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The Role of Borderline Personality Features, Social Support, and Perceived Stress on Prescribed and Non-Prescribed Opioid Use during Pregnancy

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To the Graduate Council:

I am submitting herewith a dissertation written by Gretchen Kurdziel entitled "The Role of Borderline Personality Features, Social Support, and Perceived Stress on Prescribed and Non-Prescribed Opioid Use during Pregnancy." I have examined the final electronic copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in Psychology.

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The Role of Borderline Personality Features, Social Support, and Perceived Stress on Prescribed
and Non-Prescribed Opioid Use during Pregnancy

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Degree

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ABSTRACT

The current project examined the role of prescribed and non-prescribed opioid use in a sample of pregnant mothers ($N = 99$) who were patients in a high-risk pregnancy clinic. Borderline personality disorder features were assessed as whether these personality features may be associated with opioid misuse during pregnancy. Hepatitis-C virus, lack of social support, and perceived stress was also assessed in relation to opioid use and borderline personality features. Participants were representative of the geographic area (78.7% White) and in their 2nd and 3rd trimester (Gestation $M = 26.2$). Opioid use was measured through self-report questionnaires as well as urine and blood analysis from medical records. Linear and hierarchical regressions were employed to test predictor and outcome variables. Individuals who had high borderline features were more likely to misuse opioids, particularly the features of negative relationships and self-harm. Individuals with HCV were more likely to misuse opioids but were not more likely to have a clinical cut-off score of borderline features. The borderline features of negative relationships was positively associated with HCV diagnosis. Lack of social support did not moderate the relation between total borderline features and both self-reported and urine analysis of opioid use. Perceived stress moderated the relation between total borderline features and opioid use severity as indicated in the urine samples, such that when levels of perceived stress were medium to high, borderline features did not affect opioid use severity. Limitations along with future directions and clinical interventions are discussed.

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CHAPTER ONE
INTRODUCTION

Borderline Personality Disorder (BPD) is a severe, chronic disorder characterized by emotional disturbance and difficulty maintaining relationships (Linehan, 1993; Linehan & Dexter-Mazza, 2008). When understood from a biosocial framework, one can view BPD as a dysregulation of emotions and difficulty with coping with negative emotions, processes which are theorized to develop from an interaction between a biological predisposition and growing up in an invalidating home environment (Linehan, 1993). BPD can also be studied along a self-reported continuum that focuses on specific characteristics of individuals with the disorder including affective instability, negative relationships, identity disturbance, and self-harm/impulsivity. These features are highly correlated with a BPD diagnosis assessed from structured interviews (Kurtz & Morey, 2001) and have been used frequently in young adults (Trull, 1995). The current investigation aims to understand BPD features in opioid addicted pregnant women by quantifying the specific variance that borderline features has in women who misuse opioids. States including Ohio, West Virginia, Kentucky, and Tennessee report among the highest rates of opioid misuse and overdose in the United States (Centers for Disease Control and Prevention, 2016). The state of Tennessee, specifically, is known for one of the highest rates of addiction in the opioid epidemic and pregnant women mark one of the most vulnerable populations affected by this outbreak (Forray & Foster, 2015). The rate of individuals diagnosed with Borderline Personality Disorder and Opioid Use Disorder has been well-established (Sansone, Watts, & Wiederman, 2013; Trull, 2000). However, the association between BPD and Opioid Use Disorder has not been studied in pregnancy. Given the rising public health concern of opioid dependence in the state of Tennessee and the specific risk it poses for opioid addicted

pregnant women and their infants, the current project investigated BPD features that are associated with opioid dependence within the context of pregnancy. BPD is first diagnosed in late adolescence or early adulthood and diminishes in severity by middle age (Paris, 2003) making BPD largely a problem during a woman's child-bearing years. Co-morbid opioid use during this time may increase negative consequences not only for the mother but also for her infant. Pregnancy marks a critical time to intervene, as a mother-to-be is likely to seek medical care, and to be motivated to address her drug addiction in order to safeguard her infant's well-being. Understanding complications due to co-morbid BPD or BPD features in pregnant women who abuse opioids will inform preventative interventions in high risk pregnancy clinics. The current study examined whether BPD features of affective instability, negative relationships, identity disturbance, self-harm/impulsivity, and total features are associated with opioid misuse. We will also examine the moderating role of lack of social support and perceived stress in the relationship between BPD features and opioid misuse among pregnant women.

Opioid Dependency in Pregnancy

Opioid misuse among pregnant women in the state of Tennessee, for example, had increased substantially within the past decade. Between 2000 and 2009, the incidence of opioid misuse during pregnancy had increased from 1.19 to 5.77 per 1000 hospital births (Patrick et al., 2012). Moreover, there are many neonatal outcome risks associated with opioid exposure during pregnancy, including risk of low birth weight, respiratory complications, toxemia, third trimester bleeding, postnatal growth deficiency, neurobehavioral problems, and sudden infant death syndrome (Minozzi, Amato, Bellisario, Ferri, & Davoli, 2013). In cases of drug exposure during pregnancy, infants may also be diagnosed with Neonatal Opioid Withdrawal Syndrome (NOWS), previously referred to as Neonatal Abstinence Syndrome; in fact, 45-94% of infants

exposed to opioids in utero (including methadone and buprenorphine) are also diagnosed with NOWS, which is associated with negative neonatal outcomes and high health-care utilization (Minozzi et al., 2013). In 2012, it was estimated that the average cost of care for infants born with NOWS was $66,700 compared to infants born without NOWS whose cost was $3,500. State Medicaid programs paid for 81% of the costs associated with treating infants with NOWS; indeed, the average stay in the hospital for an infant with NOWS is 16.9 days compared to 2.1 days for infants born without NOWS (Patrick et al., 2015; Patrick et al., 2012).

Consequent to the increase of opioid use in the state of Tennessee over the past decade, there was a substantial change in NOWS diagnosis, increasing from 1.2 to 3.39 infants per 1000 hospital live birth per year diagnosed with the syndrome (Patrick et al., 2012). Further, between 2009-2011 the rate of NOWS infants born in Tennessee increased to 10.7 (Patrick et al., 2015) and increased again in 2013 to 11.6 per 1000 hospital births (Warren, Miller, Traylor, Bauer, & Patrick, 2015). These previous studies document a 16-fold increase in NOWS diagnosis since the year 2000 and highlights the significance of this serious public health concern. Innovative perinatal research is testing more effective ways to help women addicted to opioids during pregnancy, such as having women complete detoxification before giving birth so that their baby is not born with NOWS (Bell et al., 2016). However, there remains little research on psychological mechanisms including personality characteristics of the mother carrying the pregnancy. Without addressing mothers' co-morbid mental health disorders during pregnancy while detoxing from opioids to avoid NOWS, relapses may be more likely. BPD features in women who are pregnant and addicted to opioids may be a key risk factor to address when trying to prevent relapse.

Borderline Personality Disorder and Substance Use Disorder within the Context of Pregnancy

Women who have BPD approach pregnancy and delivery as traumatic, and often request early delivery from their health care providers (Blankley, Galbally, Snellen, Power, & Lewis, 2015) which may present greater health risk for the infant. Additionally, studies have found that women diagnosed with BPD are more likely to give birth prematurely, have newborns with a low APGAR scores, use substances during pregnancy, and are more likely to have been born prematurely themselves (Bandelow et al., 2005; Blankley et al., 2015; Pare-Miron, Czuzoj-Shulman, Oddy, Spence, & Abenhaim, 2016). Women with BPD also have higher rates of unplanned pregnancies, teenage pregnancy, and increased risk for developing substance use disorder (SUD) while pregnant (De Genna, Feske, Larkby, Angiolieri, & Gold, 2012) compared to pregnant women without the disorder. Moreover, co-morbid BPD and SUD increase the risk of having an unplanned pregnancy compared to women who do not have this co-morbid diagnosis (De Genna et al., 2012). Research is needed to further understand the multifaceted nature of BPD and opioid use within the context of women who have a high-risk pregnancy.

Linehan's (1993) biosocial model of BPD indicates that from a developmental psychopathology perspective, individuals develop BPD by the interaction of biology and an invalidating home environment (Linehan & Dexter-Mazza, 2008). Because of this interaction, individuals with the disorder are thus characterized as having a low threshold for negative emotional stimuli, which subsequently leads to intense reactions to emotional stimuli, and a slower return to neutral emotional baseline, thus prolonging an intense emotional response (Crowell, Beauchaine, & Linehan, 2009). During a time of intense life change such as pregnancy, examination is warranted as to whether BPD could potentially be associated with opioid misuse in order to help cope with these intense affective states, and specific correlates that

may contribute to the likelihood of using drugs to cope with or help regulate negative emotions.

Each borderline feature and the sum of all four are highly correlated with a diagnosis of BPD (Morey, 1991). Wapp et al. (2015) found that SUD and BPD are most common in patients who are younger, who are female, and who most often also diagnosed with co-morbid AD/HD, a diagnosis also notable for impulsivity. Overall, 24.2% BPD patients have some diagnosed SUD (Trull, 2000). More specifically, 18.5% of individuals diagnosed with BPD also have an opioid dependence, compared to 14.3% with alcohol use/dependence, and 16.8% cocaine use/dependence (Trull, 2000) making opioid dependence among one of the more serious SUD's in individuals with BPD.

Individuals with BPD experience lower physical pain tolerance than individuals without BPD. Reynolds, Carpenter & Transgresser (2017) found that BPD features were related to higher pain complaints, with the borderline feature of affective instability specifically related to patients experience of pain. Researchers also found that anxiety in anticipation of pain were similarly related to patients' experience of pain. This is important information given that regardless of whether a woman gives vaginal or cesarean birth, she may experience significant pain during labor and after giving birth. While these statistics are known within the general population, pregnant women present a unique group for studying the rate of BPD and opioid misuse during pregnancy. The four features of BPD (affective instability, negative relationships, identity disturbance, self-harm/impulsivity) and how these may relate to opioid dependence in women who are pregnant has not yet been examined.

Self-Harm/ Impulsivity and Substance Use

The BPD feature of self-harm/impulsivity in individuals with BPD has been established (Moeller et al., 2001). Impulsivity can be understood both within the context of BPD and SUD,

with some researchers considering substance use as a manifestation of impulsivity (Martino, Spada, Menchetti, Lo Sterzo, Sanza, Tedesco, Trevisani, 2017; Links, Heslegrave, & van Reekum, 1999). Self-harm/impulsivity is an important borderline feature examined in the current study. Risky sexual behavior (which may lead to unplanned pregnancy) and risky drug use behavior (e.g. needle sharing) may be a result of an impulsive decision based on current feeling and thinking *and* inability to comprehend the consequences of a behavior in the present moment. Research has indicated that BPD features were significantly associated with higher levels of opioid misuse in college students (Tragesser, Jones, Robinson, Stutler, & Stewart, 2013). In this study, BPD features were also positively associated with more frequent opioid use, greater quantity of the drug, pain medication misuse, more serious consequences, and greater risk for dependence compared to opioid users with low BPD features. These risks were associated specifically within the impulsivity feature of BPD. Individuals who have co-morbid BPD and opioid dependence also maintain significant difficulty with crime, injection-related health problems, overdose, depression, and overall global health after withdrawal and treatment compared to opioid users without BPD (Darke et al., 2007). Given the medical implications pregnant women face with opioid use during the gestation period, it is important that we test how different features of BPD may manifest in this vulnerable population.

Between women and men diagnosed with BPD and SUD, women are more likely to display impulsive sexual behavior compared to men (Erez, Pilver, & Potenza, 2014). Women compared to men are also more likely to use drugs with many partners, share drug paraphernalia with an injection partner, and are more likely to contract Hepatitis C Virus (HCV) (Erez et al., 2014). Forty to 75% of pregnant women who use opioids are HCV positive (Hallinan, Byrne, Amin, & Dore, 2005; Krans et al., 2016). Not only can HCV contribute to poor neonatal

outcomes – it can also be transmitted from mother to child, which is currently the number one cause of pediatric chronic HCV infection (Arshad, El-Kamary, & Jhaveri, 2011; Cottrell, Chou, Wasson, Rahman, & Guise, 2013). Women with opioid use disorder report using contraceptives less often compared to non-drug abusers (Terplan, Hand, Hutchinson, Salisbury-Afshar, & Heil, 2015) which may put women addicted opioids at an even greater risk in their overall health and well-being. In 2010, 9 out of every 10 pregnancies among opioid misusing women were unplanned (Heil et al., 2011) raising several concerns about the ability to cope with such a significant, perhaps unintended, life change. In the current study, we expect a positive correlation between HCV diagnosis and each BPD features (affective instability, identity problems, negative relationships, self-harm/impulsivity) as well as individuals with a BPD clinical cut-off of ≥38.

Negative Relationships and Social Support

Though it is clear that women who use drugs while pregnant are in need of significant medical and psychological support, they are a considerably stigmatized demographic in social, and at times medical, contexts (Poole & Dell, 2005). Having adequate social support during pregnancy is important for any mother, but having social support while pregnant and also struggling with addiction is paramount (Milligan, Usher & Urbanoski, 2016). Women who do struggle with drug addiction may unfortunately find themselves receiving varied levels of social support during pregnancy. On the one hand, women who feel they need to keep their substance use and addiction a secret from their family and friends because of fear of rejection (Milligan, Usher & Urbanoski, 2016) may be left coping with their substance use on their own during their pregnancy. Conversely, women who do make the decision to share with family and friends their SUD while pregnant may *also* experience significant stigmatization and isolation, or be deemed

as "abusing" their unborn fetus by using drugs (Apter-Danon & Candilis-Huisman, 2005). Some health care workers report feeling less empathy toward patients with BPD (Markham, 2009) and thus the combination of BPD and drug use may be a particularly difficult population for health workers to treat. This dichotomy puts pregnant women in an inevitable bind in which they are either personally isolated or socially stigmatized regarding their struggle with addiction during pregnancy.

Though we know that individuals with BPD have negative experiences with relationships, little is known about their own perception of social support. Individuals with BPD report having more romantic and sexual partners than individuals without BPD (Clifton, Pilkonis, & McCarty, 2007). However, they also report experiencing relationships with less satisfaction compared to healthy controls (Lazarus, Southward, & Cheavens, 2016). In a retrospective study of mothers whose offspring had BPD, mothers whose offspring had the diagnosis reported significantly more interpersonal stress with both romantic partners and family members, and also reported lower social support during their pregnancy (Schwarze et al., 2013). While the diagnosis of BPD of the mothers in this study are unknown, the offspring subjected to these conditions in utero went on to develop BPD, marking pregnancy as a particularly important time for women who have been diagnosed with BPD and also struggle with addiction.

Women with BPD report having smaller social networks, rate relationships as less supportive and satisfying, report having more ruptures, and experience their relationships as more conflictual and critical compared to women without BPD (Lazarus et al., 2016). In a detailed study examining social support in an adult sample diagnosed with BPD, Beeney, Hallquist, Clifton, Lazarus, & Pilkonis (2016) found that BPD status was associated with perception of less closeness, trust, and support, more frequent arguments with social support, less

face-to-face time, and lower feelings of attachment to romantic partners compared to those without BPD. Researchers also found that individuals with BPD were closest with those peripheral to their social network, and have romantic relationships outside of their social network, suggesting that individuals with BPD may have an easier time bonding to those outside of their immediate social network. Moreover, while negative relationships are in-fact a feature of BPD, the experience of individuals with BPD is such that they do not feel as though others can be relied on or confided in, particularly within their social networks. Given the stress of pregnancy, and the added stress that struggling with a substance use disorder may have on any person's life, individuals with BPD who are also pregnant may be at particular risk for finding, what feels to them, adequate social support.

The negative and unstable relationships that are characteristic of those with BPD could potentially give rise to a lack of social support during times of need. Therefore, it is important to determine whether low social support may increase the likelihood that an individual with high BPD features may misuse opioids during pregnancy. Conversely, high social support may be a safeguard for women with high BPD features to not turn to drug use during pregnancy. Currently in the literature, little is known about perceived social support among those with BPD who use opioids, and there are no studies measuring these constructs in pregnancy. Given the lack of social support among individuals with BPD and potentially individuals with SUD during pregnancy, it is imperative that we study these associations before a baby is born. In the current study, we expect to find that social support will moderate the relation between BPD features and opioid misuse in that women with high BPD features who report high levels of social support will be less likely to misuse opioids compared to women with high BPD features who also report low social support.

Affective Instability and Perceived Stress

Other theories have attempted to extend Linehan's (1993) model in examining the role that affective instability plays in individuals with BPD. For instance, the DynAffect theory (Kuppens, Oravecz, & Tuerlinckx, 2010) proposes that every individual is characterized by an affective "baseline" despite the presence of psychopathology. Moreover, a person's affect fluctuates based on internal or external experiences over time. This model is congruent with affective instability in individuals with BPD and has been tested in recent literature. Ebner-Priemer et al. (2015) found that individuals diagnosed with BPD when compared to a normative sample had an affective baseline that was more adverse and had an increased level of distress compared to normative comparisons when measured in 24-hour increments. Researchers also found a more intense response to emotional stimuli, an increased variability in mood over time, and longer time period returning to baseline mood. The difficulty that individuals with BPD experience in coping with negative emotions has been established within the literature (Conklin, Bradley, & Westen, 2006; Ebner-Priemer & Sawitzki, 2007; Linehan, 1993). Since it is difficult for individuals with BPD to regulate emotions, pregnancy may be a particularly relevant time to measure perceived stress, given that stress has a substantial impact on emotion regulation and in turn, mothers' stress may also have an impact on the fetus. Studies have found that prenatal stress level, measured by HPA-axis level cortisol, predicts infant negative affect and reactivity at six-months (Davis et al., 2007). Outcomes of childhood BPD symptoms have also been associated with prenatal negative affect in the mother. For instance, Winsper, Wolke, & Lereya (2014) found that stress, prenatal anxiety, and depression at 18 weeks gestation were significantly associated with childhood BPD symptoms at 11 years of age during follow-up. Another study found that mothers who report significant stress during pregnancy have infants

who are more emotionally reactive, and that mothers who report stress are also more likely to be fearful and emotionally reactive to their 6-month-old infant (Nolvi et al., 2016). These findings suggest that prenatal stress may continue on after birth, affecting the development of the baby and the nature of the infant-mother relationship dynamics. While the effect that maternal stress has on infant outcomes have been established in recent literature, the current project will investigate whether maternal borderline features are associated with opioid use as a means to cope with stress. Specifically, in the current study we predict that individuals who have high BPD features and report higher perceived stress will be more likely to misuse opioids compared to those with high BPD features and lower perceived stress. Therefore, perceived stress will act as a moderating variable between BPD features and opioid misuse.

The Current Study

The current study is the first to investigate several questions regarding the associations between BPD features (affective instability, negative relationships, identity disturbance, self-harm/impulsivity, total), hazardous drug use in general, and opioid use in particular in a sample of pregnant women in a High-Risk Pregnancy Clinic. We examined possible moderators that may broaden our understanding of these associations, including social support and perceived stress. Specifically, keeping the biosocial model in mind, it is important to understand these psychological relations given that BPD features likely develop between an interaction of biological and environmental influences. This research highlights the importance of studying opioid addiction and BPD, a time when the etiology of developing BPD may be drastically altered with the proper support and intervention.

In a sample of women with high-risk pregnancies, we made the following hypotheses:

1a. Mothers' borderline features (affective instability, negative relationships, identity disturbance, self-harm/impulsivity) would be positively associated with illicit hazardous drug use (all illegal drugs).

1b. The borderline feature of self-harm would have a stronger association with illicit hazardous drug use than will other borderline features.

2a. Mothers with a clinical cut-off score of BPD ($\geq$38 of total features) would be more likely to be opioid users compared to mothers scoring in the non-clinical range ($\leq$37 of total features). Similarly, mothers' BPD features (affective instability, negative relationships, identity disturbance, self-harm/impulsivity) would be positively associated with opioid use.

2b. The borderline feature of self-harm would have a stronger association with opioid use than will other borderline features.

3a. Mothers with HCV (yes/no) would be more likely to be opioid users (yes/no).

3b. Mothers with a clinical cut-off score of BPD ($\geq$38 of total features) would be more likely to have an HCV diagnosis compared to mothers scoring in the non-clinical range ($\leq$37 of total features).

3c. The borderline feature of self-harm would have a stronger association with HCV diagnosis than other borderline features.

4. Social support would moderate the relation between total borderline features and opioid use such that individuals with low levels of social support in the context of borderline features would be more likely to misuse opioids.

5. Perceived stress would moderate the relation between total borderline features and opioid use such that mothers with high levels of perceived stress in the context of borderline features would be more likely to misuse opioids.

Procedures

High Risk Pregnancy Appointment. Women who were pregnant and a patient in the High-Risk Pregnancy Clinic and who were in their second trimester of pregnancy or beyond were eligible to participate. Women were referred to the High-Risk Pregnancy Clinic for a variety of reasons including having multiple gestations, being over the age of 35, having had several miscarriages, or reporting abusing substances. Upon arriving at their appointment, the receptionist asked the potential participant if she was interested in participating in a study on high-risk pregnancy conducted in collaboration with the Psychology Department at University of Tennessee. She was told that the survey takes about 30 minutes, that questions involve topics including life history, mood, drug use, and coping skills, and that she will be given a $25.00 gift card for her participation. If the potential participant showed interest in participating, a nurse brought her to a private examination room to learn more about the study from a research assistant either prior to or after her appointment with her OBGYN. While in the examination room the research assistant explained more about the study. If the mother agreed to participate, the research assistant reviewed the IRB approved consent form with the participant. The participant had the option to list her phone number if she would like to be considered for future research studies. Once the participant signed the consent form, she was given the survey packet. Once the survey packet was complete, the participant was given a $25.00 gift card to WalMart from the research assistant. Participants were escorted to and from the waiting room if their OBGYN was not ready to see them at the completion of the study.

Participants

Participants were patients who had at least one appointment to confirm their pregnancy in the High-Risk Pregnancy Clinic at University of Tennessee Medical Center. Participants were at least 18 years of age or older. Fifty-five participants were opioid users, ($n = 38$) were non-opioid users, and ($n = 6$) were other drug users.

Measures

Demographics. Patients in the High-Risk Clinic filled out a set of demographic questions upon their initial appointment with their doctor. Upon attending their first medical appointment, patients provided information regarding current relationship status, past medical and psychological diagnosis, pregnancy history, and current and past drug use history. Patients were asked to indicate their age, gender, race, ethnicity, and income. There were no significant demographic differences between opioid users (non-prescribed and prescribed) and non-opioid users. Individuals who used other drugs (e.g. marijuana) but not opioids were left out of analysis specific to opioid use in the current study. See Table 1.

Borderline Features. The Personality Assessment Inventory- Borderline Features Scale (PAI-BOR) is a self-report measure (Morey, 1991) of borderline features that contain subscales that measure constructs that are present in a BPD diagnosis. This scale measures four features of BPD including *affective instability* (assessing mood swings and difficulty controlling anger, e.g. "I have little control over my anger"), *identity problems* (assessing identity instability and lack of sense of self, e.g. "My attitude about myself changes a lot"), *negative relationships* (assessing a history of intense and unstable relationships, e.g., "People once close to me have let me down"), and *self-harm* (assessing impulsivity in potentially harmful areas including risky sexual behavior, self-injury, or suicide behaviors). Sample items for self-harm include "I am too

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impulsive for my own good" and "I spend money too easily." This measure does not provide a

clinical diagnosis of BPD, however, it does show high convergent validity with BPD diagnosis

from structured interviews (Kurtz & Morey, 2001) and has been used frequently to assess

borderline features in young adults diagnosed with the disorder (Trull, 1995) showing good test-

retest reliability ($r = .90$) in a community sample of young adults. Furthermore, the PAI-BOR and

the DSM-IV criteria for BPD are significantly related, with adequate reliability and validity (Stein,

Pinsker-Aspen, & Hilsenroth, 2007). In the current study we used the total borderline features

score in addition to scores of all four individual features. This scale had a high level of internal

consistency in the current study as determined by Cronbach's alpha: affective instability $\alpha = .81$,

identity disturbance $\alpha = .76$, negative relationships $\alpha = .79$, self-harm/impulsivity $\alpha = .79$, total α

$= .78$.

Clinical Cut-Off BPD features. In addition to borderline features, we also created a

categorical variable to assess clinical cut-offs for BPD. Trull (1995) found in a validated study of

college students that students scoring ≥ 38 on the total borderline features scale also met criteria

for a clinical diagnosis of BPD, measured by meeting diagnostic criteria for BPD in the Diagnostic

Statistical Manual III-R (DSM-III-R). Therefore, some analyses utilized this categorical variable.

Drug Use. Drug use was measured in two ways: with data taken from medical records

and with a self-report measure.

Medical Records. Urine tests indicated the presence or absence of specified drugs in the

body. We differentiated between those women who were prescribed narcotics used to treat

opioid addiction by curbing the craving (e.g., methadone, suboxone, buprenorphine). We were

also able to determine which women were in an opioid withdrawal program, a program designed

to wean them off of prescribed opioids before they gave birth. Each participant had at least one

urine sample prior to participating in the study. Depending on their gestation, some participants had several urine samples, while others only had one doctor's appointment prior to participating in the study. For the purposes of the present study, we measured opioid use as defined by at least one positive urine sample produced in the past 30-days. Urine analysis were sent to LabCorp specialty labs for analyzing. All other drug use (e.g. marijuana, cocaine, stimulants, alcohol) were assessed from medical data for every appointment within the 30-days prior to participating in the current study.

Opioid Use Severity Groups. Participants were assigned to one of the four scores on a continuous variable based on opioid use severity. *Non-users.* Women were assigned as a "0" for being a *non-user* if they had not produced a positive urine sample for any drug (opioid or other drugs) in any of the doctors' appointments for 30 days prior to participating in the study and if no opioids had been prescribed. *Opioid withdrawal*. Women will be assigned a "1" for being in *opioid withdrawal* if they produce clean urine samples within 30 days prior to participating in the current study *and* had previously been prescribed buprenorphine, methadone, or suboxone for opioid withdrawal during pregnancy by their OBGYN. *Prescribed opioid use.* Women who produced a positive urine sample within 30 days prior to participating in the study and who were prescribed buprenorphine, methadone, or suboxone by their OBGYN in the High-Risk Pregnancy Clinic *and* who also showed no trace of other drugs in their urine were assigned a "2" for their *prescribed opioid use*. *Non-prescribed opioid misuse*. Non-prescribed opioid users were defined as individuals who produce a positive urine sample and who were not medically prescribed opioid narcotics by their OBGYN (buprenorphine, methadone, suboxone) OR who were prescribed opioids (buprenorphine, methadone, suboxone) but also produced a urine sample with traces of other opiates and other drugs (including non-prescribed opioids such as heroin,

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morphine as well as marijuana, cocaine, alcohol, etc.) within 30 days prior to participating in the study. These individuals were assigned a "3" for *non-prescribed opioid misuse*. This variable is not an equal ratio scale, and therefore when using logistic regression we treated this variable as a nominal variable to test opioid use severity group differences.

Opioid Use (yes/no). Given the nature of some of our statistical analysis, we also created a categorical variable of opioid users and non-opioid users. Individuals were given a "0" if their urine samples did not produce a positive screening for opioids (prescribed and non-prescribed) 30 days prior to participating in the study. Individuals whose urine tested positive for opioid use (both prescribed and non-prescribed) 30-days prior to participation were assigned a "1". In the current sample overall, 38.4% ($n = 38$) of individuals were classified as "opioid non-users" and 55.6% ($n = 55$) of individuals were classified as "opioid users" (prescribed and non-prescribed) for this categorical variable.

In the present study, 45.5% ($n = 48$) of individuals testing positive for prescribed opiates, 16.2% ($n = 16$) of women tested positive for non-prescribed opiates, 23.2% ($n = 23$) of individuals tested positive for marijuana, 9.1% ($n = 9$) tested positive for alcohol, 3% ($n = 3$) tested positive for cocaine, and 4% ($n = 4$) tested positive for other drugs (e.g. bath salts) as indicated by urine samples 30-days prior to participation. Forty-four percent ($n = 44$) of our sample were also cigarette smokers.

Illicit Hazardous Drug Use. Illicit hazardous drug use by mothers over the past six months was assessed using the Drug Use Disorders Identification Test (DUDIT; Berman, Bergman, Palmstierna, & Schlyter, 2004; Stuart, Moore, Ramsey, & Kahler, 2003). The DUDIT is a 14-item questionnaire. It assesses the frequency and intensity of drug use, determining if any of the symptoms reported may be consistent with tolerance or dependence. Seven different

classes of drugs are examined (cannabis, cocaine, hallucinogens, stimulants, sedatives/hypnotics/anxiolytics, opioids, steroids, inhalants) and overall drug dependence is assessed. The DUDIT has demonstrated good reliability and validity (Stuart et al., 2008; Stuart, Moore, Ramsey, & Kahler, 2004) and items are scored on a Likert type scale ranging from 0-6 for the drug use questions and from 0-3 for the dependence questions. Total scores on the DUDIT range from 0-56 and individuals who produce a total score of 8 or higher on the DUDIT are considered engaging in hazardous drug use (Stuart et al., 2008).

Self-Reported Non-Prescribed Opioid Misuse. The DUDIT includes a self-report question asking about non-prescribed opioid misuse within the past 6-months. The question reads, "*About how often do you use opiates that were not prescribed for you by a doctor (for example, heroin, morphine, Oxycontin, Hydrocodone, opium, Methadone, codeine, Demerol, Darvon, Percodan, Dilaudid, or other)?*" and is measured on a 0-6 Likert-type scale. We utilized this variable to test women's self-reported non-prescribed opioid misuse 6-months prior to participation in the current study.

Hepatitis-C Virus. (HCV) was assessed utilizing medical records. HCV was determined as a categorical (yes/no) variable, indicating whether blood samples indicated positive or negative presence of the virus. In the current sample 47% of our participants were diagnosed with HCV, with 81% of opioid users diagnosed with the virus.

Gestation. Gestation was measured by weeks of pregnancy as indicated in the participants medical files. This was measured by how many weeks between day of conception and the day the mother participated in the study. In the current study all analyses were first tested while controlling for gestation. Controlling for this variable did not alter any of our findings, and therefore we omitted this covariate from our analyses.

Social Support. Social support was measured with nonsupport subscale of the PAI (PAI; Morey, 1991). This subscale measures a perceived lack of social support and isolation, indicating both the quality and the availability of social support that the respondent experiences. The PAI-Non-Support scale was normed on a variety of adults in various settings, and the Non-Support subscale demonstrates good internal consistently (.88-1.0) and reliability (Morey, 2007) in both normative and clinical populations. There are 8 items that comprise the non-support (e.g. perception and quality of social support) for the PAI. Items are assessed on a Likert scale ranging from "not true at all" to "very true." Total scores on the Non-Support scale range from 0 to 28 and positively stated items are reversed scored. Higher scores indicate a perception of the social environment as *unsupportive* among respondent's social relationships with friends, acquaintances, family, and romantic partners. Sample items include "My friends are available if I need them"; "I spend most of my time alone"; "People I know care about me"; "In my family, we argue more than we talk." Specifically, total scores between 9-12 are indicative of persons with few supportive relationships or is dissatisfied with these relationships. Total scores of 13 or above are indicative of social relationships that offer little support and friends and family may seem unavailable or unhelpful. For the current study, we created a continuous variable of lack of social support for our interaction term and centered this term to the mean. In the current sample, ($M = 7.16\ SD = 6.00$).

Perceived Stress. The Perceived Stress Scale (PSS; Cohen, Kamarck, & Mermelstein, 1983) The PSS is a 10-item self-report measure that is widely used in psychological literature to measure individuals perceived level of stress, including how unpredictable, uncontrollable, and overloaded a person perceives their level of stress. Respondents answer the items on a 5-point Likert scale and range from 'never' to 'very often'. Positively worded items are reversed scored,

and scores range from 0 to 40, with higher scores indicating higher levels of perceived stress. We created a continuous variable and centered this variable to the mean when testing it within the interaction. In the current sample, ($M = 22.62$, $SD = 4.96$).

CHAPTER THREE
RESULTS

Hypothesis 1a: Mothers' borderline features and illicit hazardous drug use.

To test hypothesis 1a, that mothers' borderline features (affective instability, negative relationships, identity disturbance, self-harm/impulsivity) would be positively associated with all *illicit hazardous drug use*, Bivariate correlations were used. The analysis results support the hypothesis: All borderline features (affective instability, negative relationships, identity disturbance, self-harm/impulsivity) were significantly associated with illicit hazardous drug use, indicating that individuals scoring high on these features reported engaging in illicit drug use 6-months prior to participation. See Table 3.

Hypothesis 1b: self-harm/impulsivity and illicit hazardous drug use.

To test hypothesis 1b, that self-harm/impulsivity would be significantly more associated with illicit hazardous drug use compared to other borderline features, the effect of each borderline feature utilizing linear regression were compared. A scatterplot of borderline features (affective instability, negative relationships, identity disturbance, self-harm/impulsivity) against total illicit hazardous drug use was plotted. Visual inspection of the scatterplot indicated a linear relationship between the variables ($R = .40$) in the model. All participants were included in the analysis ($N = 99$). The overall model was significant $F(4, 94) = 7.19$, $p < .01$, with self-harm/impulsivity ($\beta = .40$, $p < .001$) significantly more associated with illicit hazardous drug use compared to other borderline features. This supports our hypothesis and indicates that women who report engaging in impulsive self-harm behaviors are more likely to have reported using illicit drugs six-months prior to participation compared to other borderline features (affective instability, negative relationships, identity disturbance). See Table 4.

Hypothesis 2a: Mothers' borderline features and opioid use.

To test hypothesis 2a, whether a clinical cut-off of BPD features (e.g. total score ≥38; yes/no) as well as borderline features (affective instability, negative relationships, identity disturbance, self-harm/impulsivity) were positively associated with opioid use, we utilized different methods to measure opioid use, including (1) a categorical variable of *opioid use (yes/no)*. Individuals considered to be opioid users in this variable produced positive urine analyses for both prescribed and non-prescribed opioids 30-days prior to participation. (2) the continuous variable of *opioid use severity* as indicated by the urine analysis 30-days prior to participation. Individuals were classified by opioid use severity using our continuous variable of opioid use (e.g. severity rating 0-3 of opioid use). (3) *self-reported non-prescribed opioid use* 6-months prior to participation. Individuals self-reported how often they engaged in non-prescribed opioid misuse (e.g. daily, weekly, monthly) 6-months prior to participation.

(1) To test whether women with a clinical cut-off score of borderline features (e.g. total score ≥38; yes/no) would be more likely to be opioid users (yes/no), a chi-square analysis was utilized. Six individuals were omitted from the analysis because these individuals tested positive for significant drug use, but not opioid use, leaving our sample $N = 93$. The hypothesis was supported: There was a statistically significant association between opioid use and BPD, $\chi^2 = 8.92$, $p < .05$ such that individuals with a total feature score of ≥38 were more likely to be opioid users (prescribed and non-prescribed) compared to individuals with a total borderline feature score of ≤37. See Table 5.

(2) Bivariate correlations were utilized to test whether mothers' BPD features (affective instability, negative relationships, identity disturbance, self-harm/impulsivity) would be positively associated with *opioid use severity* according to urine analysis in medical records for

30-days prior to participation. In this analysis we also omitted $n = 6$ of our participants who tested positive for using other illicit drugs, but not opioids, leaving us with a total sample of $N = 93$. *Hypothesis 2a* was partially supported when using our opioid use severity urine analysis variable: Identity disturbance, negative relationships and self-harm/impulsivity were all positively correlated with urine analysis of opioid use, however affective instability was not. See Table 2 for correlations.

(3) We tested whether borderline features (affective instability, negative relationships, identity disturbance, self-harm/impulsivity) would be positively associated with *self-reported non-prescribed opioid misuse* in the past 6 months using bivariate correlations. In this analysis we also omitted $n = 6$ of our participants who tested positive for using other illicit drugs, but not opioids, leaving us with a total sample of $N = 93$. Our hypothesis was partially supported, with negative relationships, identity disturbance, and self-harm/impulsivity positively related to self-reported opioid misuse. Affective instability was not significant. See Table 2 for correlations.

Hypothesis 2b: self-harm/impulsivity and opioid use.

In hypothesis 2b, we predicted that the borderline features of self-harm/impulsivity would be significantly more associated with opioid use compared to all other borderline features. We utilized two continuous variables of opioid use: (1) *opioid use severity* urine analysis 30-days prior to participation. Individuals were classified by opioid use using our continuous variable of opioid use severity (e.g. severity rating 0-3 of opioid use). (2) *self-reported non-prescribed opioid use* 6-months prior to participation. Individuals self-reported how often they engaged in non-prescribed opioid misuse (e.g. daily, weekly, monthly) 6-months prior to participation.

(1) The first part of the analysis was run using linear regression with opioid severity urine analysis 30-days prior to study participation as our dependent variable and borderline

features (affective instability, negative relationships, identity disturbance, self-harm/impulsivity) as our independent variables. Individuals who tested positive for other drug use but no opioid use were excluded from the analysis ($n = 6$). Collinearity tests were within the acceptable range, with Tolerance ranging from .442 to .656. The overall model was statistically significant $F(4, 88) = 5.02$, $p < .01$, adj. $R^2 = .15$ with negative relationships ($\beta = .50$, $p < .01$) and self-harm ($\beta = .40$, $p < .05$) associated with urine analysis opioid use severity above and beyond other borderline features. This partially supported the hypothesis, such that both self-harm and negative relationships had a significant association with opioid use severity urine analysis compared to other features (affective instability, identity disturbance). However, contrary to what we predicted, negative relationships were more strongly associated with opioid use severity as measured by urine analysis 30-days prior to participation compared to self-harm. See Table 6.

We also tested this analysis with multinomial logistic regression because the continuous variable of opioid use severity was not a perfect ratio scale. Borderline features of affective instability, identity disturbance, negative relationships, and self-harm/impulsivity were the independent variables. *Opioid use severity* was the dependent variable. Results from these analyses were consistent with results from the linear regression: The overall model was significant $\chi^2(2,88) = 26.51$, $p < .001$, *pseudo R^2* Nagelkerke = .27, with borderline features of negative relationship ($\chi^2 = 8.80$, $p < .05$) and self-harm/impulsivity ($\chi^2 = 8.25$, $p < .05$) significantly associated with opioid use severity.

(2) We then tested whether the borderline feature of self-harm/impulsivity would have a greater association with *self-reported non-prescribed opioid misuse* 6-months prior to participation using linear regression. Again, individuals who tested positive for other drug use, but not opioid use, were excluded from the analysis ($n = 6$). *Self-reported non-prescribed opioid*

misuse was our dependent variable and borderline features (affective instability, negative relationships, identity disturbance, self-harm/impulsivity) were tested as the independent variables. The overall model was significant $F(5, 92) = 3.71$, $p < .01$, adj. $R^2 = .10$, with self-harm ($\beta = .31$, $p < .05$) significantly associated with more severe self-reported non-prescribed opioid misuse compared to other borderline features. Using *self-reported non-prescribed opioid misuse* as the dependent variable fully supported *hypothesis 2b,* that self-harm/impulsivity would have a significant association with opioid use. See Table 7.

Hypothesis 3a: opioid use and HCV diagnosis.

For hypothesis 3a, it was predicted that women who were opioid users (yes/no) were more likely to be diagnosed with HCV. Chi-square test of independence was used to test this hypothesis. Excluding individuals who tested positive for other drug use but not opioid use ($n = 6$), our hypothesis that women who were diagnosed with HCV would also be an opioid user was supported $\chi^2 = 58.59$, $p < .001$. See Table 8.

Hypothesis 3b: mothers' borderline features and HCV diagnosis.

In hypothesis 3b it was predicted that women with a clinical cutoff score ≥38 for total borderline features would be more likely to be diagnosed with HCV. We used a chi-square test of independence to test this hypothesis. There was no statistically significant association between HCV diagnosis and clinical cut-off score of BPD, $\chi^2 = 2.04$, $p > .05$, which did not support our hypothesis that women with a clinical cut-off score of BPD would be more likely to have an HCV diagnosis. See Table 9.

Hypothesis 3c: self-harm/impulsivity and HCV diagnosis.

To test hypothesis 3c, whether mothers' BPD features (affective instability, negative relationships, identity disturbance, self-harm/impulsivity) would be positively associated with HCV diagnosis, binomial logistic regression was used. Independent variables included borderline features (affective instability, negative relationships, identity disturbance, self-harm/impulsivity). Our dependent variable was HCV diagnosis (yes/no). All individuals were included in the analysis ($N = 99$). The overall model was statistically significant, $\chi^2(4) = 11.747$, $p < .05$. The model explained 14.9% (Nagelkerke R^2) of the variance in HCV diagnosis and correctly classified 66.7% of cases. Of the four predictor variables, only *negative relationships* were statistically significant: Individuals who scored high on negative relationships had 1.235 times higher odds to be diagnosed with HCV than individuals with high scores on borderline features of affective instability, identity disturbance, and self-harm/impulsivity. This partially supported our hypothesis: negative relationships were significantly associated with HCV diagnosis. Our hypothesis that self-harm would have a stronger associated with HCV diagnosis comparted to other borderline features was not supported. See Table 10.

Hypothesis 4: lack of social support, borderline features, and opioid use.

For hypothesis 4, it was predicted that lack of social support would moderate the relation between borderline features and opioid use. To test these hypotheses, we used two separate dependent variables in separate hierarchical linear regression analyses: (1) *opioid use severity* urine analysis 30-days prior to participation and (2) *self-reported non-prescribed opioid misuse* 6-months prior to participation. We did not use our categorical variable of *opioid use (yes/no)* in this analysis in order to preserve statistical power in the analysis.

(1) We conducted a hierarchical multiple linear regression to assess whether lack of social support (PAI-Non-Support) moderated the relation between total borderline features and *opioid use severity* urine analysis. For our first analysis, we used our *opioid use severity* urine analysis from 30-day prior to participation as our outcome variable, excluding individuals who tested positive for other drug use, but not opioid use ($n = 6$). For the first step of the regression, we entered both of our centered independent variable of total borderline features score and lack of social support. On the second step, we entered our interaction term (total borderline features * lack of social support). There was a main effect of total borderline features ($B = .43$, $t = 3.36$) such that for every 1 unit increase in opioid use, there is an increase in total borderline features score. The interaction term of borderline features*lack of social support was not significant and there was no main effect of social support on opioid use. Overall, our hypothesis was only partially supported for the outcome variable of *opioid use severity* urine analysis 30-days prior to participation: There was only a significant main effect of borderline features on *opioid use severity*. There was no main effect of lack of social support and our interaction term was not significant. See Table 11.

(2) For the second analysis, we used *self-reported non-prescribed opioid misuse* during past 6 months as our outcome variable. We excluded individuals who tested positive for other drug use but no opioid use from our analysis ($n = 6$). Steps in the hierarchical linear regression were consistent with first analysis. There were no significant main effects for lack of social support or for total borderline features. There was no significant interaction between lack of social support and total borderline features on self-reported non-prescribed opioid misuse. Overall, with self-reported non-prescribed opioid use as our dependent variable, our hypothesis was not supported. See Table 12.

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Hypothesis 5: Perceived stress, borderline features, hazardous drug and opioid use.

For the fifth hypothesis, we predicted that perceived stress would moderate the relation between borderline features and opioid use. To test these hypotheses, we used two separate dependent variables in separate hierarchical linear regression analyses: (1) *opioid use severity* urine analysis 30-days prior to participation and (2) *self-reported non-prescribed opioid misuse* 6-months prior to participation.

(1) For the first analysis, we used *opioid use severity* from 30-day urine analysis as our outcome variable, excluding individuals who tested positive for other drug use but no opioid use from our analysis ($n = 6$). The independent variables were total borderline features score and perceived stress which were both centered to the mean. For the first step of the regression we entered both of our centered independent variable of total borderline features score and perceived stress. On the second step, we entered our interaction term, total borderline features * perceived stress. The hypothesis was partially supported: There was a significant main effect for total borderline score $B = .03$, $t(88) = 2.79$, $p < .05$, such that for every 1 unit increase in opioid use, there is an increase in total borderline features score. Contrary to our hypothesis, there was no significant main effect for perceived stress. There was a statistically significant moderator effect of perceived stress, $F(1, 89) = 5.66$, $p < .05$, adj. $R^2 = .05$. The addition of the interaction term explained an additional 4.40% of the total variance. See Table 13 and Figure 1.

To clarify the meaning of the significant interaction, analysis of simple slopes was calculated to determine the direction of the interaction. For individuals with levels perceived stress 1 standard deviation below the mean ($M = 17.65$, $SD = 4.96$), with every 1 unit increase of total borderline features there was a 5% increase of opioid use, $B = .05$, $t(88) = 3.45$, $p < .001$. For individuals with average levels perceived stress ($M = 22.61$, $SD = 4.96$), with every 1 unit

increase of borderline features there was a 3% increase opioid misuse $B = .03$, $t(88) = 2.83$, $p < .05$. For individuals with high levels of perceived stress ($M = 27.57$, $SD = 4.96$), there was no relationship between borderline features and opioid misuse $B = .01$, $t(88) = .95$, $p > .05$.

We utilized the Johnson-Neyman significance method to further understand the moderating effect of perceived stress. This method allowed us to examine exactly which intervals perceived stress and borderline features became significant. When levels of perceived stress are at a total score of 18, borderline features have the greatest effect on opioid use $t(88) = 3.45$, $p < .001$, $B = .05$. When total score of perceived stress reach 24, the relationship between borderline features and opioid use no longer exist $t(88) = 1.81$, $p > .05$, $B = .02$. Overall, for low to medium levels of perceived stress, the greater the impact high levels of borderline features have on opioid misuse. For high levels of perceived stress, the less of an effect borderline features have on opioid misuse. While this interaction was significant, it was not exactly what we predicted in our hypothesis, that individuals who had higher levels of total borderline features would also have higher levels of perceived stress and opioid use. Therefore, our hypothesis was partially supported. See Table 9 and Figure 1.

(2) For the second analysis, *self-report non-prescribed opioid misuse* during the past 6 months was our outcome variable. Individuals who tested positive for other drug use, but not opioid use, were excluded from the analysis ($N = 93$). Steps in the regression were consistent with first analysis. Our hypothesis was only partially supported: There was a main effect of total borderline features $B = .38$, $t(88) = 2.50$ $p < .05$, such that higher borderline features was significantly associated with self-reported non-prescribed opioid misuse. Our hypothesis that a main effect of perceived stress and an interaction between borderline features and perceived

stress would be significantly associated with self-reported non-prescribed opioid use was not

supported. See Table 14.

CHAPTER FOUR
DISCUSSION

To our knowledge this was the first study that examined the role of BPD features and opioid use in a sample of pregnant women. We examined the role that borderline features of (affective instability, identity disturbance, negative relationships, self-harm/impulsivity) were related to opioid use, all illicit hazardous drug use, and HCV diagnosis. We also examined the moderating roles of lack of social support and perceived stressed on opioid use and illicit hazardous drug use in pregnant women with varying severities of borderline features. Opioid misuse was measured both by self-report and urine sample analysis.

Borderline Features and Opioid Use

Overall, we found significant associations between borderline features and opioid use as indicated on urine analysis samples, self-reported non-prescribed opioid misuse, and self-reported illicit hazardous drug use. Individuals who scored ≥38 on the PAI-BOR were more likely to be opioid users compared to individuals who scored ≤37. Indeed, individuals who score ≥38 on the PAI-BOR are likely to have a BPD clinical diagnosis (Trull, 1995) indicating that BPD may be a significant risk factor for opioid misuse, especially during pregnancy. We also found significant associations between borderline features and opioid use, particularly the features of negative relationships and self-harm/impulsivity. Specifically, there were differences among our outcome variables of *self-reported illicit hazardous drug use*, *self-reported non-prescribed opioid-misuse*, and urine analysis of *opioid use severity*. Self-harm/impulsivity were associated with self-report of all illicit hazardous drug use and self-reported non-prescribed opioid misuse within 6-month of participation. Within the 30-day urine analysis of *opioid use severity*, self-harm/impulsivity *and* negative relationships were positively associated with opioid

use severity, such that these features were related to more severe opioid use (e.g. prescribed and non-prescribed) compared to borderline features of affective instability and identity disturbance. The difference in timeline between self-report (6-months prior to participation) and urine analysis (30-days prior to participation) may have contributed to the outcome of these analyses. For instance, the mothers in our sample had a mean gestation of ($M = 27.60$, $SD = 7.80$) indicating that women were, on average, at the very beginning of their third trimester when participating in the study. Studies have found a significant increase in illicit drug use and opioid use during the second and third trimester, but not in the first trimester (Smith, Costello, & Yonkers, 2015) indicating that illicit drug use and opioid use is perhaps more salient later in pregnancy. Furthermore, this may have impacted our findings that negative relationships were more strongly associated with *opioid use severity* as indicated by urine samples 30-days prior to participation compared to our 6-month self-reported measure of non-prescribed opioid misuse, where women may have been very early in their pregnancy, or not pregnant at all.

Nonetheless, these findings are important given the aim of the current study. The results indicate that BPD plays an important role in whether or not a woman may engage in illicit hazardous drug use, specifically opioid misuse, during pregnancy. Studies have indicated that mood and anxiety disorders are prevalent among pregnant women in opioid maintenance clinics during pregnancy (Benningfield et al., 2010; Smith et al., 2015).While it is important to continue to screen for mood and anxiety disorders, screening for BPD might be particularly important in identifying mothers who may need intervention and support for opioid maintenance during pregnancy. Personality pathology demonstrates a consistent dynamic in how a person relates to others and the environment over time (Morey, 2017). From a developmental perspective, personality can be understood as a dynamic construct in that it is the combination of historical,

biological, and social developments constantly interacting from birth to death (Fonagy, Luyten, & Allison, 2015). Therefore, the results demonstrate that it is important to include in personality pathology screening procedures in opioid maintenance high-risk pregnancy clinics. Research has found that pregnant women with depression who are receiving prenatal care in opioid maintenance clinics are significantly less adherent to prenatal care, are at an increased risk of having a baby with NOWS, and have longer hospital stays after birth (Hensley, Sulo, Kozmic, & Parilla, 2018). Given the findings, it is important that BPD screening become included in Standard Care in OBYGN opioid maintenance clinics, as our results indicate that women with clinical levels of BPD features are significantly more likely to misuse opioids.

Additionally, the results reveal that borderline features of negative relationships and self-harm/impulsivity are strongly associated with opioid misuse above and beyond affective instability and identity disturbance, making these constructs particularly important to consider among opioid-using pregnant women. Indeed, women who have BPD are already at risk for having negative birth outcomes even without the presence of substances (Blankley et al., 2015; De Genna et al., 2012; Pare-Miron et al., 2016). Retrospective reports of pregnant women with BPD have found that suicidality and difficulty in romantic relationships are strong predictors of negative birth outcomes including low APGAR scores, low birth weight, prematurity, and referrals to special care nursery's compared to healthy controls (Blankley et al., 2015). Moreover, pregnant women who misuse opioids are at more risk for cardiac arrest, intrauterine growth restriction, placental abruption, preterm labor, transfusion, stillbirth, and premature rupture of membranes (Maeda, Bateman, Clancy, Creanga, & Leffert, 2014). If women with BPD are also more likely to engage in opioid misuse and overall hazardous illicit drug use, it is important that personality constructs are taken into consideration in treating pregnant women in

opioid maintenance clinics, as BPD and Opioid Use Disorder combined may have a significant effect on the health outcomes of the mother and the baby.

Hepatitis-C, Borderline Features, and Opioid Use

We also examined the relation between borderline features and HCV diagnosis. Contrary to our hypothesis, individuals who had a clinical cut-off score of total borderline features were *not* more likely to have an HCV diagnosis. The hypothesis that individuals diagnosed with HCV were more likely to be opioid users compared to individuals who did not have an HCV diagnosis was supported, however, and is consistent with the literature (Hallinan et al., 2005; Krans et al., 2016; Page, Leeman, Bishop, Cano, & Bakhireva, 2017). Although women with a clinical cut-off score of BPD were not more likely to have HCV, we found strong associations between HCV diagnosis and borderline features of negative relationships, such that higher scores on negative relationships were positively associated with HCV diagnosis. While we cannot infer causation, the relation between negative relationships and HCV is strongly related. Indeed, contracting HCV within the context of a romantic relationship can impact a relationship negatively. Likewise, negative relationships can manifest in several ways, including risky sexual behavior, multiple partners, illicit drug use etc. HCV could then be contracted as a result of engaging in these types of risky behaviors. Moreover, women who have SUD and BPD when compared to men are in fact more sexually impulsive (Erez et al., 2014) indicating that this may also be a risk factor for negative relationships and HCV.

In a study examining pregnant women's' knowledge of HCV, half of the sample who tested positive for HCV discovered their diagnosis during prenatal blood test screenings (Krans, et al., 2018). This study found significant disproportions regarding accurate knowledge of HCV, including the majority of the sample inaccurately believing that there was a vaccine to prevent

HCV infection. This information is important not only because of the risk factor that HCV can pose on the fetus, but also because of the risk this diagnosis has on impacting particularly women in romantic relationships. The limited (and perhaps mixed) knowledge about HCV, coupled with the potential for finding out a diagnosis during pregnancy may significantly and negatively impact a romantic relationship. Moreover, given that women with co-morbid BPD and SUD are more likely to experience unplanned pregnancy (De Genna et al., 2012) the stress of unplanned pregnancy while simultaneously learning about an HCV diagnosis could be detrimental, or at best stressful, to a romantic partnership.

Perceived Stress, Borderline Features, and Opioid Use

We predicted that perceived stress would moderate the relation between borderline features and opioid misuse, such that individuals who had high borderline features would be more likely to misuse opioids when levels of perceived stress were high. The results indicated that the higher the borderline features, the less of an effect perceived stress had on opioid use severity as indicated by the urine analysis 30-days prior to participation. Conversely, when individuals reported higher levels of perceived stress, the less of an effect borderline features had on opioid use severity. These results were significant only within opioid use severity urine analysis 30-days prior to participation as our dependent variable. Perhaps the 6-month period of when self-reported non-prescribed opioid misuse was assessed had an effect on the results. Moreover, the recency of positive drug screens (30 days) may have had a greater effect on perceived stress compared to self-reported non-prescribed opioid misuse, which asked women about overall non-prescribed opioid misuse 6-months prior to participation.

The findings may shed light on other studies which have found that women with BPD report significantly more psychosocial stressors during pregnancy compared to healthy controls

(Schwarze et al., 2013; Winsper et al., 2014). Perhaps for individuals with high BPD features, the association for misusing opioids has more to do with characteristics of the disorder and less to do with perceived stress. Conversely, high levels of perceived stress may be associated with opioid use severity above and beyond BPD features when significant levels of perceived stress are experienced by the expecting mother. Implicated in these findings are again the importance of screening procedures in obstetrical opioid maintenance clinics. Maternal stress measured by HPA-axis cortisol levels may negatively impact infant emotional development at six-months (Davis et al., 2007) and throughout childhood and adolescence (Glynn et al., 2018). Given that opioid misuse may occur at an increased rate among individuals experiencing significant amounts of perceived stress, it is tremendously important that perceived stress is screened during prenatal care in obstetrical opioid maintenance clinics. Future studies should examine specifically how stress may manifest in pregnant mothers diagnosed with BPD as well as women who misuse opioids during pregnancy.

Given the moderating role of perceived stress in the current study, it is important to determine when and how women specifically first begin to use opioids. Indeed, other explanations pertaining to opioid misuse for non-physical pain related purposes has been established. In a longitudinal study among individuals in a residential substance use treatment program, Bohnert et al. (2013) found that nonmedical use of opioids for reasons *other* than physical pain respite were significantly more common for certain demographics, compared to individuals who reported using opioids for physical pain relief only. Within the study, nonmedical use of opioids for reasons other than relief of physical pain was defined as use for help with sleeping, use for improved mood, and *relief of stress*. This study also found that nonmedical use of opioids *not* associated with physical pain relief was significantly associated

with overdose, previous heroin and other sedative use, and greater depressive symptoms. When compared to men and individuals of minority ethnic and racial background, White women of child-bearing age ($M = 33.7$, $SD = 10.3$) were more likely to engage in nonmedical opioid misuse for reasons other than physical pain (e.g. stress relieve). The limbic system which controls emotions and feelings of pleasure, feelings of relaxation, and contentment is richly endowed with opioid receptors (Reyes, Kravets, Connelly, Unterwald, & Van Bockstaele, 2017). Related to women in the present study, it may be that levels of perceived stress for pregnant women in high-risk pregnancy clinics differ across individuals who are currently taking opioids, both prescribed and non-prescribed. Moreover, women in our sample could potentially be using opioids to manage non-physical pain, e.g. emotional pain, such as perceived stress. Future research should examine how opioids may affect perception of stress and whether the effect of opioids alleviates high levels of stress particularly during pregnancy.

Social Support, Borderline Features, and Opioid Use

The hypothesis that lack of social support would moderate the relation between BPD and opioid use was not supported. This was contrary to previous literature indicating that individuals with BPD report low levels of social support and high levels of psychosocial stress (Schwarze et al., 2013). Previous studies examining social relationships within the context of BPD used both quantitative and qualitative methods for social support. For instance, Beeney et al. (2016) utilized structured clinical interview and self-report measures *per each important relationship* that each participant reported. In the current study, we utilized the PAI-Non-Support scale, which captures generally both the perception of *presence* and *quality* of lack of social support. While this scale has been validated empirically (Morey, 2007) it may be that the metrics we

utilized did not capture the diverse and complex nature of relationships, particularly within the context of BPD.

Moreover, future studies should focus on the *quality* of relationships in pregnant women within the context of BPD and opioid misuse. Given the borderline features of negative relationships were strongly associated with opioid use in our study, it may be specifically the *quality* of relationships is more strongly associated with opioid misuse, regardless of whether or not social support is present or available. Furthermore, recent studies have aimed to classify the complex nature of romantic, familial, and social relationships among individuals with BPD, with the particular aim of delineating between subjective (perception of social support resources) and objective (social network size and composition) social support (Clifton et al., 2007; Lazarus & Cheavens, 2017; Lazarus et al., 2016). Metrics utilized in these studies aimed to decipher between different types of relationships. For instance, The Social Network Assessment (Lazarus et al., 2016) was created and validated in order to better understand social relationships in individuals with BPD. This measure requires each participant to answers several questions, both quantitative and qualitative, per important relationship reported. Individuals are asked to rate friends, family, and romantic partner relationships with regard to closeness, support, criticism, conflict with, and satisfaction. Raters also indicate duration of relationship, and any significant changes in the relationship within the past month. It may be that our metric for measuring social support did not capture the intricacies of all relationships among our sample. Moreover, it may also be that lack of social support does not act as a moderator between borderline features and opioid use. Given the study's sample of women living in rural Appalachia, culture may also have an effect on how women perceive social support. Future research should continue to understand the role that social support plays in different cultures especially with regard to safeguarding

drug-use in pregnant women. Future interventions could help provide more support for pregnant women in high-risk pregnancy clinics.

Strengths and Limitations

There were several limitations within the current study. First, the race of the study was majority White, limiting the generalizability of our findings to other racially and ethnically diverse populations. The sample also consisted of only women on Medicaid indicating a less than ~$20,000 per year annual income (depending on number of individuals supported by income) limiting the generalizability of our findings to individuals in different socioeconomic brackets. Additionally, our study was cross-sectional, and therefore none of our findings may be considered causal. A large limitation of the study was differences in gestation at the time data was collected, though we did try and lessen the effects of this variable by controlling for gestation in all of the analysis. Lastly, the different time points at which we measured opioid misuse as indicated in the urine samples and self-reported opioid misuse and illicit hazardous drug use may have produced significant differences in the findings. As it is, even with the urine analysis variable we may not have been able to capture accurately the nature of a particular participant's opioid use given the differences in half-life between suboxone, methadone, and buprenorphine (6-46 hours, respectively). Future research should follow women throughout their pregnancy to capture a diverse understanding of drug-use and behavioral and emotional correlates for this vulnerable population.

However, there were also several strengths within the current study. First, 33% of the mothers who participated in the study had a clinical cut-off score of BPD, indicating significant pathology in the current sample. As such, our continuous variable of borderline features provided a strong continuum of individuals who would and would not meet criteria for the disorder.

Additionally, this was the first study to examine BPD and opioid use within a sample of pregnant women who were patients in an OBGYN High-Risk Pregnancy Clinic. This strength has important implications on screening procedures for women who may meet criteria for Opioid Use Disorder or engage in other illicit substances use during pregnancy.

Future Research

The current findings provide several opportunities for future research. Longitudinal research across the entirety of a women's pregnancy would provide a deeper understanding of the pathways in which women may misuse opioids during pregnancy. For instance, research could examine whether women who have BPD are more likely to relapse or to use opioids not as prescribed at different time points during pregnancy. This knowledge would be particularly important given that detoxification from opioids during pregnancy before the birth of a fetus is becoming more widely practiced, as recent studies have found that detoxing before giving birth lessens the chances of negative birth outcomes for babies born with NOWS (Bell et al., 2016). While it is still recommended that women addicted to opioids are treated with opioid maintenance during pregnancy, under the supervision of an opioid specialist OBGYN, detoxification from opioids during pregnancy is now acknowledged by the American College of Obstetricians and Gynecologists (American College of Obstetricians and Gynecologists, 2017). If research supporting detoxification from opioids during pregnancy continues to be promising, it will be important to determine what psychopathological risks may make it more difficult for a woman to detox during pregnancy. While depression and anxiety screenings are becoming more common in OBGYN opioid maintenance clinics, screening for BPD may also be particularly important for providing a mother with optimal support during detoxification. Furthermore, women who have cesarean birth may be more likely to be prescribed opioids to manage pain

after major surgery, and thus might be at a greater risk of relapse after giving birth, regardless of whether or not they have gone through detoxification. Given that 31.9 percent of live births are cesarean section (Center for Disease Control, 2016) it is tremendously important to determine psychological risk factors linked to opioid misuse after being prescribed pain-killers following major surgery.

Future research should also consider collecting information from partners or social supports of women in high risk pregnancy clinics. While the current study did not find significant associations between lack of social support, opioid misuse, and BPD, other studies have established that individuals with BPD have difficulty maintaining relationships (Beeney et al., 2016; Lazarus & Cheavens, 2017). More optimal ways of operationalizing social support are relatively new, and it is important to continue examining these relationships, particularly with this vulnerable population in which relationships may already be strained from the nature of the disorder. Moreover, obtaining information from romantic partners and other important individuals in an expecting mother's life could further elucidate perceptions of social support. Sixty-two percent of our total sample of expecting mothers indicated they *did not* have a romantic partner. It is important to conduct future research that will help bolster the strength of these important relationships.

Future studies should continue to examine HCV within the context of pregnancy. HCV is the leading cause of infectious disease (Smith, Jorgensen, Zibbell, & Beckett, 2012) and is one of the top 10 leading causes of death worldwide. Furthermore, HCV exceeded the number of deaths from Tuberculosis, HIV/AIDS, and malaria (Smith et al., 2012). Moreover, there is very limited research on HCV, particularly within the context of pregnancy and opioid misuse. Future

research should continue to examine correlates, such as BPD, of this deadly disease within pregnant women.

Finally, our research supports further investigation to the biosocial model of the development of BPD. According to this model, having a temperamental vulnerability and growing up in an environment that is invalidating interacts in deleterious ways influencing the developmental susceptibility of BPD (Linehan, 1993). Further, mothers who misuse opioids while pregnant and who also have BPD may be unknowingly contributing to biological and environmental interaction that the biosocial model posits. Mothers with BPD who use teratogens such as opioids while pregnant may therefore be an important population to follow longitudinally, as this combination may contribute to further knowledge in regard to vulnerabilities theorized in the biosocial model.

Clinical Implications

Based on the findings from the current study, there are several ways that healthcare providers may intervene with women in high-risk pregnancy and opioid maintenance clinics. The current study found a strong associations between BPD features and opioid misuse. Attachment theories of BPD (Bowlby, 1969) have inspired empirical studies to examine how mechanisms of attachment may be utilized in treatment with individuals with BPD. Given the importance of attachment to one's caregiver during infancy, future clinical interventions should utilize Mentalization Based Treatment (Bateman & Fonagy, 2010). The concept of mentalization indeed blossomed out of Bowlby's attachment theory, and targets individuals with BPD specifically because of the disorganized attachments displayed within caregiver dyads compared to healthy controls (Lyons-Ruth, Yellin, Melnick, & Atwood, 2005). Mentalization is defined as "the process by which we make sense of each other and ourselves, implicitly and explicitly, in terms

of subjective states and mental processes" (p. 11, Bateman & Fonagy 2010). Moreover, a key component of mentalization is difficulty imagining another person's thoughts and feelings dynamically within an interaction. The ability to mentalize begins as an infant, with a key ingredient being the mother's ability to "mirror" her infant's thoughts, feelings, reactions (Fonagy & Bateman, 2006; Winnicott, 1999). If the mother is not in tune with her baby or often "misses the mark" of what her baby might be feeling or thinking, the infant may internalize this "foreign experience" and develop a false-self. The theory posits that the infant never obtains the ability of having their emotions fully understood, and thus cannot do so for others.

Recent studies have validated a measure of reflective functioning, a short self-report measure of mentalization, and have found inverse correlations between reflective functioning and lack of parental reflective functioning such that parents who have difficulty imagining what their infant might be thinking or feeling or who show little curiosity in their infants internal world score low on the Reflective Functioning Questionnaire (Fonagy et al., 2016). Moreover, these studies have also found that low parental reflective functioning predicts insecure attachments among infants and their caregivers. Providing Mentalization Based Treatment would be a particularly important intervention for women who have BPD and who may misuse opioids during pregnancy in order to foster a secure attachment among infants who otherwise may not receive adequate mirroring from their caregiver.

High mentalization is also moderately correlated with mindfulness (Fonagy et al., 2016) which also may be a beneficial intervention for mothers who experience significant perceived stress and use opioids during pregnancy. The research from the present study highlighted that when perceived stress is heightened, borderline features may not have as significant effect on opioid misuse. Several studies have begun examining the effect of mindfulness-based

interventions with individuals with Opioid Use Disorder or who are in medication-assisted opioid withdrawal. Zullig et al. (2017) found significant decreases in depression and increase in mindful awareness in a mindfulness-based relapse prevention intervention from a pilot study examining individuals in an outpatient setting who were recovering from OUD. A recent meta-analysis of mindfulness-based interventions for pregnant women have found a significant decrease in a mothers' perinatal anxiety following mindfulness intervention, however, there were no significant differences found in mothers' depression following mindfulness-based interventions (Shi & MacBeth, 2017). Future studies should target specifically women who are pregnant who also enrolled in opioid maintenance or opioid withdrawal programs, as this is a particularly vulnerable population for relapse and experiencing perinatal stress.

Finally, participation in psychoeducation programs during pregnancy have shown promising outcomes for women who are pregnant and addicted to opioids. Cochran et al. (2018) conducted a recent pilot study in a sample of opioid using pregnant women testing the efficacy of Patient Navigation (PN), a health care model that has been validated with other behavioral and mental health disorders (Parker & Lemak, 2011). This model encourages self-efficacy among patients navigating the healthcare system and educates and supports patients as they face barriers to treatment adherence. Post birth, mothers who were pregnant and enrolled in opioid maintenance therapies during pregnancy reported improvement or abstinence from illicit opioids, drug use, and depression, showed increases in substance abuse treatment attendance, and achieved adequate prenatal care and general overall health. Though preliminary, these findings are promising, and indicate that adequate psychoeducation during pregnancy may safeguard women from negative birth outcomes and protect their infants from being born with NOWS.

Future studies should aim to help provide continuing support to mothers following birth, as this also poses as a significant identity transition with an increase in stress.

Conclusion

This is the first study to examine borderline features and opioid use in a sample of pregnant women in a High-Risk Pregnancy Clinic. Results of the current study indicate a significant association with borderline personality and opioid misuse during pregnancy. Clinical cut-off scores of borderline personality and total borderline features were significantly associated with overall self-reported hazardous drug-use, self-reported opioid misuse, and opioid use severity from urine analysis samples. Specific borderline features of self-harm and negative relationships were positively associated with opioid use in prescribed and non-prescribed users. The relation between HCV and borderline features was an important finding in our study, particularly the virus' association with borderline features of negative relationships. It was discovered that when perceived stress or borderline features are in a heightened state, each construct may have a greater effect on opioid misuse, respectively. Overall, this research contributes to the ways in which the medical community can better support expecting mothers who are being treated for opioid misuse during the perinatal and postnatal period. These findings will support the addition of more comprehensive screening methods in high-risk pregnancy clinics, particularly those that provide opioid maintenance or opioid withdrawal treatment. Data encourages the healthcare system to commit to support women who are pregnant, which will also promote the health of their infants and of future generations.

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APPENDICES

Table 1. *Demographic information, N = 99.*

Variable	Opioid User *n* = 55 M (*SD*)	Opioid Non-User *n* = 38 M (*SD*)	Non-Opioid Drug User *n* = 6
Mother age	27.76 (4.36)	25.24 (3.45)	25.50 (2.66)
Gestation	27.78 (7.76)	26.82 (8.23)	31.00 (5.36)
Relationship status			% (*n*)
Married	20% (11)	23.7% (9)	--
In relationship	16.4% (9)	15.8% (6)	16.7 (1)
Single	61.8% (34)	60.5% (23)	83.3% (5)
Divorced	1.8% (1)	--	--
Minority racial/ethnic status			
White	92.7% (51)	71% (27)	83.3% (5)
Black	5.5% (3)	10.5% (4)	16.7% (1)
Biracial	--	5.2% (2)	--
Middle eastern	--	2.6% (1)	--
Hispanic	1.8% (1)	2.6% (1)	--
Not specified	--	7.9% (3)	--
Unemployed	85.45% (47)	65.70% (25)	66.6% (4)
Medicaid	100% (55)	100% (38)	100% (6)

*M = Mean, average of all scores; *SD* = Standard Deviation, deviation of a group as a whole; *n*= number of participants in sample.

Table 2. *Descriptive statistics for variables in the study, N = 99.*

Variable	Opioid User *n* = 55 M (*SD*)	Opioid Non-User *n* = 38 M (*SD*)	Non-Opioid Drug User *n* = 6
Illicit hazardous drug-use	15.02 (13.90)	1.18 (3.60)	13.33 (12.53)
Self-reported non-prescribed opioid misuse	1.96 (2.56)	.13 (.81)	.17 (.40)
Opioid use severity	2.47 (.63)	.00 (.00)	--
Perceived stress total	23.49 (4.23)	21.00 (5.60)	24.67 (4.67)
Social support total	7.49 (5.38)	6.26 (5.34)	9.83 (4.87)
Borderline features total	35.51 (13)	26.79 (13.68)	43.33 (9.91)
Affective Instability	9.00 (4.23)	7.82 (4.26)	11.67 (3.67)
Identity disturbance	9.62 (3.89)	7.89 (4.30)	11.83 (3.13)
Negative relationships	11.07 (3.71)	8.03 (4.42)	10.67 (4.96)
Self-harm/impulsivity	5.82 (4.23)	3.16 (3.48)	9.17 (3.86)

*M = Mean, average of all scores; *SD* = Standard Deviation, deviation of a group as a whole; *n*= number of participants in sample.

Table 3. *Bivariate correlations between all hazardous drug use, opioid use, and borderline features in pregnant women, N = 99.*

	Borderline features			
	Affective Instability	Identity Disturbance	Negative Relationships	Self-harm
All hazardous drug use (6-months) *n* = 99	.231*	.324*	.333*	.447**
Urine analysis opioid use severity (30 days) *n* = 93	.137	.216*	.360*	.318*
Self-reported opioid misuse (6-months) *n* = 93	.153	.235*	.216*	.309*
Hepatitis-C diagnosis *n* = 99	.08	.159	.288*	.173

* $p < .05$
** $p < .001$
p = evidence from statistical model to reject the null hypothesis; n = number of participants in sample.

Table 4. *Multiple regression of pregnant women's borderline features associated with self-reported hazardous drug use 60-days prior to participation, N = 99.*

	Self-reported hazardous drug use 6-months prior to participation					
I.V.	*B*	β	*t*	*F*	*df*	R^2 (adj.)
Affective instability	-.47	-.15	-1.22	7.19	4,94	.20
Negative Relationships	.60	.21	1.47			
Identity Disturbance	.27	.09	.68			
Self-harm	1.20	.40	3.57**			

** $p < .001$

p = evidence from statistical model to reject the null hypothesis; n = number of participants in sample; B = unstandardized beta; $β$ = standardized beta; df = degrees of freedom; R^2 (adj.) = adjusted R square

Table 5. *Cross-tabulation of borderline feature clinical cut-off ≥38 and opioid users (yes/no), N = 93.*

		BPD feature clinical cut-off ≥38	
Opioid User		Yes	No
		M (%)	*M (%)*
	Yes	23 (71.9)	32 (52.5)
	No	9 (28.1)	29 (47.5)

M = Mean, average of all scores; *SD* = Standard Deviation, deviation of a group as a whole; *n*= number of participants in sample.

Table 6. *Multiple regression of pregnant women's borderline features associated with opioid misuse as indicated in urine analysis 30-days prior to participation, N = 93.*

		Opioid misuse urine analysis 30-days prior to participation				
<u>I.V.</u>	<u>*B*</u>	β	<u>*t*</u>	<u>*F*</u>	<u>*df*</u>	R^2 (adj.)
Affective instability	-.05	-.53	-1.11	5.02	4, 88	.15
Negative Relationships	.12	.40	2.73**			
Identity Disturbance	-.10	-.10	-.70			
Self-harm	.09	.30	2.36*			

* *p* < .05
** *p* < .001

p = evidence from statistical model to reject the null hypothesis; *n* = number of participants in sample; *B* = unstandardized beta; *β* = standardized beta; *df* = degrees of freedom; R^2 (adj.) = adjusted *R* square

Table 7. *Multiple regression of pregnant women's borderline features associated with self-reported opioid misuse as indicated 6-months prior to participation, N = 93.*

Opioid misuse 6-months prior to participation

I.V.	*B*	*β*	*t*	*F*	*df*	R^2 (adj.)
Affective instability	-.08	-.16	-.75	3.71	4, 88	.10
Negative Relationships	.06	.12	.66			
Identity Disturbance	.05	.09	.68			
Self-harm	.17	.31	2.63*			

* *p* < .05

p = evidence from statistical model to reject the null hypothesis; *n* = number of participants in sample; *B* = unstandardized beta; *β* = standardized beta; *df* = degrees of freedom; R^2 (adj.) = adjusted *R* square

Table 8. *Cross-tabulation of opioid users (yes/no) and HCV diagnosis, N = 93.*

	HCV diagnosis	
Opioid User	Yes	No
	M (%)	*M (%)*
Yes	45 (95.7)	10 (21.7)
No	2 (4.3)	36 (78.3)

M = Mean, average of all scores; *SD* = Standard Deviation, deviation of a group as a whole; *n*= number of participants in sample.

Table 9. *Cross-tabulation of HCV diagnosis and borderline features clinical cut-off ≥38, N = 99.*

	Borderline features clinical cut-off ≥38	
HCV diagnosis	Yes	No
	M (%)	*M (%)*
Yes	21 (44.7)	26 (55.3)
No	16 (30.8)	36 (69.2)

M = Mean, average of all scores; *SD* = Standard Deviation, deviation of a group as a whole; *n*= number of participants in sample.

Table 10. *Logistic regression of associations between BPD features and HCV diagnosis in pregnant women, N = 99.*

	HCV diagnosis					
I.V.	*B*	(SE)	Wald χ^2	*p*	Odds Ratio	CI 95%
Affective instability	-.11	.07	2.54	.11	.88	.76-1.02
Negative Relationships	.21	.08	6.86**	.001	1.23	1.05-1.44
Identity Disturbance	.-.01	.07	.05	.81	.98	.85-1.13
Self-harm	.06	.06	1.04	.30	1.06	.94-1.44

** $p < .001$
p = evidence from statistical model to reject the null hypothesis; n = number of participants in sample; B = unstandardized beta; β = standardized beta; *SE = standard error, Wald* χ^2 = chi-square test; CI = confidence interval.

Table 11. *Hierarchical multiple regression analyses predicting urine analysis of opioid use severity in pregnant women within 30-days of participation, N = 93.*

Opioid use severity 30-days prior to participation

Step	Independent Variables	ΔR^2	β	B	t	R^2 (adj.)	F	df
1.	Total borderline features	.02	.04	.43	3.36*	.10	6.40	2,90
	Lack of social support		-.30	-.12	-1.00			
2.	Total borderline features	.00	.04	.42	3.26*	.10	4.21	1,89
	Lack of social support		-.03	-.12	-.99			
	Total features*lack of social support		.00	-.01	-.11			

*p < .05
p = evidence from statistical model to reject the null hypothesis; *n* = number of participants in sample; *B* = unstandardized beta; *β* = standardized beta; *df* = degrees of freedom; R^2 (adj.) = adjusted *R* square; ΔR^2 = *R square change.*

Table 12. *Hierarchical multiple regression analyses predicting self-reported non-prescribed opioid use in pregnant women within 6-months of participation, N = 99.*

				Opioid misuse 6-months prior to participation				

Step	Independent Variables	ΔR^2	β	B	t	R^2(adj.)	F	df
1.	Total borderline features	.07	.20	.03	1.63	.12	5.93	2,90
	Lack of social support		.16	.07	1.37			
2.	Total borderline features	.01	.21	.08	1.55	.12	4.27	1, 89
	Lack of social support		.18	.03	1.42			
	Total features*lack of social support		-.10	-.04	-1.00			

p = evidence from statistical model to reject the null hypothesis; *n* = number of participants in sample; *B* = unstandardized beta; *β* = standardized beta; *df* = degrees of freedom; R^2 (adj.) = adjusted *R* square; ΔR^2 = *R square change.*

Table 13. *Hierarchical multiple regression analyses predicting urine analysis of opioid use severity in pregnant women within 30-days of participation, N = 93.*

Opioid use severity 30-days prior to participation

Step	Independent Variables	ΔR^2	β	B	t	R^2 (adj.)	F	df
1.	Total borderline features	.12	.33	.03	2.64*	.11	5.77	2, 90
	Perceived stress scale		.04	.01	.30			
2.	Total borderline features	.05	.34	.03	2.79*	.05	5.66	1,89
	Perceived stress scale		.01	.01	.12			
	Total features*Perceived stress scale		-.21	-.01	2.16*			

p < .05

p = evidence from statistical model to reject the null hypothesis; n = number of participants in sample; B = unstandardized beta; β = standardized beta; df = degrees of freedom; R^2 (adj.) = adjusted R square; ΔR^2 = *R square change.*

Table 14. *Hierarchical multiple regression analyses predicting self-reported non-prescribed opioid misuse in pregnant women within 6-months of participation, N = 99.*

Opioid misuse 6-months prior to participation

Step	Independent Variables	ΔR^2	β	B	t	R^2(adj.)	F	df
1.	Total borderline features	.10	.27	.04	2.40*	.08	5.00	2,90
	Perceived stress scale		.03	.01	.15			
2.	Total borderline features	.01	.27	.38	2.50*	.07	3.44	1,89
	Perceived stress scale		.02	.01	.08			
	Total features*Perceived stress scale		-.09	-.03	-.73			

*p < .05

p = evidence from statistical model to reject the null hypothesis; n = number of participants in sample; B = unstandardized beta; β = standardized beta; df = degrees of freedom; R^2 (adj.) = adjusted R square; ΔR^2 = R *square change.*

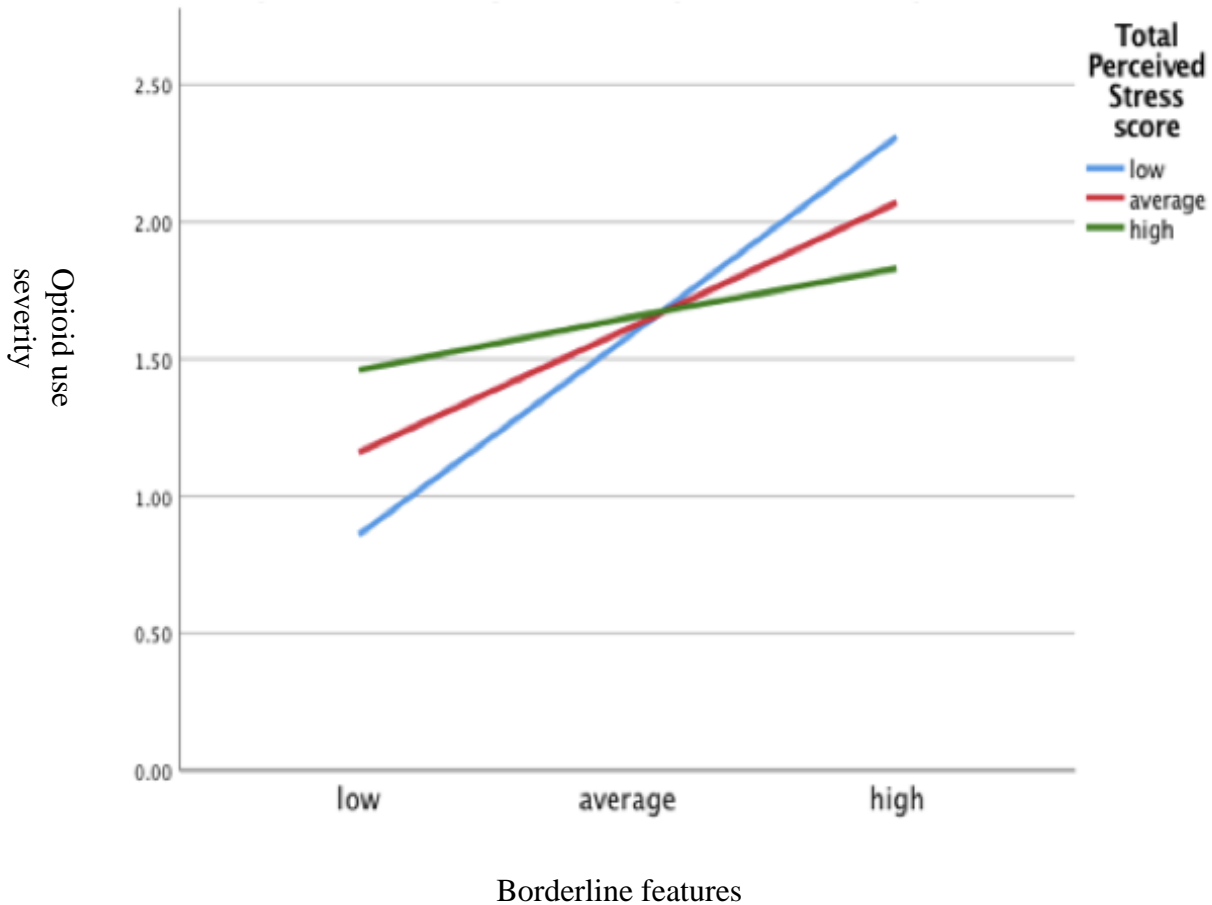Total borderline features X total perceived stress

Figure 1. *Multiple line mean of opioid misuse by total BPD score by total perceived stress score.*

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*For individuals with levels perceived stress 1 standard deviation below the mean (M = 17.65, SD = 4.96), for every 1 unit increase of total borderline features there was a 5% increase of opioid use. For individuals with average levels perceived stress (M = 22.61, SD = 4.96), for every 1 unit increase of borderline features there was a 3% increase opioid misuse. For individuals with high levels of perceived stress, there was no relationship between borderline features and opioid misuse.

VITA

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