antenatal period.

Sense of Belonging

Sense of belonging is a concept that has received increasing attention in the mental health literature but, no attention in the PPD literature. Maslow (1954) recognized belonging as a basic human need and ranked it just above basic physiological and safety and security needs. Sense of belonging had been defined as “the experience of personal involvement in a system or environment so that persons feel themselves to be an integral part of that system or

environment” (Hagerty, Lynch-Sauer, Patusky, Bouwsema, & Collier 1992, p. 172). “Fitting in” with other individuals, systems, and/or environments and feeling valued and are important concepts related to sense of belonging.

The relationship between sense of belonging and depression was researched by Hagerty and Williams (1999) who assessed 379 community college students and a depressed clinical sample. The strongest predictor of depression in their study populations was sense of belonging which explained 52% of the variance on depression. The relationship between sense of belonging and depression has been noted by others as well (McLaren, 2006; McLaren, Jude, & McLachlan, 2007).

Conflict and Violence—Conflict is defined as “perceived discord or stress in relationships caused by behaviors of others or the absence of behaviors of others, such as the withholding of help” (Tilden, Nelson, & May, 1990 p. 338). One extreme of form of conflict is intimate partner violence which has been defined as physical force or the intent of physical harm against someone by current or former husbands, unmarried male or female domestic partners, or other persons where an intimate relationship is shared (Golding, 1999; Koss et al., 1994; Straus, 1991).

Dennis and Ross (2006) examined women’s perceptions of relationship conflict in the development of PPD in 396 mothers at 1, 4, and 8 weeks postpartum and noted relationship conflict was significantly higher in women with depressive symptoms at 8 weeks when compared with women who were not depressed. In addition, mothers who experienced depressive symptoms were more apt to report having a partner who “made them angry, tried to change them, was critical of them, and made them work hard to avoid conflict” (Dennis & Ross, 2006, p. 593).

Conflict and/or violence related to a mother’s childhood maltreatment history has been noted as a predictor of PPD as well ($R^2=.035$, $p<.001$) (Seng et al. 2013). In addition, childhood maltreatment survivors of sexual assault report less family of origin and friend support (Golding, Wilsnack, & Cooper, 2002) which (social support from family and friends) in turn is a predictor of PPD (Hung, 2007; Kuscu et al., 2008).

Parenting Sense of Competence

Parenting sense of competence is the degree to which parents feel confident and self-efficacious in their role as a parent (Gilmore & Cuskelly, 2008; Mildon, Wade, & Matthews, 2008). High levels of parenting sense of competence are associated with responsive and nutritive behaviors that result in better maternal-child attachment (Ngai, Chan, & Ip, 2010).

The Attachment Bond

Attachment is described as an everlasting emotional bond that exists between an infant and one or more caregivers (Main, 1996). Attachment theory also includes the notion that security, safety, and satisfaction compose the attachment relationship and termination of this relationship causes distress (Goldberg, Muir, Kerr, 1995). Attachment may be viewed as a characteristic of a relationship between a caregiver and child where the child feels safe,

protected, and secure whereas bonding may be viewed as a process that occurs after birth where a mother has an affectionate attachment to her infant (Myers, 1984).

Mother-infant bonding disorders occur in 29% of mothers who have been diagnosed with PPD (Brockington et al., 2001). Moehler, Brunner, Wiebel, Reck, and Resch (2006) noted a strong association of decreased quality of maternal-infant bonding in women with PPD at 2 weeks, 6 weeks, and 4 months postpartum in a sample of 101 mother-infant pairs. It is important to note that almost all research studies to date state that PPD causes impaired mother-infant bonding (Edhborg, Nasreen, & Kabir, 2011; Liberto, 2012; Patel et al., 2012; Weis & Lederman, 2010).

Loneliness

Loneliness is the “unpleasant experience that occurs when a person’s network of social relations is deficient in some important way, either quantitatively or qualitatively” and occurs as an emotional response to a “discrepancy between desired and achieved levels of social contact” (Paloutzian & Ellison, 1982 p. 4–5).

The relationship between loneliness and depression has been well established over the years with research grounded in relational designs. Multiple phenomenological research studies revealed loneliness as a major theme in PPD. Women revealed in these studies feelings of loneliness and isolation with no one to talk to (Beck, 1992; Nahas & Amasheh, 1999a&b; Ugarriza, 2002).

Additional Depression Risks—The aforementioned variables all have an influence on depression however there are additional risk factors for depression worth noting. Women aged 18–24 years old have depression rates of 11.1%, which is greater than any other childbearing age categories (25–34 years: 9.3% and 35–44 years: 8.7%) (CDC, 2010b). Additional risk factors include: having an annual income of less than \$15,000, having a high school education or less, and living in high crime neighborhoods (CDC, 2010b; Cutrona et al., 2005; Galea et al., 2007; Latkin & Curry, 2003). These risk factors are important to note since cumulative sociodemographic disadvantage increases risk for poor mental health outcomes as opposed to any one risk factor alone (Sameroff & Rosenblum, 2006).

Materials and Methods

Design

The research design for the parent study was prospective and this secondary analysis study was prospective as well and considered the model variables in relationship to time. Data from “wave 1” (<28 weeks gestation), “wave 2” (28–35 weeks gestation), and “wave 3” (6 weeks postpartum) were analyzed in a predictive model using multiple regression, path analysis, structural equation modeling (SEM), and stratified approaches.

Sample

This study secondary analysis was part of a larger prospective longitudinal cohort study (Psychobiology of PTSD & Adverse Outcomes of Childbearing, NIH R01 NR008767). The

sample for this secondary analysis study included the 564 women recruited for a cohort study of PTSD who completed the postpartum wave of data collection who had a range of relational risk factors (e.g. abusive family of origin, interpersonal sensitivity). They were recruited via prenatal care clinics in three health systems (one in a university town and two in an urban area) in the state of Michigan. All three health systems approved this research project through their respective institutional review boards. The timeline for recruitment was from August 2005 through May 2008. Eligible research participants included women who were 28 weeks gestation or less, expecting their first born infant, could speak and understand English, and were at least 18 years of age. Detailed descriptions of recruitment and survey methods have been described elsewhere (Seng, Low, Sperlich, Ronis, Liberzon, 2009).

Sample Size

Cohen's (1988) framework was utilized in the power analysis to determine the sample size required to test the proposed model. A sample size of at least 200 participants was recommended as a goal for SEM to ensure adequate statistical power for data analysis as goodness of fit is overestimated with most fit indices for small sample sizes of less than 200 (Kenny, 2011; Tomarken & Waller, 2005).

Procedure

Women who were interested and eligible for the study ($n=2,689$) provided their contact information, were given a copy of the consent form, and then contacted by a survey research organization who obtained informed consent and completed the structured computer-assisted telephone interview ($n=1,581$) (Seng et al., 2009). Data from "wave 1" (<28 weeks gestation), "wave 2" (28–35 weeks gestation), and "wave 3" (6 weeks postpartum) were analyzed and a description of the instruments and model variables are listed below.

Measures used in the Parent Study

Wave 1 Instruments—Instruments included: Life Stressor Checklist (LSC) (Cusack, Falsetti, & de Arellano, 2002), National Women's Study PTSD Module (NWS-PTSD) (Resnick, Kilpatrick, Dansky, Saunders, Best, 1993), Perinatal Risk Assessment Monitoring System (PRAMS) (CDC, 2011), and the Symptom Checklist 90-R (SCL-90-R) (Derogatis, 1997). All of these instruments are established and reliable measures. Reliability coefficients were calculated for each of the instruments as appropriate and the SCL-90-R had a coefficient of .84.

Wave 2 Instruments—The instruments utilized included: Experiences of Discrimination Scale (EDS) (Kessler, Mickelson, & Williams, 1999), Family APGAR (Smilkstein, 1978), Health Care Alliance Questionnaire (HCAQ) (Hiser, 2004), and the Quality of Life Inventory (QOLI) (Frisch, Cornell, Villanueva, & Retzlaff, 1992). Reliability and validity testing had been established with all instruments. Cronbach alpha coefficients for this study ranged from .79–.93.

Wave 3 Instruments—Instruments included: Parenting Sense of Competence Questionnaire-Modified (PSOC-M) (Gibaud-Wallston & Wandersman, 2000; Mowbray,

Bybee, Hollingsworth, Goodkind, & Oyserman, 2005), Postpartum Bonding Questionnaire (PBQ) (Brockington et al., 2001). Postpartum Depression Screening Scale (PDSS) (Beck & Watson-Driscoll, 2006). These instruments are considered reliable and/or valid. In the current study, the Cronbach alpha's for the instruments range from .80–.95.

Variables Constructed to Operationalize Components of the Theory from the Measures used in the Parent Study

Perceived social support—Perceived support from family, friendships, a partner, and healthcare providers were four variables used to operationalize perceived received social support from social network members. The Family APGAR instrument and the HCAQ assessed perceived support from family and healthcare providers respectively. Perceived social support from friends and a partner were measured using single items from the QOLI (Frisch et al., 1992).

Sense of Belonging—The sense of belonging proxy variable was constructed using selected items from the NWS-PTSD, SCL-90-R, EDS, and QOLI. These items were selected from the survey scripts based on the Hagerty definition of sense of belonging defined previously. Content validity was established by using an expert panel, including Hagerty who created the SOBI. The original 13 potential items were reduced to three. The alpha reliability for this small scale was 0.61.

Conflict—The “conflict in relationships” proxy was created using items from the LSC to operationalize three different conflict variables including childhood family violence before age 16 (six items), lifetime domestic violence (three items), and current domestic violence (six items). The childhood family violence items are related to physical neglect; witnessed violence between family members; and physical, emotional, and sexual abuse whereas the current and lifetime domestic violence items are related to physical, emotional, and sexual abuse and were answered in a yes/no format.

Loneliness—Loneliness was measured using a single item from the NWS-PTSD. “(In the past month) have you felt cut off from other people”? The cut-off time-point used in the model is in the postpartum period to follow the time sequence of the model.

Data Analysis

Rates and degree of depressive symptoms were determined by examining the PDSS cut-off scores of participants and determining how many participants scored in the not probable, mild, and severe depressive symptom categories. Means and standard deviations were obtained for all model variables. A summative (0–5) index of sociodemographic disadvantage (SDD) risk variable was created from the five sociodemographic factors (African American race, being pregnant as a teen, having high school education or less, having income <\$15,000, and living in a zip code with a crime rate higher than the U.S. average. This index was collapsed to having fewer (0 or 1) versus more (2 or greater) SDD risks. T-tests were conducted on all of the model variables in relation to less and more SDD risk. Regression residuals of all dependent variables were normally distributed, as required to meet the assumptions for regression modeling (Lewis-Beck, 1980).

Amos™ 19 was used to test a structural equation model (SEM) to determine the best model to explain the theoretical model variables. SEM is based on principles related to regression and path analysis (Byrne, 2010) however, SEM allows one to test more complicated path models with intervening variables connecting the independent and dependant variables (Ullman, 2007). SEM analysis involved assessing for model “fit”. There are many indices that may be used to assess for model “fit” with great discrepancy among researchers as to the best indices as well as what the cut-offs are (Hooper, Coughlan, Mullen, 2008) therefore only the mostly widely accepted indices and cut-offs were used to evaluate the proposed model.

Direct effects in the path model are displayed by the regression coefficients whereas to estimate the magnitude of the indirect effects of one variable on another, each indirect pathway was considered. The bootstrap method was utilized to determine the standard error, confidence intervals, and *p*-values of the paths.

Stratified testing using the multi-group moderation test was conducted to determine whether the model “fits” equally well for postpartum women who had low or more sociodemographic disadvantage and was performed by running two models (an unconstrained and a constrained model). A chi-square for each model was obtained and a difference test performed to determine if the model “fits” differently between the SDD groups of women (Hox & Bechger, 1998). A Stats Tool Package (Gaskin, 2012) using group difference calculated the path differences of the two groups by taking into consideration the critical ratio for differences table which contained the z-score for the differences of the parameters in the model compared against both groups as well as the estimated regression weights for both groups.

Results

The demographics of the program participants (*n*=564) are discussed with consideration of the dependent variable, PPD (Table 1). Of these 564 women, 202 (35.8%) had PDSS cut off scores of 60 or above indicating mild and or major depression and 121 (21.5%) had PDSS cut off scores of 80 or above indicating major depression. Participants with more SDD risk experienced symptoms of minor and major depressive symptoms greater than that of the overall group.

Table 2 displays all model variables. In terms of the independent variables most women had higher than the neutral category for social support, sense of belonging, and parenting sense of competence and had less than the neutral category for impaired bonding and conflict.

Missing data emerged for a few reasons. Some participants did not answer items such as race/ethnicity. There were also 85 pregnant women who gave birth early and had missing data in wave 2 in relation to the interim assessment of on-going abuse because labor had already occurred. This affected the “current domestic violence” and “lifetime domestic violence” items and would have reduced the sample size available for modeling. Data were imputed for the abuse items and a decision tree for imputation of missing data was

constructed based on participant response to abuse questions at four other time points in waves 1 and 3.

Differences were examined in mean scores related to all model variables for participants with less and more SDD. All but two variables (perceived social support from friends and loneliness) were statistically significant. According to the Cohen's d effect size, it appeared that perceived social support from family and healthcare practitioners, lifetime domestic violence, parenting sense of competence, and PPD had small effect sizes; perceived social support from a partner and sense of belonging had moderate effect sizes; and current domestic violence, childhood family violence, and impaired bonding had close to medium effect sizes.

The SEM path model (Figure 2) displays the paths in the proposed model with the path coefficients and R^2 results displayed using AMOS™ 19. R^2 values which are located near the upper right hand corner of each variable box indicated that 35% of the variance in PDD was explained by the model variables with impaired bonding and loneliness explaining the most variance. Sense of belonging as an endogenous variable had 37% of the variance explained by the model with family violence and perceived social support from friends explaining the most variance. Percent of the variance in impaired bonding (30%) was explained by the model with parenting sense of competence explaining the most variance. Finally, 17% of the variance in loneliness was explained by the model. Impaired bonding contributed more to loneliness than sense of belonging. Childhood family violence had the greatest impact on sense of belonging and also significantly impacted PPD. Also more social support from a partner resulted in more impaired bonding. Model fit statistics indicate that the model is a very good fit: $\chi^2=10.52$, $df=14$, $p=.72$; RMSEA=0.000; NFI=0.99; and CFI=1.00.

Table 3 includes the standardized direct and indirect path coefficients as well as standard errors. There were 27 direct paths tested in the model with 10 paths that were not significant. The paths that were insignificant in the model included the paths from: lifetime IPV to sense of belonging; sense of belonging to impaired bonding; current IPV to impaired bonding; all of the conflict items to loneliness; current IPV, social support from friends, social support from family, and lifetime IPV to depression.

The strongest predictors of PPD were impaired bonding (.43) and loneliness (.23). Parenting sense of competence (−.21), sense of belonging (−.15), perceived social support from a healthcare practitioner (−.11) and a partner (−.07), were additional significant predictors of PPD.

An analysis of the hypothesized model (Figure 1) using SEM multi-group moderation with both less and more SDD women was also performed. The unconstrained model indicated a relatively good model fit as evidence by: $\chi^2=25.89$, $df=22$, $p=.26$; RMSEA=0.02; NFI=0.98; and CFI=0.99. The next step was to constrain the path model so differences in SDD could be examined and resulted in $\chi^2=111.05$, $df=49$, $p<.001$; RMSEA=0.05; NFI=0.92; and CFI=0.95. The difference of the two models resulted in a $\chi^2=85.16$, $df=27$, $p<.001$ which indicated that the model explains depression differently in less versus more SDD women.

Path estimates were compared to determine if the various paths in the model were different for less versus more SDD women (Table 4). There are several significant differences noted between less and more SDD women in terms of path coefficients. The paths between childhood family violence and sense of belonging and all of the conflict variables and loneliness had a greater effect on women with more SDD as opposed to less SDD. In addition, the path from social support from friends to PPD had a path difference that was greater for more versus less SDD women. The impact of impaired bonding on PPD, perceived social support from family on impaired bonding, and parenting sense of competence on impaired bonding was greater for women with less SDD when compared to women with more SDD.

Discussion

This secondary analysis study was designed to better understand the impact of relational variables on PPD. There were 27 direct paths tested in the model with 10 paths that were not significant. The significant paths to sense of belonging were supported by other research (Hagerty & Williams, 1999; McLaren et al., 2007; Sargent et al., 2002) and it also was noteworthy that lifetime domestic violence did not impact sense of belonging as the examined research suggests that current conflict in relationships affects sense of belonging more than conflict in the past.

The next paths examined were the paths that led to impaired bonding. Perceived social support from family, friends, and a partner impacted the mother-infant dyad in terms of bonding, however, the variable that had the greatest impact on impaired bonding was parenting sense of competence with a regression weight of -0.49 . This is especially useful information as healthcare practitioners could easily assess for sense of competence prenatally and build competence to prevent impaired bonding in the postpartum. Two paths to impaired bonding that were not significant were sense of belonging and current IPV. The insignificant relationship between sense of belonging and bonding is noteworthy because whether or not the new mother feels “valued” or “fits” with family, friends, and community does not have an impact on the relationship the mother has with her new infant. In terms of the path from conflict to impaired bonding, conflict is associated with insecure attachment (Bowlby, 1980; Pietromonaco, Greenwood, & Barrett, 2006) however bonding is an intimate relationship between a mother and infant and therefore, in this research study, current domestic violence does not appear to destroy or even influence the mother-infant bond.

The final paths that were examined included the paths to PPD. All of the paths noted in the model were supported in the literature as having an effect on PPD however this path model demonstrated that perceived social support from friends and family had no direct impact on depression. It is important to state that both of these variables significantly affect PPD however this occurred along an indirect path. There were two perceived social support paths that had a direct effect on depression and included the quality of the love relationship (partner quality) path and the healthcare alliance path. There certainly was research that supported the notion that partner support (or lack of) affects PPD (described above) however the surprising direct path result was the strength of the standardize regression estimate for

healthcare alliance ($-.11$) as this variable was the third strongest predictor variable to PPD. This result is important for healthcare practitioners as their relationship with their patients matter and to the extent that postpartum women who share an alliance with their practitioner, have less depressive symptoms. This finding that a positive alliance with maternal care providers was protective against PPD has a parallel in the research. According to Seng et al. (2013) and Fisher (1994), a positive perception of the care received in labor also has a protective effect on postpartum mental health.

A path that was significant but not in the expected direction was the path from perceived partner support to impaired bonding. It was expected that more support from a partner would result in less impaired bonding however, the reverse was true, meaning the more perceived support from a partner, the more bonding was impaired. This finding is counter to the intuition that positive partner relationships would be associated with positive mother-baby relationships. More research is needed to understand why this might be.

There are a few other relationships worth mentioning in terms of the path differences in the model based on SDD. A surprising result for women with more SDD was the fact that the partner relationship did not have a significant impact on the dependent variables of impaired bonding, sense of belonging, and PPD and therefore did not impact the model at all. Initially it was believed that these women did not rely on a partner and instead social support from friends was what impacted impaired bonding, sense of belonging, and PPD however, a post hoc analysis revealed that 88.3% of more SDD women had no partner whereas 87.6% of less SDD women had a partner. Finally, the path from perceived social support from friends to PPD was different for more SDD women as opposed to less SDD women. Again, more SDD women in this study appeared to rely on friends more than a partner or even family and this perceived support from friendships (or lack of) was what had a direct impact on depression. It is also important to mention that the path from healthcare practitioner alliance to PPD affected both groups however for more SDD women the influence was 40% greater.

The overall message that is important to note regarding women with more SDD is that the trajectory of violence for these women continues from their own birth until pregnancy as 11% of these women experience current IPV as compared to women with low SDD who essentially do not experience IPV at all (1 out of 371 women). In addition, many women with more SDD do not have partners which may be a healthy situation if these women severed an abusive relationship (Kruse et al., 2012) which means they need to rely on others to meet their social support needs. Data from this analysis indicate that the primary support people that directly affect PPD for more SDD women include friends and the obstetric healthcare practitioner.

There are a few additional significant relationships that are important to highlight. In terms of variables that impact sense of belonging, the variable with the strongest relationship to sense of belonging is childhood family violence with a standardized regression weight of $-.33$. Therefore, in order to enhance sense of belonging, healthcare practitioners will need to explore ways to enhance a woman feeling “valued” and “fitting in” as it pertains to the childhood maltreatment the woman experienced in the past. Issues related to childhood family violence are important to address in pregnancy as it appears to impact loneliness

(indirectly) and depression postpartum (directly). In fact, the total effect of childhood family violence on PPD was .17 and this variable had the fourth largest total impact on PPD.

Another significant relationship to note was that parenting sense of competence in the postpartum was the greatest predictor variable of impaired bonding and had almost five times the impact on impaired bonding compared to perceived support from family, friends, and a partner. This finding is noteworthy as healthcare practitioners may assess for parenting sense of competence in pregnancy and enhance those women with low perceived competence skills through informational and emotional support strategies (e.g. parenting education classes). Parenting sense of competence is important to enhance in women who perceive low competence as the path to impaired bonding has a standardized beta weight of $-.49$ and the path from parenting sense of competence to PPD .21 (indirect effect through bonding).

Another significant finding of this study was that loneliness in the postpartum period had a direct effect on PPD as well as on impaired bonding. It is important to highlight that loneliness was measured after the birth of the baby and a possible explanation for the relationship between loneliness and PPD is that the mother may feel “cut off” from her “normal” routine and prior way of life.

Impaired bonding had the greatest impact on PPD of all of the independent variables with a standardized regression weight of .36 for the direct effect. Impaired bonding also indirectly affected PPD through loneliness for a total effect of .43. It is very important to note that the direction of this relationship is in the opposite direction from most theories which consider that impaired bonding, i.e., subjective lack of closeness with the infant, is an outcome of maternal depression. Results of this SEM indicate that it is also a risk factor for maternal depression. This is consistent with this relational theory of depression which posits that difficulties in or inadequate relationships increase risk of depression—including difficulties in the maternal-infant dyadic relationship. Since bonding begins during pregnancy (Klaus, Kennell, & Klaus 1996), assessing both parenting sense of competence and prenatal “taking in” (Rubin, 1967) of the child would allow for both depression and parenting preventive work ahead of the birth. Recognizing, acknowledging, and addressing the mother’s concerns or feelings of detachment might have the additional benefit of strengthening her sense of being cared for, the alliance with the care providers, and sense of belonging to the proportion of mothers who struggle with such experiences.

There are several limitations to this study. The findings may not be generalizable to multiparous women, women who are not pregnant, and men. In addition, because this was a secondary analysis of data, there were several proxy variables that were created. This is not to say that these proxies were not reliable or valid, however, the variables of sense of belonging and loneliness in particular may have been more “true” to the concept had an established, reliable measure been used. That being said, feeling “cut off” is related to the DSM-IV criteria for PTSD of feeling detached from others and it was hypothesized that this description might be a more accurate reflection of a woman’s situation immediately after birth.

Despite these limitations, there were some major strengths of this research. The proposed model provides evidence that 35% of the variance in depressive symptoms may be explained by the independent variables and that impaired bonding and loneliness explained the most variance with estimates of 0.36 and 0.23 respectively. The novel result, that impaired bonding might be a cause of PPD rather than an effect, is supported by the SEM model fit statistics. Another major strength of this research was that social support was examined according to “type of helper”. This was important because it was very clear in the analysis what type of helper had the most influence on each of the variables. A final strength of this research was that the study was prospective, therefore the data for the model variables on the left side of the model were collected before the data on the right, lending support to causal reasoning.

Finally, another major strength of this research is that it has the potential to impact practice. For example, interpersonal psychotherapy (IPT) is one of the major psychotherapeutic treatments used for women with PPD with a focus on the four treatment areas of grief and loss, role transitions, interpersonal sensitivity, and interpersonal disputes (Weissman, Markowitz, Klerman, 2007). Solving interpersonal disputes is a priority step, though addressing the root of the relationship problem when IPT clients have a history of IPV and childhood maltreatment is a more long-term proposition. Results of this study suggest that IPT and parenting education programs could have even better effects if they were modified to prioritize the needs of women reporting feelings of detachment from their upcoming infant during pregnancy.

Conclusion

The proposed relational model of PPD tested with these data gives insight into the additional risk factors for PPD: sense of belonging and impaired bonding. Therefore, a future research direction would include examining these variables, with established reliable and valid instruments, to further validate the theory that sense of belonging and impaired bonding truly impact PPD. Mean while, the results of this research give healthcare practitioners insight into the key variables for PPD and enrich options for assessment during pregnancy and for potential interventions to decrease the toll of depression in the postpartum.

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Figure 1.
The theoretical model of postpartum depression

Figure 2.

The theoretical model for postpartum depression tested by using SEM with standardized regression coefficients (above straight arrows) and R² values (above endogenous variables, top right corner). Observed variables are represented by squares.

Table 1

Demographics by Postpartum Depressive Symptoms: Chi-Square Test for Independence in Postpartum Women (N=564)

Characteristic	No PPD n (%) 241 (42.7)	Cut of score of 60- Minor PPD n (%) 202 (35.8)	Cut of score of 80- Major PPD n (%) 121 (21.5)	Total N (%) 564 (100)	$\chi^2(2)$	p
Race/Ethnicity ^a						
African Americans (n=170)	62 (36.5)	67 (39.4)	41 (24.1)	170 (30.1)	3.92	.14
Am Indian/Alaska Native (n=7)	3 (42.9)	3 (42.9)	1 (14.2)	7 (1.2)	.27	.88
Asians (n=46)	16 (34.8)	22 (47.8)	8 (17.4)	46 (8.2)	3.14	.21
European Americans (n= 324)	155 (47.8)	102 (31.5)	67 (20.7)	324 (57.4)	8.86	.01
Hawaiian/ Pacific Islander (n=3)	1 (33.3)	2 (66.7)	0 (0)	3 (0.5)	1.51	.47
Latinas (n=31)	17 (54.8)	10 (32.3)	4 (12.9)	31 (5.5)	4.58	.33
Middle Eastern (n=19)	5 (26.3)	8 (42.1)	6 (31.6)	19 (3.4)	5.94	.20
Other race/ethnicity (n=23)	8 (34.8)	9 (39.1)	6 (26.1)	23 (4.1)	.67	.72
Teens (18–20) (n=89)	39 (43.8)	36 (40.4)	14 (15.8)	89 (15.8)	2.28	.32
Income <\$15,000 (n=85)	31 (36.5)	32 (37.6)	22 (25.9)	85 (15.1)	1.93	.38
High School or less (n=183)	74 (40.4)	68 (37.2)	41 (22.4)	183 (32.4)	.58	.75
Urban or High Crime Residence (n=187)	66 (35.3)	76 (40.6)	45 (24.1)	187 (33.2)	6.33	.04
More SDD Risk	70 (36.3)	76 (39.4)	47 (24.3)	193 (34.2)	5.06	.08
Mean number of SDDs(SD)	1.1 (1.6)	1.4 (1.7)	1.3 (1.7)	1.3 (1.7)		.49
Mean age (SD)	27.3 (5.4)	26.9 (5.7)	27.1 (5.1)	27.1 (5.4)		.46

Note.

^a Some demographics do not total to the full sample size of 564 due to small numbers of participants declining the question or due to women giving more than one race/ethnic identity.

SD=Standard Deviation, SDD= Sociodemographic disadvantage, which is a sum of being African American, a teen, with low income, and a high school education or less, and More SDD Risk= Two or more SDD risk factors.

Table 2
Descriptive Statistics and Distributions of the Model Variables in Postpartum Women (N=564)

Variable	M	95% CI	SD	Theoretical Range	Observed Range
Perceived Social Support					
Family APGAR	22.0	21.6–22.3	3.6	5–25	5–25
Friendships	4.6	4.6–4.7	0.6	1–5	2–5
Partner Quality	3.6	3.6–3.7	0.6	1–5	1–5
Healthcare Alliance	60.9	60.3–61.5	6.5	16–80	34–79
Sense of Belonging					
Feeling cut off from other people (for 1 month or more)	Yes=24.1% (n=136)	No=75.9% (n=428)		0–1	0–1
Feeling others do not understand you or are unsympathetic	3.2	3.1–3.3	1.1	0–4	0–4
Feeling that people are unfriendly or dislike you	3.8	3.7–3.9	0.7	0–4	0–4
Conflict					
History of Family Violence (before age 16)	0.5	0.4–0.6	0.9	0–6	0–6
Lifetime Domestic Violence	1.1	0.9–1.2	1.7	0–3	0–3
Current Domestic Violence	0.1	0.0–0.1	0.2	0–6	0–2
Parenting Sense of Competence	53.3	53.0–53.5	2.9	11–55	35–55
Impaired Bonding	17.4	16.7–18.1	7.9	0–115	8–55
Loneliness (wave 3)	Yes=13.8% (n=78)	No=86.2% (n=486)	1	0–1	0 and 1
PPD	64.1	62.3–65.8	19.4	35–175	35–146

Note. CI=confidence interval.

Table 3
SEM Effects of the Causal Variables on the Endogenous Variables in Postpartum Women (N=564)

Endogenous Variables									
Causal Variables	Sense of Belonging		Impaired Bonding		Loneliness		PDSS		SE
	Sth.	SE	Sth.	SE	Sth.	SE	Sth.	SE	
Family Violence									
Direct Effect	-0.33***	0.04	-	-	0.06	0.04	0.11**	0.03	
Indirect Effect	-	-	0.02	0.01	0.07***	0.01	0.06***	0.01	
Total Effect	-0.33***	0.04	0.02	0.01	0.13**	0.05	0.17***	0.04	
Lifetime IPV									
Direct Effect	-0.06	0.04	-	-	0.02	0.04	-0.02	0.03	
Indirect Effect	-	-	-	-	0.01	0.01	0.02	0.01	
Total Effect	-0.06	0.04	-	-	0.03	0.05	0.00	0.04	
Current IPV									
Direct Effect	-0.16***	0.04	-0.05	0.04	0.05	0.04	-0.04	0.04	
Indirect Effect	-	-	0.01	-	0.02	-	0.01	-	
Total Effect	-0.16***	0.04	-0.04	0.04	0.07	0.04	-0.03	0.04	
Friends									
Direct Effect	0.19***	0.04	-0.12**	0.03	-	-	-0.01	0.03	
Indirect Effect	-	-	-0.01	0.01	-0.08***	0.02	-0.08***	0.01	
Total Effect	0.19***	0.04	-0.13**	0.04	-0.08***	0.02	-0.09*	0.04	
Family									
Direct Effect	0.15***	0.04	-0.09*	0.03	-	-	-0.01	0.03	
Indirect Effect	-	-	-0.01	0.01	-0.06***	0.02	-0.06***	0.01	
Total Effect	0.15***	0.04	-0.10**	0.04	-0.06***	0.02	-0.07*	0.04	

Endogenous Variables									
Causal Variables	Sense of Belonging		Impaired Bonding		Loneliness		PDSS		
	Sth.	SE	Sth.	SE	Sth.	SE	Sth.	SE	
Partner									
Direct Effect	0.08*	0.03	0.09**	0.04	-	-	-0.10**	0.03	
Indirect Effect	-	-	-	-	0.01	0.01	0.03*	0.01	
Total Effect	0.08*	0.03	0.09**	0.04	0.01	0.01	-0.07*	0.04	
Endogenous Variables									
Causal Variables	Sense of Belonging		Impaired Bonding		Loneliness		PDSS		
	Sth.	SE	Sth.	SE	Sth.	SE	Sth.	SE	
Parenting SOC									
Direct Effect	-	-	-0.49**	0.03	-	-	-	-	
Indirect Effect	-	-	-	-	-0.14***	0.02	-0.21***	0.02	
Total Effect	-	-	-0.49**	0.03	-0.14***	0.02	-0.21***	0.02	
Sense of Belonging									
Direct Effect	-	-	-0.05	0.04	-0.19***	0.04	-0.08*	0.04	
Indirect Effect	-	-	-	-	-0.01	0.01	-0.07***	0.01	
Total Effect	-	-	-0.05	0.04	-0.20***	0.05	-0.15**	0.05	
Impaired Bonding									
Direct Effect	-	-	-	-	0.29***	0.04	0.36***	0.02	
Indirect Effect	-	-	-	-	-	-	0.07***	0.01	
Total Effect	-	-	-	-	0.29***	0.04	0.43***	0.03	
Healthcare Alliance									
Direct Effect	-	-	-	-	-	-	-0.11***	0.04	

Endogenous Variables									
Causal Variables		Sense of Belonging		Impaired Bonding		Loneliness		PDSS	
		Sth.	SE	Sth.	SE	Sth.	SE	Sth.	SE
Indirect Effect		-	-	-	-	-	-	-	-
Total Effect		-	-	-	-	-	-	-0.11***	0.04
Loneliness									
Direct Effect		-	-	-	-	-	-	0.23***	0.04
Indirect Effect		-	-	-	-	-	-	-	-
Total Effect		-	-	-	-	-	-	0.23***	0.04

Notes: Std.=Standardized; SE=Standard Error; SOC=sense of competence

* $p<.10$;
** $p<.01$;
*** $p<.001$

Table 4

Path Estimates with Z-scores for Path Differences Between Less and More SDD Women (N=564)

		Less SDD (n=371)		More SDD (n=193)		p	z-score
		Estimate	p	Estimate	p		
Sense of Belonging	<---	-0.376	.008	-0.071	.824		0.870
Sense of Belonging	<---	0.086	.001	0.085	.016		-0.012
Sense of Belonging	<---	0.043	.773	0.217	.180		0.796
Sense of Belonging	<---	0.630	.000	0.733	.001		0.393
Sense of Belonging	<---	-0.390	.000	-0.695	<.001		-2.029**
Sense of Belonging	<---	-2.302	.095	-0.995	.020		0.906
Impaired Bonding	<---	0.514	.467	0.549	.224		0.042
Impaired Bonding	<---	-0.491	.000	-0.087	.380		2.549**
Impaired Bonding	<---	-0.970	.134	-1.734	.006		-0.843
Impaired Bonding	<---	-0.492	.036	-0.195	.284		1.002
Impaired Bonding	<---	-1.565	.809	0.295	.780		0.283
Impaired Bonding	<---	-1.541	.000	-0.518	<.001		5.639***
Loneliness	<---	-0.044	.000	-0.022	.040		1.448
Loneliness	<---	0.062	.059	-0.097	.047		-2.704***
Loneliness	<---	-0.004	.825	0.046	.022		1.776*
Loneliness	<---	-0.521	.100	0.155	.019		2.088**
Loneliness	<---	0.012	.000	0.014	<.001		0.468
PDSS	<---	15.089	.000	9.836	.011		-1.139
PDSS	<---	-3.887	.018	-0.846	.538		1.418
PDSS	<---	21.715	.159	-4.321	.237		-1.644
PDSS	<---	2.616	.095	-4.667	.016		-2.915***
PDSS	<---	0.075	.807	-0.079	.794		-0.357
PDSS	<---	-0.968	.545	-1.217	.652		-0.079
PDSS	<---	1.867	.066	1.469	.182		-0.265
PDSS	<---	1.069	.000	0.583	.007		-2.025**

		Less SDD (n=371)		More SDD (n=193)		p	z-score
		Estimate	p	Estimate	p		
PDSS	<---	Sense of Belonging	-.0759	.198	-.0545	.368	0.253
PDSS	<---	Healthcare Alliance	-.0312	.021	-.0386	.026	-.0333

Notes:

*** p-value < .01;

** p-value < .05;

* p-value < .10,

IPV=intimate partner violence, Parenting SOC=parenting sense of competence; <--- =direction of the relationship