

Accepted manuscript published in *Journal of Social and Clinical Psychology* - full reference: Xie, E. B., Rioux, C., Madsen, J. W., Lebel, C., Giesbrecht, G. F., & Tomfohr-Madsen, L. (2022). Romantic Relationship Quality and Mental Health in Pregnancy During the Covid-19 Pandemic. *Journal of Social and Clinical Psychology*, 41(5), 463-490.

Romantic Relationship Quality and Mental Health in Pregnancy During the COVID-19
Pandemic

Abstract

Introduction: Social capital is important for good mental health and the quality of close relationships is one key indicator of social capital. Examining the association between relationship quality and mental health may be particularly important during pregnancy as mental health concerns during this period pose significant risk to families. The COVID-19 pandemic has contributed to increased mental health problems among pregnant individuals. The resulting lockdown protocols of the pandemic has also disrupted larger social networks and couples spent more time together in the context of ongoing chronic stress, highlighting the particular importance of romantic relationship quality. This study explored longitudinal associations between relationship satisfaction, depression, and anxiety among pregnant individuals during the first wave of the COVID-19 pandemic. **Methods:** Pregnant individuals ($n = 1842$) from the Pregnancy During the Pandemic Study were surveyed monthly (April-July 2020). Depression and anxiety symptoms, and relationship satisfaction were self-reported. Cross-lagged panel models were conducted to examine bidirectional associations between relationship satisfaction and mental health symptoms over time. **Results:** Relationship satisfaction was significantly correlated with depression and anxiety at all time points. Longitudinally, relationship satisfaction predicted later depression and anxiety symptoms, but depressive and anxiety symptoms did not predict later relationship satisfaction. **Discussion:** This study suggests that poor relationship satisfaction was linked to subsequent elevations in prenatal depressive and anxiety symptoms during the COVID-19 pandemic. Relationship enhancement interventions during pregnancy may be a means of improving the mental health of pregnant individuals, and interrupting transgenerational transmission, during times of prolonged psychological distress.

Keywords: close relationships; romantic relationships; pregnancy; mental health; COVID-19

Social connectedness is crucial for good mental health (Cruwys et al., 2014; Kawachi & Berkman, 2001; Perkins et al., 2015). Social capital represents a multidimensional concept including both structural and cognitive components. Structural components are material indicators of social relationships (e.g., marital status, social isolation), and cognitive components serve as subjective appraisals of relationships (e.g., perceptions of social connections) (Almedom, 2005; Berry & Welsh, 2010; Saeri et al., 2017). Social capital can be examined at the macro (e.g., neighbourhoods and communities) and/or micro (e.g., individual, family, or household) levels (Almedom, 2005). When considering micro level social capital (e.g., romantic relationships), previous research has discussed the importance of considering the *quality* of relationships, rather than solely the presence of a relationship, in understanding how social relationships influence mental health (Holt-Lunstad et al., 2010; Saeri et al., 2017).

Examining relationship quality and its association with mental health may be particularly important during pregnancy as mental health problems are common during this time and pose significant long-term risks to maternal and child well-being. Sustained prenatal psychological distress increases the risk of postpartum depression (Robertson, Grace, Wallington, & Stewart, 2004), prenatal illness and infection (Coussons-Read, 2013), miscarriage, preterm birth, and reduced birthweight (Accortt, Cheadle, & Schetter, 2015; Grigoriadis et al., 2018; Qu et al., 2017; Rondó et al., 2003; Stein et al., 2014). Furthermore, there is considerable evidence demonstrating that children of mothers who experience greater symptoms of depression, anxiety, and stress during the prenatal period are themselves at a greater risk of adverse neurodevelopmental outcomes, including emotional and behavioural problems (Glover, 2011; MacKinnon, Kingsbury, Mahedy, Evans, & Colman, 2018; Stein et al., 2014; Talge et al., 2007; Van den Bergh, Mulder, Mennes, & Glover, 2005; Van den Bergh, Dahnke, & Mennes, 2018;

Van den Bergh et al., 2017), and are at higher risk for later mental health problems, such as anxiety and attention deficit hyperactivity disorder (Glover, 2011; Van den Bergh & Marcoen, 2004).

The COVID-19 pandemic has introduced additional stress and uncertainty for individuals worldwide. Physical isolation from social support networks, economic and employment stressors, additional childcare responsibilities, worries related to potential harm to one's child and oneself, and barriers to care can have pernicious effects (Lebel, MacKinnon, Bagshawe, Tomfohr-Madsen, & Giesbrecht, 2020; Pietromonaco & Overall, 2020). Parents were especially affected by COVID-19 related stressors, which disproportionately impacted women (Sevilla & Smith, 2020; Thayer & Gildner, 2020; Wang et al., 2020). Pregnant individuals faced challenges related to prenatal healthcare disruptions and uncertainty regarding the effect of COVID-19 on the developing fetus (Preis et al., 2020).

Research from the first wave of the COVID-19 pandemic in Canada showed increased levels of anxiety and depression symptoms among pregnant individuals, compared to pre-pandemic estimates, (Lebel et al., 2020). This is consistent with global estimates. Based on findings from a meta-analysis, including studies from 22 countries, these clinically concerning elevations in anxiety and depression symptoms for pregnant individuals were observed worldwide during the first wave of the pandemic (Tomfohr-Madsen et al., 2021). This meta-analysis showed clinically elevated mental health rates between 24-30% (Tomfohr-Madsen et al., 2021).

The elevated estimates of mental health concerns during the pandemic demonstrate a drastic increase in mental health concerns among pregnant women compared to pre-pandemic estimates. Pre-pandemic research has suggested prevalence rates of depression and anxiety

ranging from approximately 6 to 14% among pregnant individuals (Andersson et al., 2003; Gavin et al., 2005; Woody et al., 2017). Psychosocial stress, which is linked to mental illness, is also common in this population, including prior to the pandemic (Woods et al., 2010). However, stress and mental health concerns in this population become worse during times of great uncertainty. Systematic review findings have suggested that pregnant individuals, and their infants, may be particularly vulnerable to events such as terrorist attacks, and environmental and natural disasters (Harville et al., 2010). Despite the influence of disasters and pandemics on mental health, there is heterogeneity in mental health outcomes in the perinatal period (i.e., during pregnancy and the first year postpartum), which suggests that risk and resilience factors play a role in mental health over time.

Although social relationships are often the central source of emotional support, many individuals who are pregnant during the COVID-19 pandemic are isolated from much of their social network, likely making their romantic partner the primary source of social connection. Whereas positive relationships are critical for good mental health, poor romantic relationship quality can contribute to more mental health concerns. Relationship dissatisfaction, in particular, is robustly linked to various types of psychopathology (Barbato & D'Avanzo, 2008; Overbeek et al., 2006; Whisman & Baucom, 2012). Levels of one's own and one's partner's marital satisfaction predict later depressive symptoms for both partners (Beach, Katz, Kim, & Brody, 2003). Similarly, spouses who are more dissatisfied with their relationship are more likely to develop a major depressive episode compared to spouses who are more satisfied with their relationship (Whisman & Bruce, 1999). One study found similar longitudinal effects of marital discord on depressive symptoms and effects of depressive symptoms on marital discord, suggesting that this longitudinal association is of a bidirectional nature (Whisman & Uebelacker,

2009). Relationship distress has also been found to longitudinally predict the onset of anxiety disorders in the general population (Overbeek et al., 2006).

Although many studies have examined the longitudinal relationship between poor relationship satisfaction and mental health in the general population (see South, 2021 for a review), the research in pregnant populations is scarce. Low levels of marital satisfaction and partner support during pregnancy have been found to be risk factors for elevated depressive symptoms in the postpartum period (Hock et al., 1995; Milgrom et al., 2008). Furthermore, relationship enhancement delivered during the perinatal period has been shown to improve parent mental health and to confer secondary benefit in reducing child emotional and behavioural problems (Doss et al., 2014; Tomfohr-Madsen et al., 2020). These secondary improved child outcomes also benefit parents as child problems contribute to parental stress (Hastings, 2002). Still, the nature of the association between relationship satisfaction and mental health in pregnant individuals remains unclear since only one study examined their bidirectional associations during the perinatal period (Whisman et al., 2011). This study of mothers with a history of major depression showed that relationship adjustment was associated with both concurrent anxiety and depressive symptoms. Greater depressive, but not anxiety, symptoms were predictive of lower *subsequent* relationship adjustment. Furthermore, lower relationship adjustment was associated with greater subsequent anxiety, but not depression symptoms (Whisman et al., 2011). The authors noted that there might be differences in longitudinal associations between relationship satisfaction and mental health in pregnant individuals without a history of depression.

Examining the association between parental relationship satisfaction and psychopathology during the perinatal period is important due to the high prevalence of mental health concerns during this time (Gavin et al., 2005; Schwartz et al., 2020; Woody et al., 2017)

and the repercussions of these mental health problems for maternal and child well-being (Coussons-Read, 2013; Stein et al., 2014). Although the transition to parenthood tends to contribute to decreases in marital satisfaction, (Twenge et al., 2003) relationship satisfaction is a factor that is modifiable through intervention (Doss et al., 2020). Examining the directionality of such association is important to identify the appropriate modifiable targets for interventions with pregnant people (i.e., relationship quality to improve mental health concerns and/or mental health to improve relationship quality).

The current COVID-19 pandemic and the lockdown protocols provide a unique context in which many couples are spending more time together and have reduced external social supports. Early research from the pandemic showed that, although couples typically did not report changes in their relationship quality, couples who reported high conflict in their relationship did experience slight decreases in their relationship satisfaction during the pandemic (Williamson, 2020). This is consistent with research on mothers suggesting that the pandemic may have amplified existing sources of relationship conflict (Calarco et al., 2020).

The current study aimed to explore the longitudinal association between relationship satisfaction and depression and anxiety symptoms among pregnant individuals during the first wave of the COVID-19 pandemic in Canada (i.e., April to July 2020). It was expected that, with the uncertainty, stressors, amount of time couples are spending together, and the barriers to other sources of support during the COVID-19 pandemic, partner satisfaction among pregnant individuals would be longitudinally associated with their mental health outcomes. It was also expected that poor mental health would contribute to lower partner satisfaction as those with depression may perceive more interpersonal stress (Hammen, 1991) and previous studies have highlighted the bidirectional association between mental health and relationship quality

(Gustavson et al., 2012). However, it was expected that relationship satisfaction would be a stronger predictor of mental health outcomes since previous research examining social connectedness and mental health has found that social connectedness is a stronger predictor of subsequent mental health than the reverse (Saeri et al., 2017).

Due to the dramatic elevations in mental health concerns among pregnant individuals during the pandemic (Lebel et al., 2020), the relative stability typical of depressive and anxiety symptoms during pregnancy (Dekel et al., 2019; Viswasam et al., 2020), and the adverse sequelae of maternal mental health problems during the perinatal period for mothers and children (Stein et al., 2014), it is paramount to explore modifiable factors that may be contributing to maternal mental health. Exploring whether and how relationship satisfaction is linked to anxiety and depression will help to identify targets of intervention. Furthermore, this research will help to inform programming for individuals in the perinatal period, to protect against the adverse consequences of COVID-19 and the associated sustained maternal psychological distress on families.

Method

Sample

Participants are from the Canadian Pregnancy during the COVID-19 Pandemic (PdP) study, an ongoing pan-Canadian cohort study that began in April 2020 (See Giesbrecht, 2020 for full longitudinal cohort study protocol). This study was approved by the Conjoint Health Research Ethics Board (CHREB) at <BLINDED> (REB##-#####) and all participants provided consent to participate. Participants were recruited via social media ads and invited to complete monthly prenatal surveys. Within the PdP cohort, 3747 individuals with a delivery due date after July 2020 participated between April and July 2020. A due date past July 2020 was chosen as

this allowed us to examine individuals who were pregnant throughout the study duration. To have adequate covariance coverage to conduct longitudinal analyses, the sample for the current study was restricted to those with data for at least two assessments (out of four) between April and July 2020, yielding a final sample of 1842 participants. Table 1 shows demographics of this study sample.

Table 1

Participant demographics

[Insert Table here]

Note. M = Mean. SD = Standard Deviation. CAD = Canadian Dollar.

There were significant differences between participants who completed at least two assessments and those who completed only one assessment (who were excluded from the analyzed sample). Participants were more likely to complete 2+ (as opposed to just one) assessment if they had higher income (OR = 1.13, 95%CI [1.09-1.16], $p < .001$), higher education (OR = 1.61, 95%CI [1.07-2.42], $p < .001$), and were in a marriage or domestic partnership (OR = 1.61, 95%CI [1.07-2.42], $p = .022$), but did not differ in terms of previous miscarriages and depression and anxiety disorder diagnoses before pregnancy ($p > .50$). Furthermore, attrition analyses within participants who joined the study in April ($n = 1234$) showed that the odds of having two or more assessments were slightly lower for those with higher levels of depression (OR = 0.95, 95%CI [0.93-0.97], $p < .001$) and anxiety in April (OR = 0.97, 95%CI [0.96-0.99], $p = .009$).

Measures

Relationship quality. Romantic relationship satisfaction (skewness = -1.13 to -1.22 ; kurtosis = 0.92 to 1.51 ; $\alpha = 0.88$ to 0.89) was self-reported at each assessment using the 4-item

Couple Satisfaction Index (Funk & Rogge, 2007). Items are answered on a 7-point (1 item) or 6-point (3 items) scale and summed scores can range from 0 to 21 with higher scores indicating higher levels of relationship satisfaction. Scores ≤ 13.5 suggest notable relationship dissatisfaction.

Anxiety symptoms. General anxiety symptoms (skewness = -0.01 to 0.32 ; kurtosis = -0.57 to -0.81 ; $\alpha =$ all 0.94) were self-reported at each assessment using the PROMIS® Anxiety 7-item short form (Cella et al., 2010; Pilkonis et al., 2011). Items are answered on a 5-point scale and summed scores can range from 7-35, where higher scores indicate more severe symptoms. Scores of 20-27 are indicative of moderately elevated anxiety symptoms and scores ≥ 28 are indicative of severely elevated anxiety symptoms (Cella et al., 2010; Pilkonis et al., 2011).

Depression symptoms (skewness = 0.37 to 0.58 ; kurtosis = -0.13 to 0.01 ; $\alpha = 0.88$ to 0.89) were self-reported at each assessment using the 10-item Edinburgh Postpartum Depression Scale (Cox et al., 1987), which is validated for prenatal assessments (Bergink et al., 2011). Items are answered on a 4-point scale and summed scores can range from 0-30, where higher scores indicate more severe symptoms. A cut-off score ≥ 13 is used to identify individuals with clinically concerning depression symptoms (Cox et al., 1987).

Covariates. Potential confounding variables were included as covariates and were self-reported by each participant at their first assessment. Covariates included (1) education level; high school degree or lower vs. post-secondary education, (2) household income, (3) changes in household income due to COVID-19, (4) marital status; married or in a domestic partnership vs. other, (5) number of live children, (6) having had a miscarriage prior to the current pregnancy, and (7) pregnancy stage, using the number of weeks until delivery due date on April 1, 2020.

Analyses

Cross-lagged panel models were carried out using Mplus version 8.5 (Muthén & Muthén, 1998-2017) and maximum likelihood estimation, which can handle levels of skew and kurtosis of 2 and 7, respectively (Curran et al., 1996; Ryu, 2011) – values within which all main study variables fell (see measures section). Cross-lagged panel models allow examining bidirectional effects between variables (i.e., cross-lagged effects, where one variable predicts another variable measured at a later occasion), while controlling for the stability of individual differences within each variable (i.e., autoregressive effects, where the same variable predicts itself over time), (see Todd D Little, 2013; Orth et al., 2021). Two models were examined: (a) model examining associations between relationship satisfaction and depressive symptoms, and (b) model examining associations between relationship satisfaction and anxiety symptoms. The Benjamini–Hochberg procedure (Benjamini & Hochberg, 1995; Thissen et al., 2002) was used to correct for multiple testing. All covariates (see measures section) were included in the models by regressing mental health and relationship satisfaction variables at the first time point on the covariates.

Tests of goodness of model fit included the model chi-square (χ^2), the Comparative Fit Index (CFI), the Tucker-Lewis Index (TLI), the Root-Mean-Square Error of Approximation (RMSEA), and the Standardized Root-Mean Residual (SRMR). An adequate fit is suggested by a non-significant χ^2 , a CFI and TLI > 0.90 and a RMSEA and SRMR < 0.08 (T. D. Little, 2013). However, the chi-square test is sensitive to sample size, and with a large sample size, such as in the present study, large power leads the chi-square test to be significant even with trivial differences between the observed and model-implied variance-covariance matrix (T. D. Little, 2013). Furthermore, the TLI was found to be less reliable in large samples and for smaller models (Cangur & Ercan, 2015; Shi et al., 2019). Thus, based on these findings, the CFI,

RMSEA and SRMR were considered more reliable for our model and large sample. An overall pattern where all three indices showed adequate fit supported an acceptable model fit.

Missing data. Full information maximum likelihood (FIML) was used to account for missing data (Lang & Little, 2018). Participant recruitment and attrition across data collection waves is shown in Table 2. Of the 1842 participants included in this study, 825 joined the study in April, of which 358 had complete data at all four assessments. Of the included study participants, 1017 joined the study in May or June, of which 789 had complete data thereafter but had missing data for assessments that occurred before they joined the study (empty cells; Table 2), which was considered missing completely at random (Graham, 2009) as the recruitment procedures did not change. Potential predictors of the missing at random mechanism (Graham, 2009) within the analyzed sample were examined by comparing the participants who withdrew or missed assessments after joining the study to the remainder of the sample. Household income, number of children, previous miscarriages, marital status, education, anxiety and depression diagnoses before pregnancy, temporary or permanent job loss due to COVID-19, and income change due to COVID-19 were examined and found to be nonsignificant predictors of missingness ($p > .10$).

Table 2

Participant recruitment and attrition

[Insert Table here]

Results

Descriptive Statistics

Descriptive statistics of the study variables are presented in Table 3. Crosstabulations showed that in April, rates of clinically concerning depressive symptoms were significantly higher for participants with notable relationship dissatisfaction compared to other participants (44% vs. 26%; $\chi^2(1) = 19.05, p < .001$). The same was found for moderately to severely elevated anxiety symptoms for participants with notable relationship dissatisfaction compared to other participants (61% vs. 48%; $\chi^2(1) = 8.96, p = .003$). These estimates were much higher than pre-pandemic estimates of depression and anxiety of around 6 to 14% among pregnant individuals (Andersson et al., 2003; Gavin et al., 2005; Woody et al., 2017). Bivariate correlations between all mental health and relationship variables across the four assessments are presented in Supplementary Table 1.

Table 3

Descriptive statistics of study variables

[Insert Table here]

Note. M = Mean; SD = Standard Deviation. % = percentage of participants. Relationship notable dissatisfaction = scores ≤ 13.5 on Couple Satisfaction Index. Moderately elevated anxiety symptoms = scores of 20-27; severely elevated anxiety symptoms = scores ≥ 28 on PROMIS® Anxiety. Clinically concerning depression symptoms = scores ≥ 13 on Edinburgh Postpartum Depression Scale.

Relationship satisfaction, depressive symptoms, and anxiety symptoms

Model fit was adequate for the cross-lagged panel models between relationship satisfaction and depressive symptoms ($\chi^2(54) = 542.94, p < .001, CFI = 0.92, TLI = 0.88, RMSEA = 0.07, SRMR = 0.04$) and between relationship satisfaction and anxiety symptoms

($\chi^2(54) = 595.52, p < .001, CFI = 0.91, TLI = 0.86, RMSEA = 0.07, SRMR = 0.05$). Results (see Figure 1) showed the same pattern of associations for depressive symptoms (Table 4) and anxiety symptoms (Table 5), with slightly lower effect sizes for anxiety. There was strong stability in depressive symptoms, anxiety symptoms, and relationship satisfaction, with slightly less stability earlier in the pandemic for anxiety and relationship satisfaction. Relationship satisfaction was significantly correlated with depression and anxiety at all time points.

Relationship satisfaction in April and May was negatively associated with later depressive and anxiety symptoms, in May and June respectively. While initial results showed that depressive and anxiety symptoms in April were negatively associated with relationship satisfaction in May, the effects were small and no longer significant after controlling for multiple testing. There were no significant cross-lagged associations between variables in June and July.

Table 4

Full Results of Cross-Lagged Panel Model Between Depressive Symptoms and Relationship Satisfaction

[Insert Table Here]

Note. * $p < .05$ ** $p < .01$ *** $p < .001$. Significant cross-lagged associations are bolded. β = standardized beta. r = correlation coefficient. Arrows denote the direction of association in regression paths (predictor \rightarrow outcome).

Table 5

Full Results of Cross-Lagged Panel Model Between Anxiety Symptoms and Relationship Satisfaction

[Insert Table Here]

Note. * $p < .05$ ** $p < .01$ *** $p < .001$. Significant cross-lagged associations are bolded. β = standardized beta. r = correlation coefficient. Arrows denote the direction of association in regression paths (predictor \rightarrow outcome).

Figure 1.

Results for the cross-lagged panel models between (a) depressive symptoms and relationship satisfaction and (b) anxiety symptoms and relationship satisfaction from April to July 2020.

[Insert Figure here]

Note. Models control for education level, household income, changes in household income due to COVID-19, marital status, number of live children, having had a miscarriage prior to the current pregnancy, and number of weeks until delivery due date. Only significant paths ($p < .05$) are presented for clarity. Dashed lines indicate paths that are no longer significant after controlling for multiple testing. Standardized coefficients are provided.

Discussion

The purpose of this study was to examine longitudinal, directional associations between relationship satisfaction and mental health among individuals who were pregnant during the first wave of the COVID-19 pandemic. Rates of relationship satisfaction remained relatively stable throughout the study period. Rates of depression and anxiety symptoms showed improvements but remained high compared to pre-pandemic levels, which is consistent with findings from other studies (Daly & Robinson, 2021a, 2021b). Results from cross-lagged models showed that relationship satisfaction was predictive of later mental health symptoms, which were not predictive of later relationship satisfaction. Specifically, after controlling for demographic variables, lower relationship satisfaction in April and June 2020 predicted higher levels of anxiety and depressive symptoms a month later. Relationship satisfaction in June 2020 was no

longer predictive of changes in mental health a month later but remained highly associated with depression and anxiety in July 2020.

The observed longitudinal associations between relationship satisfaction and mental health outcomes during the COVID-19 pandemic builds on previous research that has shown cross-sectional associations between relationship satisfaction and mental health outcomes during the pandemic (Pieh et al., 2020). This prior research showed that individuals with poor relationship satisfaction had higher levels of mental health concerns compared to individuals with either high levels of relationship satisfaction or those who were not in a relationship (Pieh et al., 2020). These findings are partly consistent with the only other study that examined bidirectional associations between relationship satisfaction and mental health symptoms during the perinatal period (Whisman et al., 2011). Indeed, both the study by Whisman and colleagues (2011) and our study suggest that lower relationship adjustment among pregnant individuals is associated with greater concurrent anxiety and depressive symptoms and greater subsequent anxiety symptoms. The present study, however, also found that lower relationship satisfaction was associated with greater subsequent symptoms of depression, which was not the case in the previous study by Whisman et al. (2011). This finding, however, is consistent with previous research in non-pregnant samples that has shown that marital adjustment is associated with subsequent depressive disorders and symptoms (Beach et al., 2003; Whisman & Bruce, 1999; Whisman & Uebelacker, 2009).

Although Whisman et al. (2011) found that some associations between relationship satisfaction and mental health were bidirectional, our study suggests clear directionality where relationship satisfaction predicts depression and anxiety symptoms, but not the opposite. The inconsistent findings with Whisman and colleagues (2011) may be due to relationship quality

being particularly important for mental health in the pregnant population during the COVID-19 lockdown. Alternatively, this inconsistency may be attributable to the study by Whisman and colleagues (2011) being conducted in pregnant individuals with a history of major depression, as longitudinal associations between relationship satisfaction and mental health could differ between mothers with and without a history of depression. Finally, while the study by Whisman and colleagues (2011) showed bidirectionality across the perinatal period it did not examine *when* during this period relationship satisfaction predicts mental health and vice-versa. The present study raises the possibility that relationship satisfaction would predict depression and anxiety symptoms during pregnancy, and that depression and anxiety symptoms would in turn predict relationship satisfaction during the postpartum period. Future studies across both periods should aim to disentangle these longitudinal effects. Overall, the present study highlights the need for more research to examine the directionality of the association between relationship satisfaction and mental health during pregnancy and the perinatal period.

In the present study, while associations were found between April and June, individuals' relationship satisfaction did not predict mental health symptoms at the last time point (July 2020). This association may not have been significant due to changes in lockdown protocols in mid-summer in Canada. There were similar lockdown and relaunching protocols across Canadian provinces over the 4-month duration of the current study (Detsky & Bogoch, 2020; Giesbrecht, 2020). As restrictions were eased during this time, individuals may have been able to gain more space from their partner and seek emotional support from other sources. It is also possible that as the pandemic progressed participants became better adjusted to the lockdown protocols and discovered new strategies to cope with their relationship struggles, helping to protect against increases in mental health concerns.

Pregnant individuals who experienced poor relationship satisfaction may have been particularly vulnerable to increases in mental health symptoms during the COVID-19 pandemic for a number of reasons. Pregnancy is a time of uncertainty and stress for many individuals and a time in which a strong support system is valuable and often paramount (Milgrom et al., 2008). During the lockdown, reliance on intimate partners has been further heightened. Pregnant individuals with poor relationships may have experienced worry that their partners would be less available for support or worry about the possibility of relationship dissolution, potentially contributing to symptoms of depression and anxiety (Whisman et al., 2011). Relationship struggles may have been particularly frustrating and psychologically taxing during this time due to the barriers to other forms of support and outlets (e.g., family members outside of the home, friends, prenatal groups). Furthermore, pandemic related stressors (Sevilla & Smith, 2020; Thayer & Gildner, 2020; Wang et al., 2020) may have contributed to an exacerbation of existing relationship problems for parents. Based on previous research suggesting that the pandemic has amplified existing relationship conflict for mothers (Calarco et al., 2020), this exacerbation of previously manageable relationship challenges may have contributed to feelings of hopelessness and frustration, in turn contributing to increases in mental health concerns. Pre-pandemic longitudinal cohorts with follow-ups during COVID-19 could help clarify these effects.

Strengths and limitations

The strengths of the current study included the longitudinal design of the study, allowing us to examine longitudinal associations between mental health symptoms and relationship satisfaction over a four-month period and a large sample of individuals who were pregnant during COVID-19. Using data from a longitudinal cohort that began data collection within a few weeks of the onset of the pandemic in Canada allowed us to examine these associations

throughout the entirety of the first wave of COVID-19 in Canada. The recruitment of individuals from across Canadian provinces who were both English and French-speaking contributes to the representativeness of this sample. The current sample also includes individuals at different stages of pregnancy and with a wide range in the number and ages of children in the home. However, the generalizability of our findings should be interpreted with caution since the sample was composed of individuals living in Canada (where there is universal health care) with low sociodemographic risk factors. Research during the COVID-19 pandemic has shown that mothers who experienced income or employment disruptions and had difficulty obtaining childcare during the pandemic displayed greater levels of anxiety and depression compared to mothers who did not experience these challenges (Racine et al., 2021). Furthermore, communities that are more disadvantaged (e.g., low-income multigenerational families in single homes and migrant farm workers) tend to experience higher rates of infection and mortality due to pandemics (Bambra et al., 2020; Detsky & Bogoch, 2020). As such, future research should examine whether relationship dissatisfaction is elevated in contexts and populations with lower sociodemographic risks, such as less education, greater financial strain, less access to childcare resources, and work and living conditions.

Participants with higher initial levels of anxiety and depression were also more likely to have only one assessment and be excluded from the analyses of the present paper, and thus effect sizes may be underestimated. Beyond generalizability, the present study had other methodological limitations. While this longitudinal study was able to show that relationship satisfaction is predictive of mental health while controlling for reverse-directionality, all associations remain correlational and do not demonstrate causality. Furthermore, all data were self-reported, raising the possibility of shared method variance accounting for a portion of the

associations. It is also possible that other factors that were not considered in the current study (e.g., substance use during pregnancy) may influence the observed associations. Future research may want to examine potential moderating variables, such as substance use, to better understand for whom poor relationship quality is particularly harmful.

Finally, this study, rooted in the social connectedness and health literature, explored one cognitive component (i.e., relationship satisfaction) of social capital at the micro level (romantic relationships). Future research should consider examining additional measures of subjective relationship appraisal (e.g., partner commitment, attachment, and trust). These subjective indicators of relationship functioning are more informative than examining structural components of social capital (e.g., relationship status) alone (Holt-Lunstad et al., 2010; Saeri et al., 2017). Furthermore, understanding which additional subjective relationship factors contribute to psychopathology during the perinatal period may better help to inform the development and delivery of relationship interventions to couples, especially during times of uncertainty.

Implications and Applications

To our knowledge, this is the first study to test the directionality of the association between relationship quality and mental health during pregnancy in the general population. While Whisman and colleagues (2011) tested these relationships in a sample with a history of major depression and found bidirectional associations in the perinatal period, the present study found directional associations where relationship satisfaction predicts depression and anxiety symptoms, but not the opposite. This raises three possibilities: (1) associations differ according to the history of major depression before pregnancy; (2) although relationship quality predicts poorer subsequent mental health during times of stress (e.g., during strict COVID-19 lockdown protocols where social connection is more limited), this association may not hold true in times

where stress and uncertainty are less severe (e.g., before the pandemic, or when pandemic restrictions are loosened); (3) the associations between relationship satisfaction and mental health during pregnancy differ in the postpartum period. Accordingly, further research into these longitudinal associations is needed to properly guide clinical practice.

Still, the current findings add to the evidence that relationship satisfaction is a predictor of mental health concerns during pregnancy. Targeting relationship quality during pregnancy through intervention, such as couple's counselling, may be a promising avenue to help prevent or reduce the adverse consequences of mental health problems during pregnancy and promote the well-being of families. Improving relationship satisfaction during the transition to parenthood has been shown to increase marital satisfaction and there is evidence of long term benefits for child outcomes (Doss et al., 2014). The present findings suggest that there is promise in exploring relationship interventions during pregnancy in order to promote better mental health outcomes. Adapting existing relationship interventions and testing them during pregnancy remains on the agenda for future research. Pregnant individuals face unique stressors and needs so we encourage researchers to identify relationship interventions that can be easily accessed and delivered in future situations that pose risk for prolonged psychological distress among pregnant individuals. Specifically, mothers during the perinatal period have identified web-based and telephone support as their preferred methods of additional support for their mental health needs (Schwartz et al., 2020). E-health relationship enhancement interventions do exist (Doss et al., 2020). However, to our knowledge, they have not been tested during pregnancy.

Social networks, which are critical for good mental health, have been disrupted during the COVID-19 pandemic, potentially increasing the importance of romantic partner quality on mental health. Although the COVID-19 lockdown has been challenging for most individuals, it

may have been particularly difficult for pregnant individuals with poor relationships. Pregnancy is a time of vulnerability, during which many individuals struggle with their mental health.

Although support systems are known to be helpful during times of psychological distress, many pregnant individuals have been physically isolated from everyone besides their partners, whom individuals with poor relationships may not have easily been able to rely on or draw support from. These findings support future investigation of the efficacy of using relationship enhancement interventions as a means of improving mental health in pregnancy during times of prolonged psychological distress.

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Tables and Figures

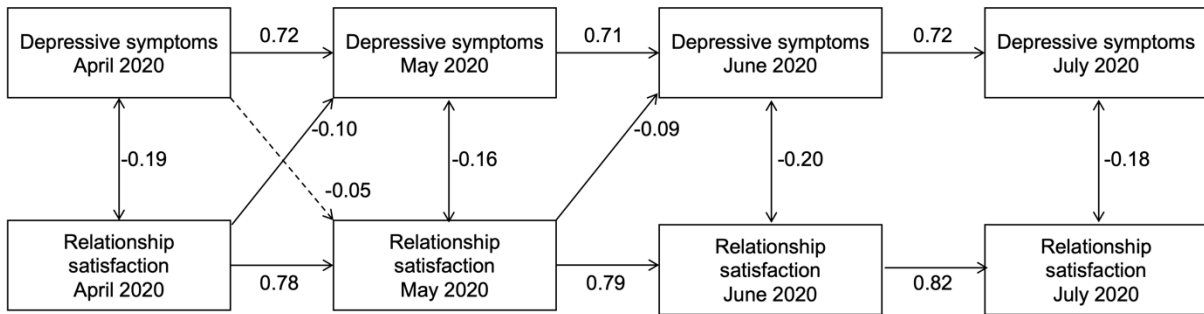
Table 1*Participant demographics*

Baseline characteristic	Value
Number of live children (%)	
0	21.9
1	56.7
2	15.7
3+	5.6
Age of children (M, SD)	3.86 (3.43)
Age range	0-23
Weeks until due date on April 1, 2020 (M, SD)	27.63 (7.00)
History of miscarriage (%)	47.1
Age (M, SD)	32.78 (4.05)
Age range	19-49
Median household income (CAD)	100,000-124,999
Born in Canada (%)	86.1
Race/Ethnicity (%)	
White	85.4
First Nations	0.9
Metis	1.2
Black	1.0
West Asian/Arab	0.8
South Asian	1.9
Southeast Asian	1.7
East Asian	2.1
Hispanic/Latinx	2.1
Biracial	2.8
Education (%)	
Less than high school	0.4
High school	5.9
Trade or community college diploma	18.2
Bachelor's degree	43.4
Graduate or professional degree	32.1

Note. M = Mean. SD = Standard Deviation. CAD = Canadian Dollar.

Figure 1

a. Depressive symptoms and relationship satisfaction



b. Anxiety symptoms and relationship satisfaction

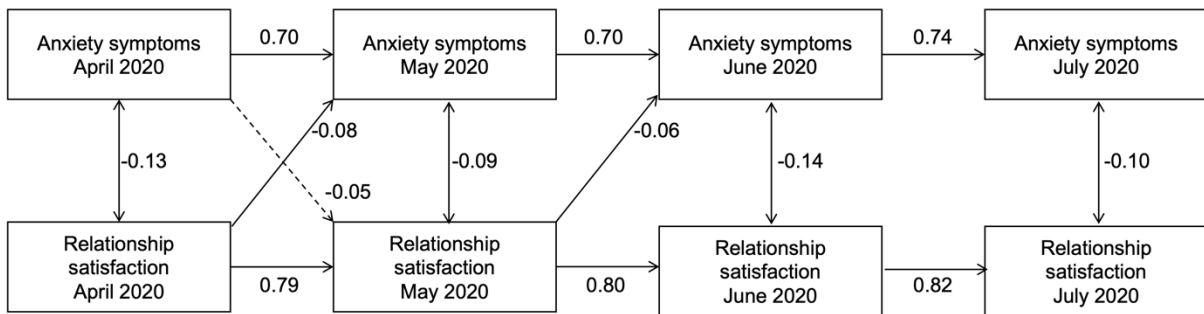


Table 2*Participant recruitment and attrition*

	Number of participants at each data collection wave			
	April 2020	May 2020	June 2020	July 2020
Participants recruited in:				
April	825	754	582	448
May		562	483	413
June			455	455
Total with data (%)	825	1316	1520	1316
Total with missing data (%)	1017	526	322	526

Table 3*Descriptive statistics of study variables*

Variable	April 2020 (n = 825)		May 2020 (n = 1316)		June 2020 (n = 1520)		July 2020 (n = 1316)	
	M (SD)	%	M (SD)	%	M (SD)	%	M (SD)	%
Relationship satisfaction	16.62 (3.67)		16.51 (3.72)		16.49 (3.76)		16.44 (3.72)	
Notable dissatisfaction		19.2		19.2		19.3		20.1
Anxiety symptoms	19.20 (6.12)		17.81 (6.02)		17.16 (5.95)		16.91 (5.99)	
Moderately elevated		42.3		35.1		31.6		30.6
Severely elevated		7.8		5.4		4.3		4.0
Depression symptoms	9.83 (5.20)		9.20 (5.21)		8.67 (5.32)		8.38 (5.35)	
Clinically concerning		30.1		26.4		23.1		21.6

Note. M = Mean; SD = Standard Deviation. % = percentage of participants. Relationship notable dissatisfaction = scores ≤ 13.5 on Couple Satisfaction Index. Moderately elevated anxiety symptoms = scores of 20-27; severely elevated anxiety symptoms = scores ≥ 28 on PROMIS® Anxiety. Clinically concerning depression symptoms = scores ≥ 13 on Edinburgh Postpartum Depression Scale.

Table 4*Full Results of Cross-Lagged Panel Model Between Depressive Symptoms and Relationship**Satisfaction*

	Estimate(SE)	β/r
Control variables		
Higher education → Depression April	-0.97(0.64)	-0.05
Higher education → Relationship April	0.75(0.45)	0.05
Household income → Depression April	-0.45(0.07)***	-0.17
Household income → Relationship April	0.02(0.05)	0.01
Income change COVID-19 → Depression April	-0.96(0.18)***	-0.15
Income change COVID-19 → Relationship April	0.13(0.13)	0.03
Marital status → Depression April	-2.59(1.02)*	-0.07
Marital status → Relationship April	5.70(1.01)***	0.22
Number of children → Depression April	-0.15(0.24)	-0.02
Number of children → Relationship April	-0.50(0.15)***	-0.11
Previous miscarriage → Depression April	0.38(0.34)	0.03
Previous miscarriage → Relationship April	-0.76(0.23)**	0.09
Weeks until due date April 1 st → Depression April	-0.01(0.02)	-0.02
Weeks until due date April 1 st → Relationship April	-0.01(0.02)	-0.01
Autoregressive paths		
Depression April → May	0.73(0.02)***	0.72
Depression May → June	0.73(0.02)***	0.71
Depression June → July	0.72(0.02)***	0.72
Relationship April → May	0.79(0.02)***	0.78
Relationship May → June	0.80(0.02)***	0.79
Relationship June → July	0.80(0.02)***	0.82
Correlations		
Depression/Relationship April	-3.49(0.59)***	-0.19
Depression/Relationship May	-1.25(0.28)***	-0.16
Depression/Relationship June	-1.66(0.25)***	-0.20
Depression/Relationship July	-1.41(0.23)***	-0.18
Cross-lagged paths		
Depression April → Relationship May	-0.03(0.02)*	-0.05
Depression May → Relationship June	-0.02(0.01)	-0.03
Depression June → Relationship July	-0.01(0.01)	-0.02
Relationship April → Depression May	-0.14(0.03)***	-0.10
Relationship May → Depression June	-0.09(0.03)**	-0.07
Relationship June → Depression July	0.00(0.03)	0.00

Note. * $p < .05$ ** $p < .01$ *** $p < .001$. Significant cross-lagged associations are bolded. β =

standardized beta. r = correlation coefficient. Arrows denote the direction of association in regression paths (predictor → outcome).

Table 5*Full Results of Cross-Lagged Panel Model Between Anxiety Symptoms and Relationship**Satisfaction*

	Estimate(SE)	β/r
Control variables		
Higher education → Anxiety April	-0.73(0.78)	-0.03
Higher education → Relationship April	0.77(0.45)	0.05
Household income → Anxiety April	-0.37(0.02)***	-0.12
Household income → Relationship April	0.02(0.05)	0.01
Income change COVID-19 → Anxiety April	-1.01(0.22)***	-0.14
Income change COVID-19 → Relationship April	0.13(0.13)	0.03
Marital status → Anxiety April	-2.37(1.23)	-0.06
Marital status → Relationship April	5.85(1.02)***	0.22
Number of children → Anxiety April	-0.34(0.29)	-0.05
Number of children → Relationship April	-0.50(0.15)**	-0.11
Previous miscarriage → Anxiety April	0.41(0.40)	0.03
Previous miscarriage → Relationship April	-0.76(0.23)**	-0.09
Weeks until due date April 1 st → Anxiety April	0.04(0.03)	0.04
Weeks until due date April 1 st → Relationship April	-0.01(0.02)	-0.01
Autoregressive paths		
Anxiety April → May	0.69(0.02)***	0.70
Anxiety May → June	0.70(0.02)***	0.70
Anxiety June → July	0.74(0.02)***	0.74
Relationship April → May	0.79(0.02)***	0.79
Relationship May → June	0.81(0.02)***	0.80
Relationship June → July	0.80(0.02)***	0.82
Correlations		
Anxiety/Relationship April	-2.68(0.69)***	-0.13
Anxiety/Relationship May	-0.82(0.33)*	-0.09
Anxiety/Relationship June	-1.33(0.29)***	-0.14
Anxiety/Relationship July	-0.82(0.25)**	-0.10
Cross-lagged paths		
Anxiety April → Relationship May	-0.03(0.01)*	-0.05
Anxiety May → Relationship June	0.00(0.01)	0.00
Anxiety June → Relationship July	-0.01(0.01)	-0.02
Relationship April → Anxiety May	-0.12(0.04)**	-0.08
Relationship May → Anxiety June	-0.09(0.03)**	-0.06
Relationship June → Anxiety July	-0.04(0.03)	-0.03

Note. * $p < .05$ ** $p < .01$ *** $p < .001$. Significant cross-lagged associations are bolded. β =

standardized beta. r = correlation coefficient. Arrows denote the direction of association in regression paths (predictor → outcome).

Supplementary Table 1.

Correlations Between Depressive Symptoms, Anxiety Symptoms, and Relationship Satisfaction Across the Four Assessments.

	1	2	3	4	5	6	7	8	9	10	11	12
1. Depression Apr	–											
2. Depression May	.74	–										
3. Depression Jun	.65	.71	–									
4. Depression Jul	.61	.66	.72	–								
5. Anxiety Apr	.82	.65	.56	.53	–							
6. Anxiety May	.68	.83	.63	.60	.71	–						
7. Anxiety Jun	.64	.63	.82	.66	.66	.70	–					
8. Anxiety Jul	.60	.61	.65	.82	.64	.69	.74	–				
9. R. satisfaction Apr	-.22	-.28	-.27	-.16	-.16	-.21	-.20	-.14	–			
10. R. satisfaction May	-.24	-.30	-.26	-.18	-.19	-.22	-.21	-.16	.79	–		
11. R. satisfaction Jun	-.19	-.25	-.31	-.23	-.13	-.17	-.22	-.20	.78	.78	–	
12. R. satisfaction Jul	-.19	-.24	-.28	-.27	-.16	-.16	-.21	-.20	.78	.80	.82	–

Note. All $p < .01$. Apr = April. Jun = June. Jul = July.