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# Biopsychosocial predictors of trajectories of postpartum sexual function in first-time mothers

Samantha J. Dawson, Ph.D.,[1] Marie-Pier Vaillancourt-Morel, Ph.D.,[2] Marianne Pierce, M.D. FRCSC,[3] & Natalie O. Rosen, Ph.D.[1,3,4]

[1] Department of Psychology & Neuroscience, Dalhousie University, Halifax, Nova Scotia

[2] Département de psychologie, Université du Québec à Trois-Rivières, Trois-Rivières, Quebec

[3] Department of Obstetrics and Gynaecology, Dalhousie University, Halifax, Nova Scotia, Canada

This research was supported by grants awarded to N. O. Rosen from the Canadian Institutes of Health Research (CIHR; FRN 135870) and the Nova Scotia Health Research Foundation (FRN 1762). S. J. Dawson was supported by a Social Sciences and Humanities Research Council Banting postdoctoral fellowship (Appl ID 411912) and the IWK Health Centre postdoctoral fellowship (FRN 1024277) and N. O. Rosen was supported by a CIHR New Investigator Award (FRN 141986). The authors would like to acknowledge Jaimie Beveridge, Gillian Boudreau, Emily Coté, Kayla Mooney, Megan Muise, Hannah Richardson, and Loriann Williams for their assistance with data collection. Versions of this paper were presented at the annual meetings of the Department of Obstetrics and Gynecology, Dalhousie University, Halifax, Nova Scotia (April, 2019) and the International Academy of Sex Research in Mexico City, Mexico (July, 2019).

*Corresponding Author Information:*
[4] Natalie O. Rosen
Departments of Psychology & Neuroscience, Dalhousie University, 1355 Oxford Street, P.O. Box 15000, Halifax, Nova Scotia, Canada, B3H 4R2
Tel.: +1 (902) 494-4044
Fax: +1 (902) 494-6585
E-mail: nrosen@dal.ca

## Abstract

**Objective:** The postpartum period is a vulnerable time for sexual health, yet the relationship between biopsychosocial factors and sexual function over time remains unclear. Our aim was to identify trajectories of postpartum sexual function in first-time mothers (*N*=646), and examine associations with biopsychosocial factors. **Methods:** Biopsychosocial factors were assessed at delivery and 3-months postpartum. Sexual function was assessed during pregnancy, 3-, 6-, and 12-months postpartum using the Female Sexual Function Index. Latent class growth analysis was conducted to identify distinct sexual function trajectories. Multinomial logistic regressions examined associations between biopsychosocial factors and membership in the trajectories. **Results:** Three trajectories were identified: 52% of women reported minimal sexual function problems at 3-months postpartum and improved the least over time, 35% of women reported moderate sexual function problems at 3-months and improved the most over time, and 13% of women reported marked sexual function problems at 3-months and improved somewhat over time. Biomedical factors were not significantly related to trajectory membership. Higher sexual distress at 3-months postpartum was associated with increased odds of being in the moderate and marked sexual function problems subgroups, whereas higher sexual function in pregnancy was associated with decreased odds of being in these subgroups. Lower depressive symptoms and higher relationship satisfaction was associated with reduced odds of being in the marked problems subgroup. **Conclusions:** Improvement in sexual function postpartum is heterogeneous. Psychosocial, but not biomedical factors were significantly associated with the trajectories. This information may be integrated into psychoeducation, and for informing earlier assessment and intervention practices.


**Keywords:** sexual function; biopsychosocial; postpartum; sexual distress; relationship satisfaction

Sexual health—defined as a state of physical, emotional, mental, and social wellbeing in relation to sexuality—is an important component of overall health and well-being and uniquely contributes to better mental and physical health outcomes (Diamond & Huebner, 2012; World Health Organization, 2010). Sexual function—desire, arousal, orgasm, satisfaction, pain—is a core component of sexual health. Problems with sexual function are common, affecting up to 55% of women in the general population (McCabe et al., 2016). Such problems can newly emerge or peak following the birth of a child, which is already a vulnerable period for women's health (McBride & Kwee, 2017). Indeed, 89% of first-time mothers report experiencing at least 11 (out of 20) moderately distressing concerns regarding their postpartum sexuality. These include concerns regarding sexual frequency and how body image, physical recovery, sleep and fatigue impacts sexual function (Schlagintweit, Bailey, & Rosen, 2016). Lower sexual function postpartum contributes to poorer general health and increased health service utilization (Waterstone, Wolfe, Hooper, & Bewley, 2003), and has been linked with postpartum depression, relational conflict and dissolution, and less sensitive parenting (Figueiredo et al., 2008; Goldberg & Carlson, 2014; Reid & Crisafulli, 1990).

Cross-sectional studies reveal that 20% to 68% of first-time mothers report problems with their sexual function at 3-months postpartum, and between 5% and 37% of first-time mothers report problems at 12-months postpartum (Leeman & Rogers, 2012; McBride & Kwee, 2017; Serati et al., 2010). Although these data suggest that sexual function may improve, on average, over the postpartum period, they do not reveal if all first-time mothers show similar rates of change. The objective of the current longitudinal study was to identify unique sexual function trajectories of first-time mothers and to examine biopsychosocial predictors of the trajectories. Investigating distinct trajectories of sexual function will provide more nuanced information about women's postpartum sexual health, which may facilitate early assessment and intervention, contributing to better overall health and wellbeing for first-time

mothers. Enhanced understanding is necessary given that few women discuss postpartum sexual problems with their healthcare provider or access treatment (Barrett et al., 2000), despite adverse consequences for their health (Waterstone et al., 2003).

**Biopsychosocial Model of Postpartum Sexual Function**

Models of women's sexual function (Bancroft, Graham, Janssen, & Sanders, 2009; Basson, 2000), as well as recent conceptualizations of postpartum sexual health (McBride & Kwee, 2017; McBride, Olson, Kwee, Klein, & Smith, 2017), propose that sexual function is influenced by a combination of biological, psychological, and relational factors. Biological factors including those related to the birth experience (e.g., mode of delivery, episiotomy, epidural, induction, degree of perineal tear), and physiological and hormonal sequelae associated with pregnancy and postpartum (e.g., breastfeeding) may interfere with sexual desire and arousal or increase pain during intercourse. According to these models, sexual function may be further inhibited by the presence of psychological factors known to interfere with desire and arousal (e.g., low mood, fatigue, and distress) by distracting attention away from sexual cues or inhibiting the experience of pleasure. These psychological factors may also perpetuate difficulties or be associated with less improvement over time. Relational/social factors, including relationship dissatisfaction, are thought to inhibit sexual function by reducing feelings of intimacy and connectedness (Basson, 2000; McBride & Kwee, 2017).

Findings from cross-sectional and longitudinal research are equivocal with respect to the relationship between biological factors and postpartum sexual function (McBride & Kwee, 2017; Serati et al., 2010). The majority of research has examined the link between mode of delivery and sexual function at a particular time point (e.g., 3-months postpartum). Some studies have observed increased rates of genital pain and poorer overall sexual function among those who had an assisted vaginal delivery (i.e., forceps, vacuum, episiotomy) and severe perineal tearing compared to unassisted and cesarean deliveries

(Barbara et al., 2016; Leeman et al., 2009). Physiological changes associated with breastfeeding (i.e., elevated prolactin and oxytocin) have been linked with decreased sexual desire and arousal, increased pain during intercourse, and poorer overall sexual function (Connolly, Thorp, & Pahel, 2005; McBride & Kwee, 2017). However, other studies have not observed significant associations between the aforementioned biomedical factors and sexual function (Barrett et al., 2000; Connolly et al., 2005; Faisal-Cury, Menezes, Quayle, Matijasevich, & Diniz, 2015; Rådestad, Olsson, Nissen, & Rubertsson, 2008). No studies have examined how biomedical factors relate to change in sexual function over time, which may explain the mixed findings. It is possible that biomedical factors might be more relevant for women with persistent problems with sexual function relative to those with minimal problems or problems that resolve relatively quickly. Consistent with models of sexual function (Bancroft et al., 2009; Basson, 2000), and given the mixed findings in the literature, we hypothesized that if biomedical factors were related to sexual function, they would be associated with women who experience the most marked problems at 3-months and who show the least improvement over time.

The birth of a new child can also result in psychological (e.g., mood, distress, and fatigue) and social/interpersonal (e.g., relationship satisfaction) changes for the mother and her partner as they adapt to their new roles postpartum. Cross-sectional studies have linked postpartum depression, as well as disturbed sleep and fatigue, with poorer sexual function (Chivers, Pittini, Grigoriadis, Villegas, & Ross, 2011; Hipp, Low, & van Anders, 2012). A psychological factor that has received relatively little attention in the context of postpartum sexual function is sexually-related personal distress. Sexual distress includes worries or concerns regarding one's sex life (Derogatis, Rosen, Leiblum, Burnett, & Heiman, 2002), is common (Schlagintweit et al., 2016), and a necessary criterion for a diagnosis of sexual dysfunction. Yet little is known about the role of sexual distress in understanding change in sexual function during the postpartum. One cross-sectional study found that women experience

moderate levels of distress related to their postpartum sexual concerns (Schlagintweit et al., 2016). According to theory (Metz, Epstein, & McCarthy, 2017), psychological factors, such as fatigue, depression, and sexual distress, might promote negative cognitions and affect (e.g., nonsexual thoughts, anhedonia), that promote avoidance of sexual activity and contribute to more persistent sexual difficulties over time.

As stated, the transition to parenthood necessitates change to the interpersonal dynamics of the couple when adapting to the demands of caring for an infant. Relative to pre-pregnancy, the postpartum is associated with declines in relationship satisfaction—the degree to which one is happy and content in their romantic relationship (Doss & Rhoades, 2017). Indeed, compared to non-parent couples, first-time parents experience steeper declines in their relationship satisfaction over the same time period (Doss & Rhoades, 2017). Given the inherently interpersonal nature of the sexual relationship, declines in relationship satisfaction are not surprisingly linked to poorer postpartum sexual function (De Judicibus & McCabe, 2002; Khajehei, Doherty, Tilley, & Sauer, 2015). Women who experience marked declines in their relationship satisfaction postpartum or who are generally less relationally satisfied may be less equipped to navigate the myriad sexual concerns that arise postpartum (Schlagentweit et al., 2016), contributing to poorer sexual function and less improvement over time.

**Limitations of Previous Research**

Our understanding of postpartum sexual function is limited because many studies are underpowered, retrospective, and the prospective studies that do exist tend to compare mean sexual function scores across time points usually early in the postpartum period (e.g., 3- and 6-months; Barbara et al., 2016; Connolly et al., 2005; De Judicibus & McCabe, 2002; Fehniger et al., 2013; Khajehei et al., 2015; Leeman et al., 2009; Yildiz, 2015). This study design does not allow for an estimation of the degree of change in sexual function over time. Consequently, prior studies have not examined predictors

of these patterns of change over time. Additionally, there is substantial variability in measurement of sexual function, and few studies have used validated measures shown to differentiate women with and without sexual difficulties (Serati et al., 2010), limiting the clinical utility of this research. To our knowledge, only one study has examined change in sexual function across pregnancy and postpartum and this study only examined biomedical predictors ($N$ = 440; De Souza et al., 2015). Using linear mixed modelling, the authors observed significant improvement in sexual function from 6 to 12 months; however, change over time was not affected by the mode of delivery or perineal injury. Although the authors accounted for time in their analyses, they did not model growth over time nor did they examine if all first-time mothers followed the same pattern of change. If multiple trajectories of postpartum sexual function exist, then it is possible that biopsychosocial factors are associated with some but not all trajectories, and that these effects would be obscured when examining first-time mother's sexual function as a homogenous, rather than heterogenous, group.

**The Current Study**

The objective of this longitudinal study was to identify subgroups of sexual function trajectories in a sample of first-time mothers and to examine if biopsychosocial factors known to interfere with sexual function were associated with membership in these trajectories. Our goal was to more accurately capture women's sexual function postpartum by accounting for potential heterogeneity, and to identify pertinent risk factors that could inform early assessment and be targeted in intervention. Given the varied prevalence rates of problems with sexual function in the literature (McBride & Kwee, 2017), we hypothesized that first-time mother's sexual function would be best captured by multiple distinct trajectories. Following models of sexual function and existing literature, we hypothesized that biopsychosocial factors (i.e., biomedical risk factors, sexual problems in pregnancy, depression, fatigue,

relationship dissatisfaction, and sexual distress) would be associated with those trajectories that captured poorer sexual function and less improvement over time.

## Method

### Participants

First-time mothers were recruited during pregnancy (between 18 and 22 weeks; *M* = 20.73 weeks; *range,* 18 to 26, *SD* = 1.14) from the IWK Health Centre diagnostic imaging clinic in Halifax, Nova Scotia, during their routine anatomical ultrasound appointment. The inclusion criteria were: 1) age over 18; 2) primiparous; 3) uncomplicated, singleton pregnancy; 4) if present, well-managed medical or psychiatric illnesses (self-reported); 5) fluent in English; and 6) access to a personal email account. Additional inclusion criteria for the current analyses were: 1) completion of at least one postpartum survey; and 2) no additional pregnancies or deliveries.

Based on an apriori power analysis, a total of 906 women were recruited and enrolled in a larger study examining the prevalence and predictors of genito-pelvic pain in pregnancy and postpartum. Figure 1 depicts a flow chart of recruitment. Of the recruited sample (*n* = 906), 822 actually completed the baseline survey. Of the eligible sample (*n* = 822), 745 women completed the postpartum survey at 3-months (retention rate of 90.63%), 703 completed at 6-months (retention rate of 85.52% between baseline and 6-months), and 678 completed at 12-months (retention rate of 82.48% between baseline and 12-months). Women were excluded from the analyses if they became pregnant or gave birth during the data collection period (*n* = 58) or could not be included in the analyses because they did not complete any of the postpartum surveys (*n* = 52), leaving an eligible sample of 712 women. Of the eligible sample (*n* = 712), 66 women did not report any sexual activity in the 4 weeks prior to each of the postpartum time points precluding the calculation of a valid Female Sexual Function Index (FSFI)-total score. Although these 66 women were not able to be included in the main analyses because their

FSFI-Total was not interpretable (Meyer-Bahlburg & Dolezal, 2007), descriptive information for their biomedical and psychosocial variables are available in Table 1. There were no significant differences between sexually-inactive women ($n$ = 66) and the overall sample ($n$ = 646) for any of the biopsychosocial factors (see Table 1 for comparisons). Comparisons based on the subgroups revealed that sexually-inactive women reported better sexual function in pregnancy compared to the marked problems subgroup, but lower sexual function compared to the minimal problems subgroup. They reported lower relationship satisfaction than the minimal problems subgroup. They also reported lower sexual distress compared to the moderate and marked problems subgroups, but higher distress compared to the minimal problems subgroup. Exclusion of these women left 646 women available for the current Latent Class Growth Analysis (LCGA) using the interpretable FSFI-total scores. LCGA enabled us to retain all women who had completed at least one postpartum time point in our analyses. Full sociodemographic information for the sample are available in Table 1. Examination of women lost to attrition (i.e., who did not complete any surveys following baseline) revealed that they were significantly younger ($M$ = 27.61, $SD$ = 5.35), had been in relationships of shorter duration ($M$ = 56.70, $SD$ = 41.17), were less educated (high school; 31.5%), and of lower socioeconomic status (< $60,000/yr; 45.4%) compared to those included in the analyses (see Table 2).

**Procedure**

Research staff identified potential participants prior to their 20-week appointment at the IWK Health Centre diagnostic imaging clinic. At their appointment, a research assistant described the study and if interested and eligible, obtained informed written consent. All surveys were completed online via an e-mailed link using Qualtrics Research Suite survey software (Baseline: 18-22 weeks pregnant, 2-weeks postpartum, and 3-, 6-, and 12-months postpartum). Chart review of birth records was conducted to collect biomedical information related to labor and delivery (i.e., mode of delivery, epidural,

episiotomy, induction, and degree of perineal tearing). For women who did not deliver at the IWK Health Centre ($n$ = 18), this information was obtained with permission from their medical records and/or the 2-weeks postpartum survey. Strategies to promote participation included email and phone call reminders using an established protocol (Glowacka, Rosen, Chorney, Snelgrove-Clarke, & George, 2014; Rosen et al., 2018). Survey links expired after four weeks. Women received gift certificates to Amazon.ca: $5 for the 18-22 weeks surveys; $10 for each of the postpartum surveys. The study was approved by the ethical review board at the IWK Health Centre.

**Measures**

Participants reported on relevant sociodemographic information in the baseline survey. A chart review (i.e., mode of delivery, epidural, episiotomy, induction, and degree of perineal tearing) and 2-weeks postpartum questionnaire (i.e., breastfeeding) were used to collect the biomedical predictors. Six dichotomous (no/yes) biomedical factors related to labor and delivery were examined: epidural, vaginal delivery (which included assisted delivery methods—vacuum, forceps), induction of labor, episiotomy, perineal tear, and breastfeeding at 3-months postpartum.

**Female sexual function.** The main outcome variable was total sexual function measured at each time point using the well-validated 19-item FSFI (Rosen et al., 2000). Scoring followed recommendations to prevent artificially low scores for women who did not report engaging in sexual activity in the previous four weeks (Meyer-Bahlburg & Dolezal, 2007). Total scores based on this scoring method range from 7.2 to 36, with higher scores indicative of better sexual function. The FSFI has previously demonstrated strong psychometric properties (Rosen et al., 2000) and showed strong internal consistency in our sample at each time point (Cronbach's $\alpha$ = .94 at all time points). The total score was used for the latent class growth analyses (LCGA) because there are established clinical-cut offs for the total score (i.e., < 26.55) (Wiegel, Meston, & Rosen, 2005) but not for all subscales, thereby

enhancing the potential clinical utility of any observed findings. A total score of 26.55 has been demonstrated to be optimal for differentiating women with and without sexual dysfunction based on a combination of sensitivity, specificity, and classification and regression trees (CART) procedures (Wiegel et al., 2005).

**Postpartum depression.** The Edinburgh Postnatal Depression Scale (EPDS) (Cox, Holden, & Sagovsky, 1987) is a well-validated 10-item measure used to assess depressive symptoms at 3-months postpartum. Total scores range from 0 to 30, with higher scores indicative of greater depressive symptoms. This measure has demonstrated excellent psychometric properties (Cox et al., 1987) and showed strong internal consistency in our sample (Cronbach's $\alpha = .85$).

**Fatigue.** Fatigue at 3-months postpartum was assessed with a single item used in previous research (Rosen, Bailey, & Muise, 2017) requiring participants to report their average daily energy level. Scores ranged from 1 (high energy) to 7 (extreme fatigue).

**Relationship satisfaction.** The 4-item version of the Couples Satisfaction Index (CSI) (Funk & Rogge, 2007) was used to assess relationship satisfaction at 3-months postpartum. Total scores range from 0 to 21, with higher scores indicative of greater relationship satisfaction. The CSI has demonstrated good psychometric properties (Funk & Rogge, 2007) and strong internal consistency in the current study (Cronbach's $\alpha = .87$). The CSI items do not refer to, or assess, sexual satisfaction.

**Sexual distress.** The Female Sexual Distress Scale (FSDS) (Derogatis et al., 2002) is a well-validated 13-item measure and was used to assess distress about one's sex life at 3-months postpartum. The FSDS does not assess sexual function specifically, and is also distinct from general measures of mood and distress. Total scores range from 0 to 52, with higher scores indicative of greater sexual distress. Scores greater than 15 indicate clinically significant distress associated with sexual problems

(Derogatis et al., 2002). The FSDS has demonstrated good psychometric properties (Derogatis et al., 2002) and showed strong internal consistency in the current study (Cronbach's α = .94).

**Data Analysis**

Descriptive statistics were calculated with the Statistical Package for the Social Sciences (SPSS V. 25.0., SPSS Inc, Chicago, IL) and all other analyses were estimated with M*plus* version 8.2 using the maximum likelihood estimator. Little MCAR test revealed that item-level data were missing completely at random ($\chi^2_{1025} = 1048.60$, p = .30). Maximum likelihood imputation was used provided that the missing data was less than 20% of the total number of items in a given measure (Newman, 2003). No imputation was used for the FSFI or measures with more than 20% of the total number of items missing.

LCGA was used to identify homogeneous subgroups of trajectories based on FSFI-Total scores over 3-, 6-, and 12-months postpartum. LCGA is a type of growth mixture modeling that accounts for heterogeneity in longitudinal patterns of sexual function because the latent classes represent qualitatively unique trajectories. Variance of the intercepts and linear slopes are assumed to be invariant within a class and were allowed to vary only across classes (Grimm, Ram, & Estabrook, 2016). Models between 1 and 10 class solutions were run with 500 random start values for each model, with the 50 best retained for the final optimization. The final solution was replicated with 1500 random start values to avoid convergence on local maxima. The best-fitting classification model was determined by a combination of fit indices: parsimony, size of classes (>5% sample in each), and interpretability of the trajectories (Nylund, Asparouhov, & Muthén, 2007). The model fit indices used were: the smallest Bayesian information criteria value (BIC), a significant Lo-Mendell-Rubin likelihood ratio test (LMR-LRT), and a significant bootstrap likelihood ratio test (BLRT). Both LRT values test the significance of the improvement in the model when an additional class is extracted (Nylund et al., 2007). There is currently no consensus regarding the required sample sizes to correctly identify the number of latent classes (Park

& Yu, 2018). Nylund et al. (2007) recommended that a sample size of 500 is sufficient for detecting the correct number of latent classes using adjusted BIC and the BLRT statistics. Entropy values ranging between 0 and 1 were used to assess the precision of the individual classification, with higher entropy values corresponding to a clear class separation. Missing data in the LCGA for the FSFI-Total were treated using the full information maximum likelihood function (FIML).

Time-invariant biopsychosocial factors were used as predictors because they can be assessed at a single time point and therefore are of greater clinical utility. The 3-step method recommended by (Asparouhov & Muthén, 2014) was used to investigate whether biopsychosocial factors predicted trajectory class membership. This method estimates a second model without affecting the latent class membership of the previous model. First, univariate multinomial logistic analyses were performed for each of the predictors individually to examine their unique effects. To examine the relative contribution of each of the biopsychosocial predictors, they were then included in a multivariate analysis. There were no issues with multicollinearity between any of our predictors (all *r*s < .41). Multiple imputation was used to replace missing values on all of the predictors in the logistic analyses in order to retain the same sample size. Each missing value was imputed ten times and the average result over the ten datasets was used in the final analyses (Enders, 2010).

## Results

### Identified Outcome Trajectories for Sexual Function

Our sample, while broadly representative with regard to maternal age at childbirth, culture, and sexual orientation, appeared to be more highly educated and of higher socio-economic status compared to the general population (see supplementary Table 1). Descriptive information for all study variables, for the total sample and each of the latent classes are presented in Table 1. The model fit of the 10 estimated LCGA are reported in Table 3. Most fit indices indicated that the 3-class solution was the best

fitting model overall. The 3-class solution had the lowest BIC, alongside significant LMR-LRT and BLRT. This solution had sufficient membership in each class, and the trajectories were interpretable. The entropy value was 0.74 which indicated that the 3-class model had good quality of classification, similar to the 2-class model. As such, the 3-class model was retained as the best fitting model.

Scores lower than 26.55 on the FSFI indicates clinically significant problems in sexual function (Wiegel et al., 2005). Class 1 included 52.30% ($n$ = 338) of women with minimal sexual function problems at 3-months postpartum who remained above the clinical cut-off at 12-months postpartum. In this class, the FSFI-Total intercept was 28.90 ($SE$ = 0.29, $p < .001$) with a significant upward slope of 0.13 ($SE$ = 0.04, $p < .001$) per month over the 9-months. Class 2 included 34.68% ($n$ = 224) of women with moderate sexual function problems at 3-months postpartum who approached the clinical cut-off at 12-months postpartum. In this class, the FSFI-Total intercept was 20.78 ($SE$ = 0.59, $p < .001$) with a significant upward slope of 0.63 ($SE$ = 0.07, $p < .001$) per month over the 9-months. Class 3 included 13.00% ($n$ = 84) of women with marked sexual function problems who remained well below the clinical cut-off at 12-months postpartum. In this class, the FSFI-Total intercept was 14.44 ($SE$ = 0.75, $p < .001$) with a significant upward slope of 0.43 per month ($SE$ = 0.12, $p < .001$) over the 9-months. See Figure 2 for each trajectory.

**Predictors of Trajectory Class Membership**

Univariate odds ratios (OR) of the biopsychosocial factors in the multinomial univariate and multinomial multivariate logistic regression models are reported in Table 4. The biomedical factors—epidural, induction, vaginal delivery, episiotomy, perineal tear, and breastfeeding—did not significantly predict trajectory class membership at the univariate level. No significant effects were observed when mode of delivery (i.e., vaginal, assisted delivery using forceps, assisted delivery using vacuum, and cesarean) and degree of perineal tearing (i.e., intact, first to fourth degree tear) were examined as

categorical (rather than dichotomous) predictors of latent class group membership. To account for baseline levels of sexual function, we included the Total-FSFI from 18-22 weeks in pregnancy—when sexual function largely reflects pre-pregnancy levels (Yildiz, 2015) as a predictor of membership in the latent class trajectories. Results of the univariate analysis for baseline sexual function during pregnancy and the four psychosocial factors at 3-months postpartum showed that having higher levels of fatigue, higher depressive symptoms, and reporting greater sexual distress increased the odds for membership in the moderate and marked sexual function problems subgroups relative to the minimal sexual function problems trajectory. Higher sexual functioning in pregnancy and higher relationship satisfaction at 3-months postpartum lowered the odds for membership in the moderate and marked sexual function problems subgroups relative to the minimal sexual function problems subgroup. When all biopsychosocial variables were combined into one multivariate model and regressed simultaneously onto latent class membership, two predictors—sexual function in pregnancy and sexual distress—consistently contributed unique variance to the prediction of membership in the moderate and marked subgroups relative to the minimal sexual function subgroup. Two additional predictors—depressive symptoms and relationship satisfaction—predicted membership in the marked problems subgroup relative to the minimal problems subgroup.

## Discussion

The current longitudinal study revealed that improvement in postpartum sexual function among first-time mothers is heterogeneous. We observed three unique trajectories of postpartum sexual function: minimal, moderate, and marked sexual function problems at 3-months, with the moderate problems trajectory showing the greatest improvement over time, followed by the marked and then the minimal problems trajectories. Our findings revealed that biomedical factors were not significantly predictive of trajectory membership. Instead, baseline sexual functioning during pregnancy and

psychosocial factors assessed at 3-months postpartum—fatigue, depression, sexual distress, and relationship satisfaction—were each significantly associated with membership in the moderate and marked problems subgroups relative to the minimal problems subgroup. Our final model found that greater sexual distress at 3-months postpartum was associated with increased odds of membership in the moderate and marked trajectory subgroups, whereas higher sexual function in pregnancy was associated with decreased the odds of membership in these trajectories. Lower depressive symptoms and higher relationship satisfaction at 3-months postpartum was associated with lower odds of membership in the marked problems trajectory.

We observed significant variability both in terms of observed sexual function at 3-months postpartum, as well as the degree of improvement over time. This heterogeneity is important for conceptualizing first-time mothers' postpartum sexual function specifically, and adds to a growing body of research demonstrating variability in women's sexual response and sexual functioning (Leavitt, Leonhardt, & Busby, 2019). Even though sexual function declines postpartum relative to pre-pregnancy (McBride & Kwee, 2017), half of the women in our sample were not experiencing clinically significant problems at 3-months and their sexual function improved significantly over time remaining above the clinical cut-off. One-third of our sample were experiencing moderate sexual function problems at 3-months; however, their sexual function improved significantly and approached nonclinical levels by 12-months postpartum. Importantly, a small subset of our sample experienced marked problems at 3-months postpartum, that despite improvement over time, the significant problems in sexual function persisted at 12-months postpartum. As such, this third group might benefit most from early assessment and intervention.

Informed by the biopsychosocial model of women's sexual function that propose factors that inhibit or facilitate sexual function (Bancroft et al., 2009; Basson, 2000), as well as evidence of links

between biopsychosocial factors and postpartum sexual function specifically (McBride & Kwee, 2017), we sought to examine both biomedical and psychosocial predictors of change in women's postpartum sexual function. Biomedical factors were not significantly related to sexual function at 3-months postpartum or to the rate of improvement in sexual function over time. This finding is perhaps not surprising given equivocal results in prior studies (Leeman & Rogers, 2012; McBride & Kwee, 2017; Serati et al., 2010). However, it is an important addition to the literature because previous research has not examined the relationship between biomedical factors and unique trajectories of sexual function or the degree of change in sexual function over time.

In primarily cross-sectional studies, psychosocial factors have been more consistently linked with postpartum sexual function (De Judicibus & McCabe, 2002; Khajehei et al., 2015). The current study revealed the importance of these factors for predicting how sexual function improves postpartum. After including sexual function in pregnancy as a predictor, higher sexual distress was a robust predictor of membership in both the moderate and marked sexual function problem trajectories. Lower depressive symptoms and higher relationship satisfaction were predictors of membership in the marked sexual function problem trajectory. Findings are consistent with a retrospective cross-sectional study that demonstrated that relational variables, such as feeling close to and supported by one's partner, were more strongly related to first-time mothers' postpartum sexuality than non-relational factors, such as fatigue and stress (Hipp et al., 2012). Indeed, having higher levels of dyadic empathy for one's partner—a combination of empathic concern and perspective taking—has been linked with better sexual satisfaction and sexual desire in first-time mothers (Rosen, Mooney, & Muise, 2016). Minimal research has examined sexual distress in the postpartum. In addition to being necessary for a diagnosis of sexual dysfunction, the current findings suggest that sexual distress is an important predictor of the degree of change in sexual function postpartum. Consistent with theoretical models (Basson, 2000), sexual

distress, which involves negative affect and cognitions related to one's sexuality, could serve to distract from positive sexual experiences, inhibiting sexual function and contributing to ongoing difficulties with arousal, desire, and pain. Sexual distress may also arise through societal influences (e.g., poor sex education, gender role traditionality, cultural values) that shape first-time mothers' expectations about when to resume sexual activity postpartum and what sexual functioning should resemble following childbirth. Indeed, sexual distress in pregnancy has been linked with lower sexual and relationship satisfaction (Vannier & Rosen, 2017). Being less relationally satisfied and having a poor connection with one's partner, may make it more difficult for couples to navigate changes to their sexual relationship, perpetuating ongoing problems with sexual function.

**Strengths and limitations**

The large sample size, longitudinal design, and use of validated measures with established clinical cut-offs are significant strengths as they enabled us to conduct more powerful analyses that account for greater variability in first-time mothers' sexual experiences. Our trajectories, as well as their predictors at 3-months postpartum, enhance the clinical utility of our findings because they offer benchmarks for evaluating a woman's risk of continued problems with sexual function postpartum and for identifying who would benefit most from intervention. The inclusion of biomedical and psychosocial factors as predictors of sexual function trajectories tests a multidimensional conceptualization of postpartum sexual function, endorsed by most experts and consistent with recent theoretical models (McBride & Kwee, 2017; McBride et al., 2017; McKinney, Keyser, Clinton, & Pagliano, 2018).

A limitation of our study is that we did not assess sexual function pre-pregnancy, which is difficult for practical reasons; however, we accounted for sexual function at 18-22 weeks pregnancy when sexuality during the second trimester is similar to pre-pregnancy levels (Yildiz, 2015). Although we used a well-validated measure of sexual function and our interpretation of the trajectories were informed

by an established clinical cut-off, we are unable to determine which women met criteria for sexual dysfunction in the absence of a thorough clinical assessment. Interpretation of FSFI and FSDS scores based on established cut-offs do support that women in both the moderate and marked sexual problems subgroups would likely meet criteria for sexual dysfunction (ter Kuile, Brauer, & Laan, 2006).

Consistent with recommendations regarding the use of validated screening tools to assess postpartum sexual function (Leeman & Rogers, 2012) and longitudinal studies (De Souza et al., 2015), a significant strength of the study is that we used the well-validated gold-standard measure to assess sexual function (Meston, Freihart, Handy, Kilimnik, & Rosen, in press). However, the use of this measure necessitated that only women with a valid score on the FSFI (i.e., sexually-active in the past 4 weeks) were included in the trajectory analyses, which is a limitation. Analyses revealed no significant differences between sexually-active ($n$ = 647) and inactive ($n$ = 66) women for the biopsychosocial predictors and do not support that sexually-inactive women relative to the overall sample were experiencing poorer sexual function at baseline, the most sexual distress, or were the least relationally satisfied. Comparison of the sexually-inactive women to the various subgroups from the LCGA revealed that these women were most similar to women in the moderate problems with sexual function subgroup. One unexamined possibility is that these women were sexually-active postpartum, but that our sampling (i.e., 3-, 6-, and 12-months) and reporting timeframe (i.e., past 4 weeks) did not capture this activity. More frequent sampling may address this issue in future research. Future research could include additional measures to assess sexual function and other aspects of sexual well-being that are not contingent on sexual activity.

The sample demographics may limit the generalizability of the findings. Our sample, although broadly representative of the general population may have been biased, given that those lost to attrition were younger, less educated, and of lower socioeconomic status. It is possible that a more diverse

sample that includes sexual, racial, and ethnic minorities, lower socio-economic status, non-partnered women, multiparous women, and women experiencing their own or infant health complications may yield different trajectories. Other factors not examined in the present study (e.g., use of contraception postpartum, as well as whether or not the pregnancy was planned, medications including anti-depressants, and whether or not a mother returns to work) may also be relevant for understanding change in postpartum sexual function. Additionally, the inclusion of a more comprehensive measure of sleep quality for the parent and child may provide a stronger examination for the role of fatigue on sexual function.

**Implications & Conclusions**

Trajectories of postpartum sexual function are not uniform and clinical practice should take this heterogeneity into account in psychoeducation, assessment, and intervention practices. Healthcare providers can share the information regarding multiple trajectories of sexual function as well as the associated risk factors (i.e., sexual distress, relationship dissatisfaction, depressive symptoms) with expectant and first-time mothers to foster realistic expectations for postpartum sexual function and normalize their experiences, which may directly reduce associated sexual distress (McBride et al., 2017). The finding that biomedical factors were not significantly related to sexual function at 3-months and how it evolves over time can also be used to reassure first-time mothers that these non- or less-modifiable factors are not strong determinants of postpartum sexual function. Given that almost half of our sample experienced clinically-significant problems with sexual function at three months postpartum, and sexual function is strongly tied to women's overall health, quality of life, and well-being (Figueiredo et al., 2008; Goldberg & Carlson, 2014; Reid & Crisafulli, 1990) routine follow-up care could include screening for problems with sexual function, relationship dissatisfaction, sexual distress, and depressive symptoms. There are brief validated screening tools to assess sexual distress (Carpenter et al., 2015) and

relationship satisfaction (Funk & Rogge, 2007). This information could then be used to identify first-time mothers who are at risk of continued difficulties, and who may require intervention (e.g., referral to sex therapy).

Psychosocial factors can change over time and as such are amenable to intervention. The current study supports two targets that could be prioritized for postpartum sexual health and function—sexual distress and relationship satisfaction—in addition to existing practices screening for postpartum depression. Psychological interventions can protect against declines in relationship satisfaction experienced during the transition to parenthood (Petch & Halford, 2008; Pinquart & Teubert, 2010), which were associated with reduced odds of being in the marked problems subgroups. Additionally, these interventions also improve sexual function and sexual distress (Frühauf, Gerger, Schmidt, Munder, & Barth, 2013). There is preliminary evidence for the efficacy of a brief group intervention for first-time mothers that addresses biopsychosocial correlates of postpartum sexual function (McBride et al., 2017) and the current findings could be used to further inform relevant targets for intervention for this and other pre- and postpartum sexual health interventions.

## References

Asparouhov, T., & Muthén, B. O. (2014). Auxiliary variables in mixture modeling: Three-step approaches using M plus. *Structural Equation Modeling: A Multidisciplinary Journal, 21*, 329-341.

Bancroft, J., Graham, C. A., Janssen, E., & Sanders, S. A. (2009). The dual control model: Current status and future directions. *The Journal of Sex Research, 46*, 121-142.

Barbara, G., Pifarotti, P., Facchin, F., Cortinovis, I., Dridi, D., Ronchetti, C., . . . Vercellini, P. (2016). Impact of mode of delivery on female postpartum sexual functioning: spontaneous vaginal delivery and operative vaginal delivery vs cesarean section. *The Journal of Sexual Medicine, 13*, 393-401.

Barrett, G., Pendry, E., Peacock, J., Victor, C., Thakar, R., & Manyonda, I. (2000). Women's sexual health after childbirth. *British Journal of Obstetrics and Gynaecology, 107*, 186-195.

Basson, R. (2000). The female sexual response: A different model. *Journal of Sex & Marital Therapy, 26*, 51-65.

Carpenter, J. S., Reed, S. D., Guthrie, K. A., Larson, J. C., Newton, K. M., Lau, R. J., . . . Shifren, J. L. (2015). Using an FSDS-R Item to Screen for Sexually Related Distress: A MsFLASH Analysis. *Sexual Medicine, 3*, 7-13.

Chivers, M. L., Pittini, R., Grigoriadis, S., Villegas, L., & Ross, L. E. (2011). The relationship between sexual functioning and depressive symptomatology in postpartum women: A pilot study. *The Journal of Sexual Medicine, 8*, 792-799.

Connolly, A., Thorp, J., & Pahel, L. (2005). Effects of pregnancy and childbirth on postpartum sexual function: a longitudinal prospective study. *International Urogynecology Journal, 16*, 263-267.

Cox, J. L., Holden, J. M., & Sagovsky, R. (1987). Detection of postnatal depression: development of the

10-item Edinburgh Postnatal Depression Scale. *The British Journal of Psychiatry, 150*, 782-786.

De Judicibus, M. A., & McCabe, M. (2002). Psychological factors and the sexuality of pregnant and postpartum women. *Journal of Sex Research, 39*, 94-103.

De Souza, A., Dwyer, P. L., Charity, M., Thomas, E., Ferreira, C. H. J., & Schierlitz, L. (2015). The effects of mode delivery on postpartum sexual function: a prospective study. *BJOG: An International Journal of Obstetrics & Gynaecology, 122*, 1410-1418.

Derogatis, L. R., Rosen, R. C., Leiblum, S. R., Burnett, A., & Heiman, J. R. (2002). The Female Sexual Distress Scale (FSDS): Initial validation of a standardized scale for assessment of sexually related distress in women. *Journal of Sex & Marital Therapy, 28*, 317-330.

Diamond, L. M., & Huebner, D. M. (2012). Is good sex good for you? Rethinking sexuality and health. *Social and Personality Psychology Compass, 6*, 54-69.

Doss, B. D., & Rhoades, G. K. (2017). The transition to parenthood: Impact on couples' romantic relationships. *Current Opinion in Psychology, 13*, 25-28.

Enders, C. K. (2010). *Applied missing data analysis*: Guilford Press.

Faisal-Cury, A., Menezes, P. R., Quayle, J., Matijasevich, A., & Diniz, S. G. (2015). The relationship between mode of delivery and sexual health outcomes after childbirth. *The Journal of Sexual Medicine, 12*, 1212-1220.

Fehniger, J. E., Brown, J. S., Creasman, J. M., Van Den Eeden, S. K., Thom, D. H., Subak, L. L., & Huang, A. J. (2013). Childbirth and female sexual function later in life. *Obstetrics and Gynecology, 122*, 988-997.

Figueiredo, B., Field, T., Diego, M., Hernandez-Reif, M., Deeds, O., & Ascencio, A. (2008). Partner relationships during the transition to parenthood. *Journal of Reproductive and Infant Psychology, 26*, 99-107.

Frühauf, S., Gerger, H., Schmidt, H. M., Munder, T., & Barth, J. (2013). Efficacy of psychological interventions for sexual dysfunction: a systematic review and meta-analysis. *Archives of Sexual Behavior, 42*, 915-933.

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.

Glowacka, M., Rosen, N. O., Chorney, J., Snelgrove-Clarke, E., & George, R. (2014). Genito-pelvic pain during pregnancy and postpartum: The prospective impact of pain-related anxiety and hypervigilance to pain. *The Journal of Sexual Medicine, 11*, 3021-3034.

Goldberg, J. S., & Carlson, M. J. (2014). Parents' relationship quality and children's behavior in stable married and cohabiting families. *Journal of Marriage and Family, 76*, 762-777.

Grimm, K. J., Ram, N., & Estabrook, R. (2016). *Growth modeling: Structural equation and multilevel modeling approaches*. New York: Guilford Publications.

Hipp, L. E., Low, L. K., & van Anders, S. M. (2012). Exploring women's postpartum sexuality: Social, psychological, relational and birth-related contextual factors. *The Journal of Sexual Medicine, 9*, 2330-2341.

Khajehei, M., Doherty, M., Tilley, P. M., & Sauer, K. (2015). Prevalence and risk factors of sexual dysfunction in postpartum Australian women. *The Journal of Sexual Medicine, 12*, 1415-1426.

Leavitt, C. E., Leonhardt, N. D., & Busby, D. M. (2019). Different ways to get there: Evidence of a variable female sexual response cycle. *The Journal of Sex Research, 56*, 899-912.

Leeman, L. M., Fullilove, A. M., Borders, N., Manocchio, R., Albers, L. L., & Rogers, R. G. (2009). Postpartum perineal pain in a low episiotomy setting: association with severity of genital trauma, labor care, and birth variables. *Birth, 36*, 283-268.

Leeman, L. M., & Rogers, R. G. (2012). Sex after childbirth: postpartum sexual function. *Obstetrics & Gynecology, 119*, 647-655.

McBride, H. L., & Kwee, J. L. (2017). Sex after baby: Women's sexual function in the postpartum period. *Current Sexual Health Reports, 9*, 142-149.

McBride, H. L., Olson, S., Kwee, J. L., Klein, C., & Smith, K. B. (2017). Women's postpartum sexual health program: A collaborative and integrated approach to restoring sexual health in the postpartum period. *Journal of Sex & Marital Therapy, 43*, 147-158.

McCabe, M. P., Sharlip, I. D., Lewis, R., Atalla, E., Balon, R., Fisher, A. D., . . . Segraves, R. T. (2016). Incidence and prevalence of sexual dysfunction in women and men: a consensus statement from the Fourth International Consultation on Sexual Medicine 2015. *The Journal of Sexual Medicine, 13*, 144-152.

McKinney, J., Keyser, L., Clinton, S., & Pagliano, C. (2018). ACOG Committee Opinion No. 736: Optimizing Postpartum Care. *Obstetrics & Gynecology, 132*, 784-785.

Meston, C. M., Freihart, B. K., Handy, A. B., Kilimnik, C. D., & Rosen, R. C. (in press). Scoring and interpretation of the FSFI: What can be learned from 20 years of use? *The Journal of Sexual Medicine*.

Metz, M. E., Epstein, N., & McCarthy, B. (2017). *Cognitive-behavioral therapy for sexual dysfunction*: Routledge.

Meyer-Bahlburg, H. F., & Dolezal, C. (2007). The female sexual function index: a methodological critique and suggestions for improvement. *Journal of Sex & Marital Therapy, 33*, 217-224.

Newman, D. A. (2003). Longitudinal modeling with randomly and systematically missing data: A simulation of ad hoc, maximum likelihood, and multiple imputation techniques. *Organizational Research Methods, 6*, 328-362.

Nylund, K. L., Asparouhov, T., & Muthén, B. O. (2007). Deciding on the number of classes in latent class analysis and growth mixture modeling: A Monte Carlo simulation study. *Structural Equation Modeling: A Multidisciplinary Journal, 14*, 535-569.

Park, J., & Yu, H. T. (2018). Recommendations on the sample sizes for multilevel latent class models. *Educational and Psychological Measurement*, *78*, 737-761

Petch, J., & Halford, W. K. (2008). Psycho-education to enhance couples transition to parenthood. *Clinical Psychology Review, 28*, 1125-1137.

Pinquart, M., & Teubert, D. (2010). A meta-analytic study of couple interventions during the transition to parenthood. *Family Relations, 59*, 221-231.

Rådestad, I., Olsson, A., Nissen, E., & Rubertsson, C. (2008). Tears in the vagina, perineum, sphincter ani, and rectum and first sexual intercourse after childbirth: A nationwide follow-up. *Birth, 35*, 98-106.

Reid, W. J., & Crisafulli, A. (1990). Marital discord and child behavior problems: A meta-analysis. *Journal of Abnormal Child Psychology,, 18*, 105-117.

Rosen, N. O., Bailey, K., & Muise, A. (2017). Degree and direction of sexual desire discrepancy are linked to sexual and relationship satisfaction in couples transitioning to parenthood. *The Journal of Sex Research, 55*, 241-225.

Rosen, N. O., Mooney, K., & Muise, A. (2016). Dyadic empathy in the transition to parenthood: Associations with sexual, relationship, and psychological wellbeing. *Journal of Sex & Marital Therapy, 43*, 543-559.

Rosen, N. O., Muise, A., Impett, E. A., Delisle, I., Baxter, M. L., & Bergeron, S. (2018). Sexual cues mediate the daily relations between interpersonal goals, pain, and wellbeing in couples coping with vulvodynia. *Annals of Behavioral Medicine, 52*, 216-227.

Rosen, R. C., Brown, C., Heiman, J., Leiblum, S., Meston, C., Shabsigh, R., . . . D'Agostino, J. R. (2000). The female sexual function index (FSFI): A multidimensional self-report instrument for the assessment of female sexual function. *Journal of Sex and Marital Therapy, 26*, 191-208.

Schlagintweit, H., Bailey, K., & Rosen, N. O. (2016). A new baby in the bedroom: Frequency and severity of postpartum sexual concerns and their associations with relationship satisfaction in new parent couples. *The Journal of Sexual Medicine, 13*, 1455-1465.

Serati, M., Salvatore, S., Siesto, G., Cattoni, E., Zanirato, M., Khullar, V., . . . Bolis, P. (2010). Female sexual function during pregnancy and after childbirth. *The Journal of Sexual Medicine, 7*, 2782-2790.

ter Kuile, M. M., Brauer, M., & Laan, E. (2006). The female sexual function index (FSFI) and the female sexual distress scale (FSDS): psychometric properties within a Dutch population. *Journal of Sex & Marital Therapy, 32*, 289-304.

Vannier, S. A., & Rosen, N. O. (2017). Sexual distress and sexual problems in pregnancy: Associations with sexual and relationship satisfaction. *The Journal of Sexual Medicine, 14*, 387-395.

Waterstone, M., Wolfe, C., Hooper, R., & Bewley, S. (2003). Postnatal morbidity after childbirth and severe obstetric morbidity. *BJOG: An International Journal of Obstetrics & Gynaecology, 110*, 128-133.

Wiegel, M., Meston, C., & Rosen, R. (2005). The Female Sexual Function Index (FSFI): Cross-validation and development of clinical cutoff scores. *Journal of Sex & Marital Therapy, 31*, 1-20.

World Health Organization. (2010). Developing sexual health programs: A framework for action.

Yildiz, H. (2015). The relation between prepregnancy sexuality and sexual function during pregnancy and the postpartum period: A prospective study. *Journal of Sex & Marital Therapy, 41*, 49-59.

Table 1. *Means, standard deviations, and percentages for outcome and predictor variables for the total sample and by membership in the identified 3 class trajectories.*

| | Overall sample | Class 1 Minimal Sexual Function Problems | Class 2 Moderate Sexual Function Problems | Class 3 Marked Sexual Function Problems | Sexually-inactive women across time-points |
|---|---|---|---|---|---|
| | *N* = 646 | *n* = 338 | *n* = 224 | *n* = 84 | *n* = 66 |
| *Outcome variables* | *M* ± *SD* or *N (%)* | *M* ± *SD* or *N (%)* | *M* ± *SD* or *N (%)* | *M* ± *SD* or *N (%)* | *M* ± *SD* or *N (%)* |
| FSFI-Total (3m)* | 24.07±6.23 | 28.51±3.38 | 20.05±4.03 | 15.05±4.02 | n/a |
| FSFI-Total (6m)* | 25.57±5.90 | 29.80±2.62 | 22.64±3.15 | 14.65±3.15 | n/a |
| FSFI-Total (12m)* | 27.09±5.33 | 29.88±3.25 | 26.18±4.14 | 18.16±4.42 | n/a |
| *Predictor variables* | | | | | |
| Epidural (0/1) | 464 (71.8%) | 236 (69.8%) | 168 (75.0%) | 60 (71.4%) | 47 (69.1%) |
| Vaginal Delivery (0/1) | 478 (74.0%) | 240 (71.0%) | 175 (78.1%) | 63 (75.0%) | 48 (70.6%) |
| Induction (0/1) | 244 (37.8%) | 134 (39.6%) | 83 (37.1%) | 27 (32.1%) | 30 (44.1%) |
| Episiotomy (0/1) | 99 (15.3%) | 47 (13.9%) | 36 (16.1%) | 16 (19.0%) | 11 (16.2%) |
| Perineal Tear (0/1) | 407 (63.0%) | 202 (59.8%) | 151 (67.4%) | 54 (64.3%) | 44 (64.7%) |
| Breastfeeding 3m (0/1) | 584 (90.4%) | 305 (90.2%) | 206 (92.0%) | 73 (86.9%) | 59 (86.8%) |
| FSFI-Total (18-22w) | 27.49±5.08 | $29.33±3.96_{a}$ | 26.54±4.55 | $22.25±6.25_{b}$ | $26.69±6.56_{ab}$ |
| Fatigue (3m) | 3.72±1.15 | 3.58±1.12 | 3.86±1.13 | 3.95±1.28 | 3.84±1.20 |
| Depression (3m) | 5.54±4.38 | 4.98±4.27 | 5.94±4.22 | 6.74±4.89 | 6.08±4.35 |
| Relationship Satisfaction (3m) | 16.41±3.35 | $17.20±3.03_{a}$ | 15.86±3.39 | 14.67±3.55 | $15.73±3.35_{a}$ |
| Sexual Distress (3m) | 14.07±10.30 | $9.42±7.91_{a}$ | $17.91±9.60_{b}$ | $23.46±10.64_{c}$ | $13.21±9.35_{abc}$ |

*Note.* The *n*s and percentages for each of the dichotomous variables represents the number of women in the sample who endorsed or experienced the predictor (e.g., 1 = yes for epidural). *FSFI-Total clinical cut-off of 26.55 was used to interpret the trajectories. Variables with the same subscript letters indicate a significant difference between the sexually-inactive subsample and the overall sample or the subsamples in classes 1, 2, and 3 based on $\chi^2$ Tests of Proportions and independent samples *t*-tests with Bonferroni correction for multiple comparisons ($p = 0.01$).

Table 2. *Sociodemographics for the entire sample (n = 646).*

| | Overall sample<br>*M* ± *SD* or *N (%)* |
|---|---|
| *Age (years)* | 29.52±4.30 |
| *Highest Level of Education Completed* | |
| Less than high school or high school | 87 (13.5%) |
| Community college diploma | 137 (21.2%) |
| University degree | 256 (39.6%) |
| Masters/PhD/Secondary Degree (e.g., MD) | 166 (25.7%) |
| *Culture* | |
| Canadian (English, French, African, First Nations) | 579 (89.6%) |
| European (Eastern, Western) | 14 (2.2%) |
| Latin American/South American | 3 (0.5%) |
| Asian/Middle Eastern | 19 (3.0%) |
| Other (African, American, Australian, Caribbean) | 31 (4.8%) |
| *Sexual Orientation* | |
| Heterosexual | 598 (92.6%) |
| Lesbian/Gay | 3 (0.5%) |
| Bisexual | 33 (5.1%) |
| Pansexual | 8 (1.2%) |
| Unlabeled/Questioning | 4 (0.6%) |
| *Relationship Status* | |
| Married/Engaged/Commonlaw | 511 (79.1%) |
| Living with/Dating one partner | 130 (20.1%) |
| No regular partner/Other | 5 (0.8%) |
| *Relationship Length (months)* | 73.3±45.3 |
| *Household Income** | |
| < $60,0000 | 148 (22.9%) |
| > $60,000 | 489 (75.7%) |

Note. * indicates missing data for 9 participants for income.

Table 3. *Fit indices for solutions specifying 1-8 classes for the Female Sexual Function Index-Total score.*

| | Class Proportions | LL | BIC | LMR-LRT *p*-value | BLRT *p*-value | Entropy |
|---|---|---|---|---|---|---|
| 1 class | 1.00 | -4920.63 | 9873.62 | NA | NA | NA |
| 2 class | .32/.68 | -4714.09 | 9479.95 | $p < .001$ | $p < .001$ | 0.75 |
| **3 class** | **.35/.13/.52** | **-4648.48** | **9368.15** | ***p* < .001** | ***p* < .001** | **0.74** |
| 4 class | .46/.04/.17/.33 | -4633.61 | 9357.81 | $p = .10$ | ---* | 0.72 |
| 5 class | .47/.14/.03/.12/.24 | -4612.06 | 9334.13 | $p = .20$ | $p < .001$ | 0.73 |
| 6 class | .43/.10/.15/.03/.04/.25 | -4601.36 | 9332.14 | $p = .26$ | $p < .001$ | 0.71 |
| 7 class | .38/.07/.26/.10/.09/.03/.08 | -4593.09 | 9335.01 | $p = .25$ | $p < .001$ | 0.68 |
| 8 class | .31/.10/.02/.18/.04/.07/.19/.08 | -4587.13 | 9342.50 | $p = .74$ | ---* | 0.64 |
| 9 class | .06/.08/.16/.06/.13/.03/.33/.08/.08 | -4582.21 | 9352.08 | $p = .48$ | ---* | 0.64 |
| 10 class | .32/.01/.15/.17/.10/.02/.13/02/.03/.05 | -4573.13 | 9353.33 | $p = .11$ | ---* | 0.74 |

*Note.* Class proportions reflect the proportion of the total sample in each class and do not always equate to 100 due to rounding. LL = Model log likelihood. BIC = Bayesian information criterion. LMR-LRT = Lo-Mendell-Rubin likelihood ratio test. BLRT = bootstrap likelihood ratio test. NA = not applicable. * = did not converge or *p*-value was not trustworthy due to local maxima. Bolded information represents the final solution.

Table 4. *Biomedical and psychosocial predictors of class membership*: *Results from multinomial logistic regression models*

| | Univariate | | | | | | | | | Multivariate | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Moderate sexual function problems vs. minimal function problems | | | Marked sexual function problems vs. minimal sexual function problems | | | Marked sexual function problems vs. moderate sexual function problems | | | Moderate sexual function problems vs. minimal sexual function problems | | | Marked sexual function problems vs. minimal sexual function problems | | | Marked sexual function problems vs. moderate sexual function problems | | |
| Predictor variables | Est. (*S.E.*) | *p* | OR [95% CI] | Est. (*S.E.*) | *p* | OR [95% CI] | Est. (*S.E.*) | *p* | OR [95% CI] | Est. (*S.E.*) | *p* | OR [95% CI] | Est. (*S.E.*) | *p* | OR [95% CI] | Est. (*S.E.*) | *p* | OR [95% CI] |
| Epidural (0/1) | 0.33 (0.26) | .20 | 1.40 [0.84-2.33] | 0.07 (0.31) | .83 | 1.07 [0.59-1.94] | -0.27 (0.37) | .47 | 0.77 [0.37-1.58] | 0.33 (0.33) | .33 | 1.39 [0.72-2.66] | -0.07 (0.50) | .89 | 0.93 [0.35-2.49] | -0.40 (0.49) | .42 | 0.67 [.26-1.75] |
| Vaginal Delivery (0/1) | 0.44 (0.28) | .12 | 1.55 [0.89-2.71] | 0.11 (0.32) | .73 | 1.12 [0.60-2.11] | -0.33 (0.40) | .41 | 0.72 [0.33-1.57] | 0.61 (0.65) | .35 | 1.84 [0.52-6.54] | -0.10 (0.98) | .92 | 0.90 [0.13-6.20] | -0.71 (0.88) | .42 | 0.49 [0.09-2.74] |
| Induction (0/1) | -0.14 (0.24) | .55 | 0.87 [0.55-1.38] | -0.41 (0.30) | .17 | 0.66 [0.37-1.19] | -0.27 (0.35) | .44 | 0.76 [0.38-1.52] | -0.14 (0.34) | .69 | 0.87 [0.45-1.71] | -.59 (.49) | .22 | 0.55 [0.21-1.44] | -0.46 (0.44) | .30 | 0.63 [0.27-1.50] |
| Episiotomy (0/1) | 0.15 (0.32) | .64 | 1.16 [0.62-2.16] | 0.35 (0.36) | .34 | 1.42 [0.70-2.87] | 0.20 (0.43) | .64 | 1.22 [0.53-2.81] | 0.06 (0.46) | .89 | 1.07 [0.43-2.63] | 0.38 (0.66) | .57 | 1.46 [0.40-5.30] | 0.31 (0.60) | .60 | 1.37 [0.43-4.39] |
| Tearing (0/1) | 0.33 (0.25) | .19 | 1.40 [0.85-2.29] | 0.16 (0.30) | .60 | 1.17 [0.65-2.13] | -0.17 (0.36) | .64 | 0.84 [0.41-1.72] | -0.12 (0.57) | .84 | 0.89 [0.29-2.72] | 0.13 (0.88) | .89 | 1.13 [0.20-6.37] | 0.24 (0.77) | .76 | 1.27 [0.28-5.79] |
| Breastfeeding 3m (0/1) | 0.84 (0.58) | .15 | 2.32 [0.75-7.23] | -0.36 (0.43) | .40 | 0.70 [0.30-1.63] | -1.21 (0.68) | .08 | 0.30 [0.08-1.14] | 0.38 (0.67) | .57 | 1.46 [0.39-5.48] | -0.11 (0.84) | .90 | 0.90 [0.18-4.62] | -0.49 (0.83) | .55 | 0.61 [0.12-3.10] |
| FSFI-Total (18-22w) | **-0.18 (0.04)** | **<.001** | **0.83 [0.78-0.89]** | **-0.33 (0.05)** | **<.001** | **0.72 [0.66-0.79]** | **-0.15 (0.04)** | **<.001** | **0.86 [0.80-0.93]** | **-0.15 (0.06)** | **.006** | **0.86 [0.77-0.96]** | **-0.31 (0.06)** | **<.001** | **0.74 [0.65-0.83]** | **-0.16 (0.04)** | **<.001** | **0.86 [0.79-0.93]** |
| Fatigue (3m) | **0.26 (0.10)** | **.01** | **1.30 [1.07-1.58]** | **0.33 (0.13)** | **.01** | **1.39 [1.08-1.79]** | 0.07 (0.15) | .65 | 1.07 [0.80-1.43] | 0.20 (0.16) | .20 | 1.23 [0.90-1.68] | 0.19 (0.23) | .41 | 1.20 [0.77-1.87] | -0.02 (0.22) | .93 | 0.98 [0.64-1.50] |
| Depression (3m) | **0.07 (0.03)** | **.02** | **1.07 [1.01-1.14]** | **0.10 (0.03)** | **.001** | **1.11 [1.04-1.18]** | 0.03 (0.03) | .30 | 1.04 [0.97-1.10] | -0.09 (0.05) | .10 | 0.92 [0.83-1.02] | **-0.13 (0.07)** | **.04** | **0.88 [0.77-0.99]** | -0.05 (0.06) | .40 | 0.96 [0.85-1.07] |
| Relationship Satisfaction (3m) | **-0.16 (0.04)** | **<.001** | **0.85 [0.78-0.92]** | **-0.25 (0.04)** | **<.001** | **0.78 [0.71-0.85]** | **-0.09 (0.05)** | **.04** | **0.91 [0.84-0.99]** | -0.12 (0.07) | .07 | 0.89 [0.78-1.01] | **-0.24 (0.08)** | **.002** | **0.79 [0.68-0.92]** | -0.12 (0.07) | .08 | .89 [0.79-1.01] |
| Sexual Distress (3m) | **0.15 (0.02)** | **<.001** | **1.16 [1.11-1.21]** | **0.20 (0.03)** | **<.001** | **1.22 [1.15-1.29]** | **0.05 (0.02)** | **.005** | **1.05 [1.02-1.09]** | **0.14 (0.03)** | **<.001** | **1.15 [1.09-1.20]** | **0.19 (0.03)** | **<.001** | **1.21 [1.13-1.29]** | **0.05 (0.02)** | **.03** | **1.05 [1.01-1.10]** |

*Note.* For each of the dichotomous predictor variables the reference group was the women who had endorsed or experienced the predictor (i.e., 1 = yes). Est. = estimate. S.E. = standard error. OR = odds ratio. CI = confidence interval. Bolded information represents significant effects.

Figure 1. *Flow of participants for the current study.*

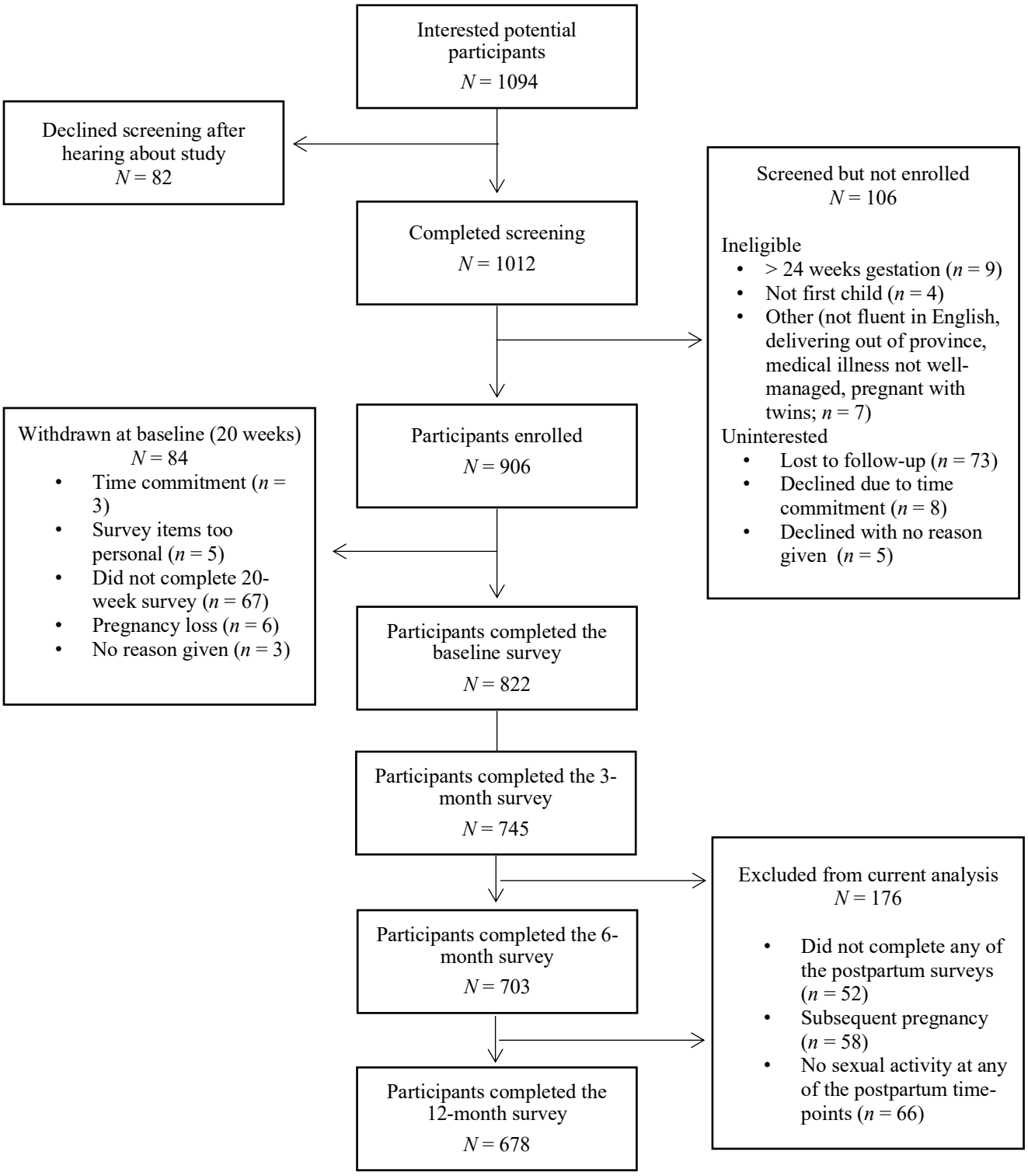

Figure 2. *Trajectories of sexual function from 3- to 12-months postpartum.*