Assessing the Role of Sleep, Grief, Anxiety, and Depression in a Miscarriage Population

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Amy Gencarelli

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Abstract

Assessing the Role of Sleep, Grief, Anxiety, and Depression in a Miscarriage Population

Amy Gencarelli

Jacqueline D. Kloss, Ph.D.

Miscarriage occurs at a relatively high rate in women who become pregnant with bereavement, anxiety, and depression as commonly experienced consequences of miscarriage. All of these consequences are connected to sleep disturbance, which to date has been neglected within the field of miscarriage research. Sleep is an important facet of miscarriage to evaluate because it is a modifiable behavior that may be a key component to include in follow-up care. We hypothesized that sleep disturbance would coincide with bereavement, anxiety, and depression not only among women who miscarried, but also among the partners of women who miscarried. It was proposed that sleep disturbance, in general, and insomnia, in specific, would be significantly associated with bereavement, anxiety, and depression. Furthermore, bereavement would account for sleep disturbance while controlling for depression. Eighty-eight women and 67 male partners who have experienced a miscarriage within the last year completed surveys on sleep and mood. Findings showed that both women who miscarried and partners of women who have miscarried experienced elevated sleep disturbance, bereavement, anxiety, and insomnia. Both sleep disturbance and insomnia were found to be associated with anxiety and depression. Women reported significantly more mood and sleep disturbance than partners, with the exception of depression and bereavement. Sleep disturbance was associated with female bereavement levels but not partner levels; insomnia was not related to either female or partner bereavement levels. Bereavement did not significantly predict sleep quality after controlling for depression. Future studies should seek to further clarify the relationships among bereavement

and sleep by attempting to provide sleep therapy post miscarriage to see if bereavement is significantly improved against a control group who receives treatment as usual. Using a prospective longitudinal design to follow participants throughout their bereavement process would better assist in understanding for whom, under what context, and during which specific time periods bereavement and sleep are most exacerbated, leading to when treatment may be most helpful.

1. Introduction

Miscarriage, one of the most common complications of pregnancy, reportedly occurs in 15% of all clinically recognized pregnancies and 30-50% of conceptions (Kalumbi, Farquharson, & Quenby, 2005; Michels & Tiu, 2007; Stephenson & Kutteh, 2007). Approximately one out of every four women experience a miscarriage during their lifetime, which amounts to around 500,000-650,000 miscarriages annually within the U.S. (Ventura, Curtin, Abma, & Henshaw, 2012). The major causes of miscarriage are genetic or developmental abnormalities of the fetus, as well as thrombophilia [abnormality of blood coagulation], cervical weakness, infection, and/or endocrine, anatomical, and immune factors (Kalumbi, Farquharson, & Quenby, 2005). Miscarriage can result in an aftermath of emotional distress and suffering resulting from many psychological reactions (Geller, Kerns, & Klier, 2004), which health care providers often lack the preparation and time to adequately address (Kemper & Mettler, 2002). Negative sequelae include anxiety, depression, grief, guilt, emotional numbness, and bereavement. Regarding bereavement, women often equate this feeling in pregnancy loss to the experience of losing another type of family member (Lee & Slade, 1996). Identification of factors that contribute to bereavement are warranted as they may buffer the effect of bereavement on one's physical and emotional functioning, as well as quality of life (Campagne, 2006).

Sleep is one such factor that is known to contribute to emotional and physical health and well-being. Sleep is a homeostatically regulated function important for survival that is theorized to contribute to the control of energy metabolism, neural

plasticity, and immune defense functions (Porkka-Heiskanen, 2013). Sleep is essential for learning, mood regulation, restorative processes, memory consolidation/neurophysiology, thermoregulation, tissue repair, and immune control (Walker, 2008; Williams, 2009). Sleep deprivation occurs in more than 30% of Americans and is becoming increasingly more common in our society (Van Cauter, Spiegel, Tasali, & Leproult, 2008). Deprivation of sleep has wide-ranging effects including reduced attentional arousal and impaired central processing; combined, this produces an overall decline in cognitive functioning (Ratcliff & Van Dongen, 2009). Van Cauter and colleagues (2008) indicate that sleep deprivation may play a role in poor appetite regulation and health, demonstrating irregular and adverse affects of important physiological activities (reduction in heart rate), metabolic hormones (brain glucose metabolism) and endocrine release (hypothalamic-pituitary-adrenocortical) that are modulated by the latter slow wave sleep. Specifically, sleep is associated with immune functioning and health such that increased time spent awake during NREM-1 period [sleep onset difficulty] is associated with lower natural killer cell numbers [immune functioning] and an increased frequency of intrusive thoughts and avoidance behaviors in a sample of individuals with bereavement-related depression (Hall et al., 1998). Chronic sleep disturbance, namely insomnia, is both a consequence of, and a prodrome for, major depression, highly comorbid with anxiety, and highly prevalent among individuals who are bereaved (Reddy & Chakrabarty, 2011; Zisook & Shear, 2009).

With regard to women's reproductive health, it is well established that sleep disturbance is associated with pregnancy, pregnancy outcomes, mood disturbances, and maternal and infant health (Balserak & Lee, 2011; Okun, Schetter, & Glynn, 2011; Okun

et al., 2012; Okun et al., 2013). In general, sleep dysregulation and mood are found to be correlated. It has been evidenced that when controlling for emotion dysregulation (difficulties modulating emotional experiences), sleep disturbance is found to be uniquely related to anxiety and depression, suggesting that it is a clinically relevant target for intervention (Fairholme, Nosen, Nillni, Schumacher, Tull, & Coffey, 2013). Sleep dysregulation has also recently been proposed to modulate a variety of fertility hormones and may even serve as a contributing factor to infertility (Kloss, Perlis, Zamzow, Culnan, & Gracia, 2014). For example, circadian dysrhythmia is associated with increased pregnancy losses (Mahoney, 2010). This said, no studies to date have delineated the degree of disturbed sleep in a miscarriage population, or the degree to which it accounts for the mood dysregulation that often accompanies miscarriage. Thus, the primary aim of this study is to determine the degree to which sleep disturbance and bereavement are experienced in a miscarriage population.

Also, evidence indicating that sleep dysregulation is strongly correlated with bereavement, depression, and anxiety could inform women's health specialists as to treatment options that a) help women cope better with miscarriage; b) improve quality of life following a miscarriage; and c) potentially, in turn, enhance fertility (Kloss, Perlis, Zamzow, Culnan, & Gracia, 2014). The secondary aim, therefore, is to address the association between sleep disturbance, bereavement, anxiety, and depression in a much-neglected population of individuals – those who are affected by pregnancy loss – that is, the women who have miscarried and partners of women who have experienced a miscarriage. Bereavement has been inadequately addressed within the field of health care. It has been even less well addressed in individuals who have experienced

miscarriage. What is least well studied is the how partners of women who have miscarried (POWM) cope with this loss. To better assist women who miscarry and partners of women who miscarry (POWM), the current study is designed to 1) identify the degree to which sleep disturbance and bereavement are encountered following miscarriage; 2) examine the associations between sleep disturbance and bereavement, anxiety, and depression; 3) explore the degree to which bereavement is contributing to sleep disturbance, while controlling for depression; and 4) explore the severity of insomnia, in specific, experienced by women and POWM and its association with bereavement, anxiety, and depression.

1.1 The Association of Bereavement and Sleep with Anxiety, Depressed Mood, and Miscarriage

Grief is the most common reaction to a miscarriage, followed by depression and anxiety (Athey & Spielvogel, 2000). In their review, Athey and Speilvogel (2000) report that approximately 40% of women suffer symptoms of grief immediately after miscarriage with varying time frames (4 months-3 years) of resolution for these symptoms. Bereavement regarding the death of a loved one has been found to be a painful and disruptive experience, affecting the bereaved emotionally, physically, socially, cognitively, and spiritually (Zisook et al., 2014). Zisook and colleagues (2014) depict adverse pathological consequences of bereavement based on prior research, linking grief to depressed mood and anxiety disorders. Lok and Neugebauer (2007) revealed that the most common psychological reactions following a miscarriage are grief, depression, and anxiety. Though bereavement and anxiety are associated with one

another, the DSM-5 identifies the differential diagnoses distinguishing bereavement from separation anxiety due to the:

> Intense yearning or longing for the deceased, intense sorrow and emotional pain, and preoccupation with the deceased or the circumstances of the death are expected responses occurring in bereavement, whereas fear of separation from other attachment figures is central in separation anxiety disorder (DSM-5; American Psychiatric Association, 2013, p. 194).

Bereavement is also found to be associated with poor sleep. It has been proposed that those who are bereaved experience a shortened latency to the first REM period (National Research Council, 1984, p. 153). As a result, preservation of normal sleep following a major negative life event may be an important correlate of resilience (Reynolds et al., 1993). Sleep disturbances are also thought to contribute to the associated medical morbidity of bereavement, increasing cortisol dysregulation and immune system dysfunction (Zisook et al., 2014). According to the National Research Council (1984), bereaved individuals self-report changes in sleep pattern in addition to a host of other signs of distress and emotional disturbance (National Research Council, 1984, pp. 29; 112).

Insomnia Disorder is defined as dissatisfaction with sleep quantity or quality associated with difficulty in initiating/maintaining sleep and involves the endorsement of cognitive performance (i.e., concentration) and daytime impairments (i.e., fatigue; DSM-5; American Psychiatric Association, 2013). Bereavement and stress, in combination with a host of other factors, are associated with acute insomnia (Zahn, 2003). Transient and acute insomnias are experienced almost universally, with common causes being acute or

sub-acute stressors such as interpersonal conflict and loss (Sateia, Doghramji, Hauri, & Morin, 2000). Considering pregnancies that are devoid of depression and carried to term (absent of loss) are still considered risk factors in the development of insomnia complaints (Chesson et al., 2000), there is reason to study sleep and bereavement in the context of miscarriage and loss. Insomnia presents a concern for psychological, physical and occupational functioning, most frequently resulting in fatigue or lethargy, mood disturbances, cognitive inefficiency, motor impairments, social discomfort, and nonspecific physical ailments (Sateia, Doghramji, Hauri, & Morin, 2000). It is well-known that psychiatric conditions are highly prevalent among insomnia, particularly anxiety and depression (Chesson et al., 2000; Sateia, Doghramji, Hauri, & Morin, 2000), which are common symptoms that emerge following loss. Those suffering from insomnia also exhibit internalized emotion and obsessive rumination, while having a tendency to somaticize psychological conflict in addition to depression and anxiety (Sateia, Doghramji, Hauri, & Morin, 2000). Higher physiological reactivity to stressors and a longer time to recover from exposure to stress is typically evidenced among individuals with insomnia compared to “good” sleepers (Sateia, Doghramji, Hauri, & Morin, 2000). Given that insomnia is highly prevalent, comorbid with other disorders related to loss, and that patients tend to overlook the impact of poor sleep quality on daily functioning (Chesson et al., 2000), it is important to assess insomnia and sleep disturbance in a miscarriage population. Assessment of insomnia may allow for a more comprehensive evaluation of the symptom presentation among individuals who have experienced a miscarriage. Understanding the degree to which sleep disturbance associates with

bereavement could better assist health care practitioners and treatment planning post-miscarriage.

If it is found that insomnia is associated with bereavement among individuals who have experienced a miscarriage, perhaps the treatment of insomnia and enhancement of sleep could, in turn, help regulate mood and improve one's overall emotional and physical well-being throughout the grieving process. When individuals with insomnia are treated with cognitive behavior therapy, improvement in sleep is accompanied by a reduction in psychological symptoms related to depression and anxiety (Bastien, Morin, Ouellet, Blais, & Bouchard, 2004). Insomnia treatments are also shown to alleviate depressive symptoms (Manber et al., 2008). It is both likely that the prevalence of insomnia will be high and that it will be associated with grief, depressed mood, and anxiety, considering its association with many other psychiatric, medical, and neurological conditions (Litner et al., 2003; Morin et al., 2006). The purpose of the present investigation is, therefore, to establish the degree to which a population of individuals who have had a miscarriage experience sleep disturbance in general, and insomnia, in specific. As such, the present study may provide preliminary, requisite data to inform educational efforts among both healthcare professionals and the community. Ultimately, this knowledge could serve to improve recognition of insomnia, anxiety, depression, bereavement, and general sleep disturbance in a miscarriage population.

1.2 The Importance of Carefully Measuring Bereavement as a Distinct Construct from Depressed Mood

It is important to recognize that bereavement is distinct from depression. Bereavement and grief, however, are interchangeable terms used in research and are

known as the emotional and physical responses to the death of a loved one contingent upon biological, cultural, and unique individual components (Ringold, Lynm, & Glass, 2005; Wiley, 2004). Grief stemming from bereavement is a normal, universal and dynamic process experienced at the individual level, though commonly disenfranchised and underestimated in the case of a miscarriage (Capitulo, 2005). Bereavement is characterized as the potential yearning and pining feeling for the deceased that women and POWM may experience in the event of a miscarriage. The yearning and pining following the loss makes it distinct, though related to depressive symptoms (Zisook & Shear, 2009). The DSM-5 further distinguishes grief from major depressive episodes (MDE) and major depressive disorder (MDD) by the predominant feelings of emptiness and loss experienced in waves that tend to be associated with thoughts or reminders of the deceased. In contrast, the main characteristic of MDE and MDD is a persistent depressed mood and an inability to anticipate happiness or pleasure. Although bereavement has the power to induce great suffering, it does not typically induce an episode of major depressive disorder though it is possible and tends to occur in persons with other vulnerabilities to depressive disorders (DSM-5; American Psychiatric Association, 2013). Klier and colleagues (2002) concluded that it is psychometrically feasible, theoretically sound, and clinically useful to study grief as a reaction to miscarriage, for it is distinct from, though frequently co-occurs with, depression.

Brier (1999) highlights that it is important for the physician to validate that a loss has occurred and to discuss the specific meaning of the loss with both the patient and her partner, appropriately acknowledging grief (Brier, 1999). Brier continues by explaining that there are few established rituals for miscarriage, separating it from other losses and

ultimately making the facilitation of grief more difficult. Brier suggests that physicians should encourage the patient to see signs of the fetus's death, such as fetal material, and name the fetus, formally acknowledging his or her presence and absence. It might also prove helpful to suggest a memorial service and share written statements, creating a permanent record and helping to maintain a connection to the lost child. Suggestions such as the ones Brier holds are equivalent to bereavement practices of other types of losses, helping women and partners to acknowledge bereavement symptoms.

Despite grief being one of the most universal experiences of human life, it remains to be adequately assessed and addressed in the context of miscarriage. Perinatal loss is considered a multiple loss: interpersonal (pregnancy), intrapersonal (potential loss of the mother's sense of identity) and extrapersonal (potential loss of family standing; Reed, 2003). Physiological aspects of perinatal grief (i.e., sleep) are even less well understood and may hinder recovery from bereavement (Reed, 2003), calling for additional research to inform the proper care and attention to individuals who have experienced a miscarriage.

1.3 The Specific Association Between Bereavement and Sleep

Considering bereavement is highly plausible in the death of an unborn child, it is important to study how miscarriage can compromise both grief and sleep. 'Normal' behavioral reactions to grief include disturbed sleep and dreams of the deceased (Worden, 2001). Altered sleep has been a concern since the 1980s in which inability to sleep throughout the night and increased daytime sleeping were thought to lead to desynchronized circadian rhythms, increased daytime napping, self-medicating, fatigue, and sleep disturbances (Davidson, 1984). It is common for bereaved individuals to suffer

from sleep disturbance, potentially leading to poor physical and mental health outcomes (Monk, Germain, & Reynolds, 2008). Buckley et al., (2012) discuss the associations of bereavement to a multitude of facets, highlighting altered sleep and suggesting that interventions for bereavement can be highly valuable when sleep disturbance becomes a prolonged feature of complicated grief. Both severity of grief symptoms and depression severity were found to be significant predictors of poor sleep quality (Germain, Caroff, Buysse, & Shear, 2008). Cognitive arousal has also been associated with disrupted sleep in an insomnia population and may be one mechanism underlying sleep disturbances in bereavement (Buckley et al., 2012). Buckely and colleagues (2012) further state that severely distressing life events causing bereavement are associated with increased cortisol secretion which potentially contributes to increased cognitive arousal resulting in sleep disturbance, especially for those who experience intense or prolonged grief reactions. Bereavement is a part of the human condition, and loss can be very traumatic dependent upon the nature of death and/or the vulnerability of the individual (Monk, Germain, & Reynolds, 2008). In their systematic review of changes in routine health behaviors following late-life bereavement, Stahl and Shulz (2013) revealed there is some support for a long-term negative effect of bereavement on sleep quality. In addition, they highlighted longitudinal evidence that individuals with late life bereavement are indicative of impaired sleep quality compared to married controls and highlight the need for prospective studies to determine if bereavement is an independent risk factor for the development of poor sleep.

Buckely et al., (2012) reviews the physiological correlates of bereavement and evidence that bereavement is shown to be associated with specific changes in sleep

architecture, sleep continuity, and increased sleep disorders. With regard to sleep architecture, bereavement is shown to associate with diminished REM latency and prolonged first REM period. With regard to sleep continuity, bereavement is associated with poorer sleep quality and decreased sleep efficiency. The use of hypnotic medications is also found to be elevated among individuals with bereavement (Buckley et al., 2012). Monk, Germaine and Reynolds (2008) found that in late-life spousal bereavement, known significant sleep impairments were observed, including poor sleep quality, increased level of sleep disruption relative to increased grief severity, and difficulty in maintaining sleep. In general, there are indications that improvements in sleep may be associated with improvements in health and functioning (Foley, Monjan, Simonsick, Wallace, & Blazer, 1999; Monk, Germain, & Reynolds, 2008). Of note, among younger adults, the association between sleep and bereavement has generally been understudied. Understanding these associations in younger individuals could be particularly relevant among women and POWM following a pregnancy loss. Knowledge of these associations can add meaningful information to the current body of science.

Contributing factors to participants who were grieving involved a reported lack of sleep, cognitive arousal, and the inability to control troubling thoughts (Bugge, Haugstvedt, Rokholt, Darbyshire, & Helseth, 2012). Other facets of bereavement, namely the nature of death or an individual's vulnerability to sleep disturbance due to resultant changes in lifestyle, have the potential to adversely affect health, functional status, and mood (Monk, Germaine, & Reynolds, 2008).

Sleep disturbance has been identified as an important therapeutic target in bereavement (Buckley et al., 2012). Researchers propose that by treating sleep

disturbances in bereaved adults with brief behavioral sessions, therapists have the potential to contribute to patient recovery in several different domains. These domains include: improvements in overall sleep quality, latency, efficiency, wake after sleep onset, marked reductions in depression, and minor changes in anxiety (Monk, Germaine, & Reynolds, 2008; Germain et al., 2006). Considering those who suffer from a miscarriage experience bereavement symptoms and that both male and female partners have the potential to undergo these same symptoms, assessment of sleep is pertinent. Careful assessment can inform and serve to improve treatment plans to potentially alleviate these symptoms of grief.

1.4 Potential of Research to Assist in Treatment Formulation

The increasing attention given to *both* women who miscarry and POWM is important within the context of societal benefits. Health care providers and service workers may be better equipped to handle psychological risk factors that arise post-miscarriage knowing two factors: (1) how much each individual may be affected and (2) how to begin to formulate a treatment for the women who experience miscarriages and POWM. It is already known that women who experience a loss suffer the most distress immediately following the loss; thus, treatment needs to be provided in a timely manner (Geller, Kerns, & Klier, 2004). In sum, sleep is a modifiable behavior (Monk, Germain, & Reynolds, 2008); studying sleep with a bereaved miscarriage population can help to further treatment and care or, at the very least, enable health professionals to address and attend to sleep disruptions in order to better assist those affected.

1.5 Bereavement in the Context of Miscarriage

The emotional experience associated with miscarriage is often marginalized compared to that associated with other types of losses (Friedman, 1989; Geller, Psaros, & Kornfield, 2010). One common societal misconception is that women do not grieve the loss of their unborn child and thus mourning becomes complicated, potentially contributing to social isolation and distress for those involved with the miscarriage (Geller, Psaros, & Kerns, 2006). Bereavement stemming from a miscarriage can be complex. Lee and Slade's (1996) review of the literature encompasses the reasons miscarriage becomes a complicated grieving process: (1) the suddenness of the death, (2) the absence of memories and/or shared life experiences, (3) having no visible child to mourn, and (4) a cultural lack of recognition of the significance to the loss. Brier (1999) adds that the absence of memories of time together to both treasure and grieve, in combination with the absence of a person to bury, contributes to the difficulties of coping with a miscarriage. Family, friends, and health care personnel often fail to appreciate the personal significance of miscarriage and exhibit an unhealthy tendency to minimize the extent of distress felt and the degree of sorrow present (Brier, 1999). In addition to lacking the social and emotional support that is normally provided with other types of bereavement, women may also be subjected to insensitive and negative attitudes, potentially causing further stress and long-term emotional consequences (Lee & Slade, 1996).

1.6 Health Care Implications for Women who Experience Miscarriage

Researchers continue to look for ways to assist those who experience miscarriages due to: (1) the limited research available, (2) the methodological limitations in previously conducted research, and (3) the potential impact miscarriage may have on increasing risk for psychiatric symptoms and disorders (Geller, Kerns, & Klier, 2004; Geller, Psaros, & Kerns, 2006; Klier, Geller, & Ritsher, 2002). Based on Geller and colleagues' 2010 review, women who miscarried were dissatisfied with the level of care received and the lack of sentiment that health care providers showed in relation to the magnitude of the loss (Friedman, 1989; Geller, Psaros, & Kornfield, 2010). The review highlights the "disconnect" felt between women and their providers, as well as the vital need for provision of information following the pregnancy loss. In addition, there is evident expectation of follow-up services (medical or psychological consultations) and some participants exhibited confusion regarding unanticipated feelings of grief after being discharged (Tsartsara & Johnson, 2002; Geller, Psaros, & Kornfield, 2010). Studies on miscarriage can improve this area of health care by targeting significant issues and enabling health care providers to better understand the psychological facets from which a recovering woman or partner may be suffering. Furthermore, it may prove useful to systematically direct patients to reliable resources (e.g., Internet sites) in order to better assist those in need (Geller, Psaros, & Kerns, 2006). There are multiple research studies as well as empirical online resources (i.e., American Society for Reproductive Medicine, BabyLoss, Hygeia Foundation, & PregnancyLoss) that reference the psychological constructs that occur for women as sequelae following a miscarriage (Geller et al., 2006). In addition to the prevalence and severity of emotional distress that is oftentimes

associated with miscarriage, the correlation between sleep, anxiety, depression, and bereavement warrants further study. Such information could provide a better understanding of, and foster more helpful responses to, the psychological reactions following pregnancy loss among women who miscarry and their partners.

1.7 Partners of Women Who Miscarry: Male-Specific Considerations

A particularly neglected area of research is the psychological and behavioral struggles that partners of women who miscarry (POWM) may experience. Female partners of women who miscarry have not been thoroughly studied in miscarriage research and male partners of women who miscarry have not been addressed in research in over twenty years. A scant amount is known regarding gender differences and reactions to various kinds of bereavement, including, but not limited to, miscarriage (Beutel, Willner, Deckardt, Von Rad, Weiner, 1995). Klier and colleagues (2002) suggested that partners of women who miscarry may also be suffering from negative affect and emphasized the inherent need for studies to include partners of women who miscarry. The few studies that have been conducted on partners are outdated and mostly limited to male populations. Beutel et al. (1996) found that male partners grieve less intensely and grief reactions diminish quicker than that of their female counterparts. They also showed that some men grieve in a similar manner to the women who experienced the miscarriage, with the exception of feeling less of a need to discuss the miscarriage and crying less frequently. In comparison to the women in the group, men did not portray an increased depressive reaction. Common major sources of grieving involved giving up personal expectations, hopes for, and fantasies regarding the unborn child. Eighteen percent of the male population in the study had higher grief scores immediately after the

miscarriage than their spouses while others felt burdened by their wives enduring depressive reactions and irritability (Beutel, Willner, Deckardt, Von Rad & Weiner, 1996). This study, conducted in Germany in 1996, contained small sample sizes with limited generalizability; nevertheless it began to pave the way for studying partner reactions to miscarriage, which up until now has still been highly disregarded. Attending to partner grief is an important component to more comprehensively understand the potential factors contributing to miscarriage reactions. Brier (1999) explains that when presented with signs of an impending miscarriage, the *couple* involved becomes highly fearful for the well-being of the fetus and the mother. After the pregnancy loss, the couple ultimately experiences unanticipated and unforeseen shock about the loss (Brier, 1999).

Puddifoot and Johnson highlight the difficult position of men in the aftermath of a miscarriage. Due to both societal and self-perceived conceptions of gender identity, males are overall treated as peripheral to the situation (Puddifoot & Johnson, 1997). The researchers elaborated on the content of transcribed interviews with male partners, noting disclosure of feelings to others, feelings related to their partners' miscarriage, and imagery related to the unborn child as major themes. Findings relative to the themes are as follows: 1) men found discussing their feelings with others to be inappropriate; 2) men felt discomfort in their perceived inability to affect, explain events, or offer comfort toward their partner, and 3) men disclosed how the impact of seeing an ultrasound increased the acknowledgement and feelings toward the child (Puddifoot & Johnson, 1997). Although its sample size was too small to make definitive conclusions, this study provided a number of hypotheses to further explore how males contextualize and frame

their experience both during and after the event of a miscarriage. This study dates back almost twenty years and little research has been done since. There may be a change in reaction given the amount of time that has passed and the minimal attention paid to partners during this time.

Since it has generally been found that men have higher cortisol levels than women, which is possibly an indicator of vulnerability to stress (Kirschbaum, Wüst, & Hellhammer, 1992; Buckley et al., 2010), it is imperative for researchers to also study male partners who have experienced loss stemming from a miscarriage. Men, in general, are known to express grief differently than woman (i.e., cry less, want to talk about it less, and tend to express more anger; Beutel et al., 1996; Johnson & Puddifoot, 1996) but it would be important to determine if this is evidenced in the specific case of a miscarriage. If men do openly express grief, how to better assist them would be vital to understand. Though a majority of prior research in the area was uncontrolled and focused only on case studies, findings suggested that men may be affected by the loss and thus the need for quantifiably measured psychological responses of male partners is overt (Geller, Kerns, & Klier 2004).

1.8 Partners of Women Who Miscarry: Female-Specific Considerations

Both men and women will be included in the overarching category of partners as greater numbers of lesbian couples are making the decision to have children and research regarding the impact of miscarriage on lesbian couples is much needed (Geller, Kerns, & Klier, 2004). Serious impairments in interpersonal and social functioning are likely to affect not only the woman who has miscarried but also the relationships with her partner. The little research that does exist indicates that the psychological sequelae following a

loss for all persons involved needs to be further investigated (Geller, Kerns, & Klier, 2004). Recognition among couples that each person needs to grieve in his or her own way and provide mutual support and communication can be helpful during a time of miscarriage (Brier, 1999). Finding out how female and male partners react can help in the supportive aftermath of a miscarriage.

Prior to 2002, there were no known published research articles on the female partner's response to the loss within a lesbian relationship and only minimal research on male affect resulting from a miscarriage (Klier, Geller, & Ritsher, 2002). To date, the rate of pregnancy losses among the lesbian population remains undiscovered (Wojnar, 2007). From the minimal research that has been done, Wojnar (2007) evidenced that as is true of men whose partners miscarry, most social mothers (the birth mother's female partner) muffled their own grief to be strong for their partner. This suggests that non-pregnant parents, men or women, may experience pregnancy loss in a similar fashion. Both men and women displayed emotions of grief and shock (Wojnar, 2007). Among lesbian couples, there is the added difficulty of finding a non-homophobic provider willing to inseminate and care for the couple, as well as fears of raising a child in a society that discriminates against nontraditional families (Wojnar, 2007).

Despite gender being a fixed attribute, there is still a need for partner studies to support gender-specific needs in terms of intervention of mental distress (Murphy, Chung, & Johnson, 2002). When non-normative relational contexts (i.e., lesbian couples) are considered in the event of a miscarriage, the bereavement, trauma, significant loss, and grief can become even more complex (Peel, 2009). The yearning and pining for the deceased, a quality of traumatic grief, suggests an increased risk of suicidal behavior and

heart disease, even after controlling for depressive symptoms (reviewed in Prigerson et al., 1999). Prior research suggests that women experience the most distress immediately following the loss. It has also been evidenced that health care providers often lack the time and preparation to fully attenuate to the situation. Given the distress experienced and lack of help available, further exploration of these risk factors in both partners will help to uncover essential knowledge regarding the psychological sequelae of miscarriage in terms of sleep and bereavement. Perhaps this will help lead to changes in how the health care system plays a role in post-miscarriage management for those involved with the loss.

1.9 Partners of Women Who Miscarry: Health Care Considerations

Partners being viewed as peripheral to the situation leads to general dissatisfaction among both women who miscarry and POWM. There are many aspects of management and care that may be contributing to the experience of emotional responses/dissatisfaction following a miscarriage at both the primary care level and within hospital services (Puddifoot & Johnson, 1997; Wojnar, 2007). Geller, Psaros, and Kerns (2006) identified web-based resources for men and women following a miscarriage (American Pregnancy Association, Miscarriage Support Auckland Inc., M.I.S.S, & Share) because they have found that pregnancy loss rarely affects only the woman and hope to provide comprehensive coverage of factual material relevant to pregnancy loss and guidance for partners (Dunn, Clinton, Goldbach, Lasker, & Toedter, 1991; Geller et al., 2006). Geller and colleagues' 2010 review noted that men also desire an explanation of the loss, laboratory tests determining the potential cause of loss, and to see the baby after death. Also, interventions such as obtaining keepsakes or attending support groups created

significantly more satisfaction with care than those who were not offered any type of intervention (Lasker & Toedter, 1994; Geller et al., 2010).

The limited clinical and research attention to male responses to pregnancy loss may extend beyond the United States. For example, Puddifoot and Johnson (1997) interviewed men in the United Kingdom and found that they are suffering from the comparable lack of attention and treatment than that given to women, alluding to an illegitimacy of their own grief response. A majority of the participants felt they received minimal care and support despite an expression of an obvious need for greater care. Partners were also unsatisfied at the manner in which the news of the miscarriage was given, the lack of information given, and the feeling of isolation that left most with distressed emotions. The prospect of an information packet for men was desired to help with the sense of exclusion at the hospital level (Puddifoot & Johnson, 1997). Again, this study was intended to be sensitizing and exploratory in nature as the sample size was too small to make global generalizations. That said, the study highlighted the types of difficulties that men encountered and suggests the need to develop more supportive conventions. Partners of women are clearly affected emotionally by the event as support groups for those who miscarry often have couples using group discussion to more fully disclose their feelings with each other, increasing their ability to be a mutual support (Brier, 1999). A majority of the limited literature seems to have been completed in the 1990's, but findings lack generalizability in many ways. Personal stress is theorized to impact sleep quality and it is imperative that sustained research is done for those in high-risk environments (i.e., high-stress factors; Shaver, 2006). Presently there is still a need to explore this area of research to expand upon previous studies and also track how partner

responses may have changed since the last era considering the reported distress experienced by POWM.

1.10 The Current Study

Taken together, the need for understanding the psychological sequelae of miscarriage is coming to the forefront of investigation and has been previously neglected by healthcare providers. Many women are experiencing pregnancy loss and this has not been adequately addressed nor fully represented in regards to both women and POWM. Moreover, the literature on partners is nearly 20 years old, calling for more current data on this understudied topic. The current study aims to look at both women who have experienced miscarriage and male and female partners of women who have experienced a miscarriage. Unlike previous studies that looked at women and their associated partners, this study will contain individuals that may have separately experienced a miscarriage. In other words, the male and female partners of women who have experienced a miscarriage are NOT intended to be the "associated" (e.g., by marriage, partnership, or common-law) partners of the women in the study. Although research has shown that sleep interacts with bereavement, in general, the role of sleep in the context of bereavement remains to be identified. The primary goal of the present study is to assess the prevalence and severity of sleep disruption within the miscarriage population. In particular, we are proposing that sleep disturbance and bereavement will be elevated among individuals who have experienced pregnancy loss. We are further proposing that those who experience a miscarriage will also experience elevated mood dysregulation as both sleep disturbance and bereavement are associated with anxiety, depressed mood, and insomnia.

1.11 Proposed Aims and Hypotheses

Aim 1. To determine the severity of sleep disturbance, as measured by the Pittsburgh Sleep Quality Index (PSQI) and bereavement, as measured by the Perinatal Bereavement Scale (PBS), in a population of women who have miscarried and POWM.

Hypothesis 1a. Both women who have miscarried and POWM will experience significantly disturbed sleep (as measured by the Pittsburgh Sleep Quality Index [PSQI] total score ≥ 5).

Hypothesis 1b. Both women who have miscarried and POWM will experience significant levels of bereavement (as measured by the Perinatal Bereavement Scale [PBS]; one standard deviation above the mean will serve as the cut off point).

Hypothesis 1c. Women who miscarried will experience significantly more sleep disturbance than POWM (as measured by the PSQI).

Hypothesis 1d. Women who miscarried will experience significantly more bereavement than POWM (as measured by the PBS).

Aim 2. To establish the presence of anxiety and depressed mood in women and POWM.

Hypothesis 2a. Both women and POWM will experience significant levels of anxiety (as measured by the Hospital Anxiety and Depression Scale [HADS-A] total score > 7).

Hypothesis 2b: Both women and POWM will experience significant levels of depressed mood (as measured by the HADS-D total score > 7).

Hypothesis 2c. Women who underwent the pregnancy loss will experience significantly more anxiety than POWM (as measured by the HADS-A).

Hypothesis 2d: Women who underwent the pregnancy loss will experience significantly more depression than POWM (as measured by the HADS-D).

Aim 3: To determine the strength of the associations between sleep disturbance using the PSQI, bereavement using the PBS, anxiety and depression using the Hospital Anxiety and Depression Scale (HADS).

Hypothesis 3. Sleep disturbance (as measured by the PSQI) will be positively correlated with bereavement (as measured by the PBS), anxiety and depression (as measured by the HADS).

1.12 Exploratory Aims

Aim 4a. To determine the degree to which bereavement (using the PBS) accounts for sleep disturbance (as determined by the PSQI) when controlling for depression (using the HADS-D).

Hypothesis 4a. Bereavement will significantly account for sleep disturbance when controlling for depression.

Aim 4b. To examine the severity of insomnia present among women who have miscarried and POWM as measured by the Insomnia Severity Index (ISI).

Hypothesis 4b. Insomnia will be significantly prevalent in a miscarriage population (ISI total score > 7).

Aim 4c. To determine the strength of the association between insomnia, bereavement (PBS), anxiety, and depression (HADS).

Hypothesis 4c. Insomnia will be significantly associated with bereavement, anxiety, and depression.

2. Methods

2.1 Participants

Participants of this study were comprised of two groups: 1) women who have had a miscarriage, and 2) male and/or female partners of women who have had a miscarriage. Of note, POWM were not be the actual partners of the women who have miscarried. Potential participants were required to be at least 18 years of age to be included in the study. In previous studies, involuntary reproductive loss has been defined as a loss prior to the range of 20-28 weeks, with several studies including stillbirth and neonatal death (as reviewed by Klier, Geller, & Ritsher, 2002). Thus, women and POWM were included in the present study if they had experienced a miscarriage at any time up through 27 completed weeks of gestation, i.e., 27 weeks plus 6 days. Those who have experienced a miscarriage over one year ago were excluded. According to the Diagnostic and Statistical Manual of Mental Disorders 5th Edition (DSM-5; American Psychiatric Association, 2013), Persistent Complex Bereavement Disorder is differentiated from normal grief based on criterion B, requiring that bereavement symptoms persist for at least 12 months. This study focused on uncomplicated bereavement, resulting in exclusion of women and POWM who have experienced a miscarriage over one year ago. However, the present study included women and POWM who have had a miscarriage over one year ago only if in addition they have experienced another miscarriage within the past one-year time frame. The questions were focused on the most recent miscarriage only. As previously

mentioned, bereavement is known as the period of grief and mourning after a loss and both of the terms ‘bereavement’ and ‘grief’ are often used interchangeably in the literature. A subtle but important difference between the two is that bereavement is the period of sadness after a death and grief, which is the normal process of reacting to the loss, occurs during this period (National Cancer Institute, 2013). It was the goal of our study to examine such grief symptoms from persons who are bereaved (i.e., feeling emotionally numb, unable to believe the loss has occurred, and symptoms of distress; National Cancer Institute, 2013). Aside from use of descriptive statistics, the design was correlational in nature and aimed to identify relationships among sleep, bereavement, anxiety, and depression up to one year post-miscarriage. We also assessed if women who miscarry experienced significantly more disturbance than POWM. To determine these relationships, 128 participants were needed to achieve 0.80 power to detect a difference using a two-sided hypothesis test with a significant criterion of 0.05 (Faul, Erdfelder, Lang, & Buchner, 2007; Faul, Erdfelder, Buchner, & Lang, 2009).

2.2 Measures

2.2.1 Demographics Questionnaire (Appendices A & B)

The demographics questionnaire helped to screen for those who have previously been diagnosed with depression and enabled the collection of variables such as gender, age, number of children, and number of previous miscarriages. There was one for women who have miscarried (see Appendix A) and another for POWM (see Appendix B).

2.2.2 Pittsburgh Sleep Quality Index (PSQI; Buysse, Reynolds, Monk, Berman, & Kupfer, 1989; Appendix C)

The PSQI measured the quality and patterns of sleep over the last month using 7 domains: Subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction. Scoring was based on a Likert Scale of 0-3, whereby 3 reflects the negative extreme. A global sum of “5” or greater indicated a “poor” sleeper. The PSQI has an internal consistency of .83 for all seven components and a test-retest reliability of .85 (Buysse, Reynolds, Monk, Berman, & Kupfer, 1989). The PSQI Global score was used in our analyses.

2.2.3 The Perinatal Bereavement Scale (PBS; Ritsher & Neugebauer, 2002; Appendix D)

The PBS is a measure of grief and yearning for the lost pregnancy and the lost baby. The set of seven pregnancy items contains statements such as "you dreamed you were still pregnant" and "you patted or held your belly as though you were still pregnant." The seven items about the loss of the baby include "you wanted to hold the baby in your arms" and "you imagined what the baby would have looked like." The remaining item asks if “you felt physically ill when you thought about the miscarriage." Respondents indicated how often the statement has been true in the last week, using a four point Likert scale ranging from "Rarely or none of the time, less than one day" (scored 1) to "most or all of the time, five to seven days"(scored 4). Responses were summed to yield a total score (possible range, 15-60) with higher scores indicative of more severe symptoms. The PBS has a high internal consistency and test-retest reliability with correlation coefficients

of .89 and .48-.69 respectively. The test-retest reliability was inversely related to the length of time between administrations of the measure: women interviewed both at 2 weeks and 6 weeks post-loss were found to have a test retest reliability of .69; 6 weeks and 6 months revealed .67 and 2 weeks and 6 months evidenced a coefficient of .48. The PBS evidenced adequate divergent validity-yearning (PBS) versus depression (Center for Epidemiological Studies-Depression Scale) with PBS accounting for only 12-26% of the variance in the CES-D score (Ritsher & Neugebauer, 2002). The PBS total score was used in our analyses.

2.2.4 The Hospital Anxiety and Depression Scale (HADS; Zigmond & Snaith, 1983; Appendix E)[1]

The HADS is a self-assessment scale used to detect states of depression and anxiety. The anxiety and depressive subscales are valid measures of severity of the emotional disorder. The anxiety (HADS-A) and depressive (HADS-D) scales each included seven 4-point Likert scale items to assess anxiety and depressive symptoms with higher scores indicating greater anxiety or depression. Cutoff scores are as follows: less than or equal to 7 for "non-cases," 8-10 for "doubtful" or subthreshold cases and 11 or more for "definite" cases. Anxiety questions consisted of "Do you ever feel tensed up?," "Worry a lot?," "Have panic attacks?," "Feel something awful is about to happen?". The

[1] HADS is a reliable self-assessment scale used to detect states of depression & anxiety. The subscales are also valid measures of severity of the emotional disorder (Zigmond & Snaith, 1982). Williams & colleagues outlined problems with this (i.e. Neurotic psych. disorder cannot be considered to be either present or absent since degree of distress is continuously distributed in the population). Questions related to 'how much' are more relevant than 'is it present'. Therefore, score ranges that indicate probable presence of clinically meaningful degrees of the mood disorder are more helpful. However, the cut off point for a 'case' in research may be either the upper or lower end of the borderline range and definite range (Williams, Tarnopolsky, & Hand, 1980)

mandatory questions for depression were “Do you take as much interest in things as you used to?,” “Laugh as readily?,” “Do you feel cheerful?,” “Feel generally optimistic about the future?” (Zigmond & Snaith, 1983). Cronbach’s alpha coefficient of internal consistency across 15 studies averaged at .83 for HADS-A and .82 for HADS-D; every study was found to have a Cronbach’s coefficient greater than .6, making this self- report instrument reliable (Bjelland, Dahl, Haug, & Neckelmann, 2002). HADS also sustains good concurrent validity, exhibiting similar sensitivity/specificity as longer versions of the General Health Questionnaire (GHQ). Correlations of HADS-D and HADS-A with the Beck Depression Inventory (BDI), the State-Trait Anxiety Inventory (STAI), the Clinical Anxiety Scale (CAS), and the Symptom Checklist-90 (SCL-90) depression and anxiety subscales were between .60 and .80 respectively (medium to strong correlations). Taken together the HADS evidences good to very good concurrent validity (Bjelland, Dahl, Haug, & Neckelmann, 2002).

2.2.5 The Insomnia Severity Index (ISI; Morin, 1993; Appendix F)

The ISI is a 7-item measure designed to assess the nature, severity, and impact of insomnia symptoms within the past two weeks based upon a 5 point Likert scale (0=no problem; 4=very severe). The ISI is a reliable (Cronbach’s alpha = .74) and valid ($p <$ .05, comparing to self-reports of sleep) measure that is commonly used among sleep researchers. The total score ranges from 0-28 with higher scores suggestive of more severe insomnia symptoms. A score of 7 or below is indicative of clinically non-significant insomnia, 8-14 has been suggested to indicate a clinical level of insomnia

symptoms (sub-threshold insomnia), 15-21 evidences moderate symptom severity and 22-28 signifies severe clinical insomnia symptoms (Bastien, Vallières, & Morin, 2001).

2.3 Procedure

Participants were recruited through Amazon Mechanical Turk (MTurk). The participants were provided with a description of the study, a link that took them to the survey, and an individualized ID and password. Before participating, the individual was prompted with an online informed consent (see Appendix G), which they had to read and accept before being allowed to begin the survey. MTurk has become increasingly popular as a source for both researchers and developers, containing over 200,000 registered workers and maxing out at 100,000 Human Intelligence Tasks (HITs) at any given time (Ross, Zaldivar, Irani, & Tomlinson, 2009). The majority of users complete surveys more often than any other type of HIT. Those who respond to surveys are found to: work less, have higher incomes, and are more likely to be from the U.S. than other users (Ross, Zaldivar, Irani, & Tomlinson, 2009). Users from the U.S. do not typically rely on Mechanical Turk as a primary source of income, are found to be younger compared to the general population of internet users, and have higher levels of education than the general U.S. population (Ipeirotis, 2010). Workers find tasks by browsing through the HITs search bar. The keywords associated with the current study are as follows: miscarriage, sleep, depression, anxiety, emotions, insomnia, and fertility. The estimated time for the survey was 20-30 minutes, including reading the consent. For completing, each participant received $1, which was distributed through each participant's Amazon

Payments Account. This protocol was approved by Drexel University's Institutional Review Board.

2.4 Aims, Hypotheses, and Proposed Data Analytic Strategy

Aim 1: To establish the presence and severity of sleep disturbance and bereavement in women and POWM.

Hypothesis 1a: Both women and POWM will experience significant sleep disturbance.

Proposed Analytic Strategy: Descriptive statistics of the PSQI total raw scores will convey the level of sleep quality in the overall sample compared to a normal population. In particular, the mean total raw score will be compared to the cutoff score of five. A score greater than or equal to 5 will be indicative of significant sleep disturbance.

Hypothesis 1b: Both women and POWM will experience significant bereavement symptoms.

Proposed Analytic Strategy: Descriptive statistics of these scores (i.e., mean and standard deviation) will indicate the degree of bereavement in the overall sample. One standard deviation above the mean from our sample will be considered the cutoff for significant bereavement because there is no normative data with which to compare the scores.

Hypothesis 1c: Women who underwent the pregnancy loss will experience significantly more sleep disturbance than POWM.

Proposed Analytic Strategy: An independent *t*-test will be conducted to compare sleep quality in the women who miscarried versus POWM, using the total raw scores from the PSQI as the dependent variable.

Hypothesis 1d: Women who underwent the pregnancy loss will experience significantly more bereavement than POWM.

Proposed Analytic Strategy: An independent *t*-test will be conducted to compare bereavement levels of women who miscarried versus POWM, using the PBS scores as dependent variables. Considering there is no normative data for the PBS, the total scale for women who have miscarried and the total scale with two questions taken out for partners of women who miscarry will be collected. In order to make a valid comparison, the same two questions that are taken out for the PBS for POWM will also be taken out for the PBS for women who miscarried. The total scores (of the final 13 item scale with two questions removed) will be used as the dependent variable.

Aim 2: To establish the presence of anxiety and depressed mood in women and POWM.

Hypothesis 2a: Both women and POWM will experience significant levels of anxiety

Proposed Analytic Strategy: Descriptive statistics of the Hospital Anxiety and Depression Scale-Anxiety total raw scores will convey the level of anxiety in the overall sample compared to a normal population. In particular, the mean total raw score will be compared to the cutoff score of seven. A score greater than 7 will be indicative of sub-threshold anxiety and a score of 11 or greater will be indicative of definite anxiety.

Hypothesis 2b: Both women and POWM will experience significant levels of depressed mood.

Proposed Analytic Strategy: Descriptive statistics of the Hospital Anxiety and Depression Scale-Depressive total raw scores will convey the level of depression in the overall sample compared to a normal population. In particular, the mean total raw score will be compared to the cutoff score of seven. A score greater than 7 will be indicative of sub-threshold depression and a score of 11 or greater will be indicative of definite depression.

Hypothesis 2c. Women who underwent the pregnancy loss will experience significantly more anxiety than POWM.

Proposed Analytic Strategy: An independent *t*-test will be conducted to compare mood dysregulation in the women who miscarried versus POWM, using the total raw scores from the Hospital Anxiety and Depression Scale-Anxiety subscale as the dependent variable.

Hypothesis 2d: Women who underwent the pregnancy loss will experience significantly more depression than POWM.

Proposed Analytic Strategy: An independent *t*-test will be conducted to compare mood dysregulation in the women who miscarried versus POWM, using the total raw scores from the Hospital Anxiety and Depression Scale-Depressive subscale as the dependent variable.

Aim 3: To determine the strength of the associations between sleep disturbance and bereavement, depression, and anxiety

Hypothesis 3: Sleep disturbance will be positively correlated with bereavement, anxiety, and depression

Proposed Analytic Strategy Bivariate correlations between the total raw PSQI Global score with each mood measure will be conducted. (i.e., total raw PBS scores and total raw HADS-A and HADS-D scores).

Aim 4a (exploratory): To determine the degree to which bereavement accounts for sleep disturbance while controlling for depression

Hypothesis 4a: Bereavement will significantly account for sleep disturbance while controlling for depression.

Proposed Analytic Strategy: A hierarchical analysis will be run using PBS total score as the independent variable and PSQI total score as the dependent variable. The depression total score on the Hospital Anxiety and Depression Scale will be loaded into Block 1, while the PBS total score will be loaded into Block 2.

Aim 4b (exploratory): To determine the severity of insomnia present among women who have miscarried and POWM.

Hypothesis 4b: Insomnia will be significantly prevalent among the miscarriage population

Proposed Analytic Strategy: Descriptive statistics of the ISI total raw scores will convey the level of insomnia symptom severity in the overall sample compared to a normal population. In particular, the mean total raw score will be compared to the cutoff score of seven. A score greater than 7 will be indicative of clinically significant insomnia symptoms.

Aim 4c(exploratory): To determine the strength of associations between insomnia, bereavement, anxiety, and depression.

Hypothesis 4c: Insomnia symptom severity will be positively correlated with bereavement, anxiety, and depression

Proposed Analytic Strategy: Bivariate correlations will be conducted between the total raw ISI score with each mood measure (i.e., total raw PBS scores and total raw HADS-A and HADS-D scores).

3. Results

3.1 Sample Characteristics

One hundred and fifty-five individuals (ages 19-45; M = 30.48; SD = 5.68) comprised the final sample. In total, 188 prospective participants logged in to take the survey. Thirty-two individuals who logged in did not meet the inclusion criteria and only 1 partially completed the survey. The individual who partially completed the survey was removed due to incomplete data. Out of the 32 persons that did not qualify, 1 individual was under the age of 18 and the other 30 did not live in the United States. Both women (N = 88; 56.8%) who experienced a miscarriage and male partners of women who experienced a miscarriage (N = 67) completed the online survey. Although both male and female partners of women who miscarried were invited to participate, there were only female partners of women who miscarried opted to take the survey; thus the term POWM only refers to male partners of women who miscarry. Data from the 155 participants was collected over a period of six days. The majority of the sample was Caucasian (68.4%),

followed by African American (12.3%), Asian (9%), Hispanic or Latino (5.1%), American Indian (4.5%), and South American (3.2%).

Frequencies were ran regarding if participants were: (1) currently pregnant while taking the survey; (2) trying to become pregnant again; and (3) concerned about future pregnancies (using a Likert scale of 1-10: 1 being not at all worried and 10 being extremely worried). Seventeen total participants reported being currently pregnant (5 women; 12 POWM), 40 participants reported they were trying to become pregnant again (16 women; 24 POWM), and women on average reported a score of 6.47/10 (SD = 3.14) compared to POWM who reported an average score of 6.52/10 (SD = 2.75) regarding concern for a future pregnancy. Regarding the 5 women who miscarried and 12 POWM who reported being currently pregnant while participating in the study, 5 participants are experiencing a pregnancy in the 1st trimester, 9 in the 2nd, and 3 in the 3rd. More than half of the participants were either married (58.7%) or in a relationship and living with their partner (19.1%).

About half of the sample reported not have any living children (N = 79; 51%) and a quarter of the sample reported having one child (N = 40; 25.8%). The remaining participants have 2 children (N = 23; 14.9%), 3 children (N = 8; 5.1%), 4 children (N= 4; 2.5%), or 5 children (N = 1; .6%). Almost all of the participants experienced only one miscarriage within the past year (N = 151; 97.4%), whereas four participants experienced two miscarriages (2.6%). The range of months since experiencing the miscarriage varies from less than one month to one year (M = 6; SD = 3.19). The total number of miscarriages experienced both during the one year scope of the study as well as those

beyond the one-year timeframe the study ranges from 1-7 (M = 1.3; SD = 0.83). Further demographic information is presented in Table 1.

3.2 Preliminary Analyses

3.2.1 Reliability. The internal reliability of the ISI, PSQI, HADS, and PBS were measured using Cronbach's Alpha. Analyses indicated good internal consistency for the ISI (α = .90), PSQI (α = .88), HADS-A (α = .85), HADS-D (α = .84), PBS-M (α = .86) and PBS-P (α = .86). All internal consistency statistics are reported in Table 2.

3.2.2 Normality. The HADS-A, PBS-Main, and PBS-POWM totals were normally distributed. The ISI, HADS-D, and PSQI violated assumptions of normality by producing a skewness value that is equal to or greater than twice its standard error.

In an attempt to rectify violations of normality, each non-normally distributed variable was transformed using square-root transformation techniques. Upon examination, this method of transformation approached normality but failed to normalize the distribution of the ISI and HADS-D scores. The square root transformation successfully normalized scores on the PSQI and was used for analyses. Means presented in tables and text are untransformed for ease of interpretation. Non-parametric tests (i.e., Mann Whitney analyses) were used for analyses including the ISI and HADS-D scales. When testing hypothesis 4a, the final sample used (N=116) revealed that a square root transformation of the HADS-D nearly normalized the scale. Both the square root transformation of the PSQI and the HADS-D were used in the hierarchical regression analysis.

3.2.3 Sample Means. Mean scores for the ISI, PSQI, HADS-A, HADS-D, and PBS are presented in Table 3. The table presents the means for females who miscarried and POWM, as well as the sample's combined mean scores on each measure. For each measure, females who miscarried produced a larger mean than POWM.

3.2.4 Bivariate Relationships. Bivariate relationships between all primary variables of interested are presented in Table 4. Pearsons r was used for all measures with normal distributions: HADS-A, PBS-P, and PBS-M. Spearmans rho was used for all other measures in which the distribution was skewed: ISI, HADS-D, and PSQI.

3.3 Primary Analyses

Aim 1: Hypothesis 1a. Descriptive statistics of the PSQI Global total raw scores yielded elevated sleep disturbance (PSQI-G $\geq$ 5) (M = 6.58; SD = 4.07) among our sample. A total of 96 participants (65.8%) produced a total PSQI score that was greater than or equal to 5. Seventy-two percent of women who miscarried experienced significant sleep disturbance (N = 64) and 48% of POWM experienced significant sleep disturbance (N = 32). Table 5 presents stratified data on the clinical thresholds for the PSQI. Figure 1 displays a visual representation of the sleep disturbance experienced by the current sample.

Hypothesis 1b. Descriptive statistics of the PBS for women who have miscarried revealed a mean score of 27.71. Elevated levels of bereavement (PBS $\geq$ 38) occurred in 13.4% (N = 11) of women who miscarried. Descriptive statistics of the PBS for POWM

yielded a mean score of 23.32. Elevated levels of bereavement (PBS $\geq$ 33) occurred in 15% (N = 9) of POWM.

Hypothesis 1c. Using the square root transformation of the PSQI total score, women who miscarried ($M_w = 7.42$, $SD_w = 4.15$) reported significantly more global sleep disturbance than partners of women who miscarried ($M_{POWM} = 5.44$, $SD_{POWM} = 3.69$). $t(144) = 2.71$, $p = .008$.

Hypothesis 1d. Women who experienced the miscarriage ($M_w = 26.38$; SD = 7.90) did not experience significantly more bereavement than POWM ($M_{POWM} = 25.34$; SD = 8.13); $t(122) = .71$, $p > .05$.

Aim 2: Hypothesis 2a. The aggregated sample of women who miscarried and POWM reported borderline abnormal levels or higher HADS-A scores (HADS-A clinical cutoff > 7; M = 7.78; SD = 4.77). Forty percent of women who miscarried experienced normal anxiety (N = 35), 22% experienced borderline levels of anxiety (N = 19), and 38% experienced abnormal levels of anxiety (N = 33). Sixty-four percent of POWM experienced normal anxiety levels (N = 42), 20% experienced borderline anxiety levels (N = 13), and 17% experienced abnormal anxiety levels (N = 11). Stratified clinical thresholds of the sample can be found in Table 5. Figure 2 displays the number of participants in each level of anxiety defined by the clinical cutoff points found in Table 5.

Hypothesis 2b. In combination, women who miscarry and POWM do not convey a significant level of depression (M = 5.95; SD = 4.51) compared to the HADS-D clinical cutoff score of 7. Sixty-three percent of women who experienced a miscarriage reported normal levels of depression (N = 55), 17% reported borderline depression levels (N =

15), and 20% reported abnormal levels of depression (N = 17). Sixty-five percent of POWM reported normal levels of depression (N = 42), 22% reported borderline depression levels (N = 14), and 14% reported abnormal levels of depression (N = 9). Further data regarding the frequency of the sample that is categorized into each clinical threshold can be found in Table 5. Figure 3 shows the amount of participants experiencing each level of depression defined by the clinical cutoffs presented in table 5.

Hypothesis 2c. Women who miscarried ($M_w = 8.90$; $SD_w = 5.11$) reported more anxiety than POWM ($M_{POWM} = 6.30$; $SD_{POWM} = 3.84$); $t(150) = 3.58$, $p < .001$.

Hypothesis 2d. Women (*Md* = 6; *n* = 87) and POWM (*Md* = 5; *n* = 65) did not report differences in their level of depression; $U = 2562.50$, $z = -.99$, $p = .32$, $r = .08$.

Aim 3: Hypothesis 3. Increased sleep disturbance was associated with elevated insomnia symptom severity ($r = .74$, $p < .01$), depression ($r = .40$, $p < .01$) and anxiety ($r = .49$, $p < .01$) in individuals who experienced a miscarriage. Increased sleep disturbance was also found to be associated with increased bereavement for women who miscarried ($r = .27$, $p < .05$) but *not* related to bereavement for POWM ($r = .12$, $p > .05$). A summary of these bivariate relationships is presented in Table 4.

Exploratory Aim 4a: Hypothesis 4a. Results of the hierarchical multiple regression analysis showed that the covariate depression significantly predicted sleep quality, r^2 change = .16, $F(1, 114) = 21.79$, $p < .001$. However, when the predictor variable bereavement was added to the model in block 2, it did not significantly account for variance in sleep quality, r^2 change = .16, $F(1, 113) = .27$, $p > .05$. Preliminary

analyses were conducted to ensure no violation of the assumptions of normality, linearity, multicollinearity, and homoscedasticity.

Exploratory Aim 4b: Hypothesis 4b. Descriptive statistics of the ISI convey that our sample experienced significant insomnia symptom severity (M = 8.32; SD = 6.35) compared to the cutoff score of 7. Thirty-nine percent of women who experienced the miscarriage reported no insomnia symptoms at a clinical level (N = 34), 42% reported sub-threshold insomnia (N = 37), 15% reported moderate insomnia (N = 13), and 5% reported severe insomnia (N = 4). Sixty-four percent of POWM reported no clinical symptoms of insomnia (N = 43), 24% reported sub-threshold insomnia (N = 16), 8% reported moderate insomnia (N = 5) and 5% reported severe insomnia (N = 3). Data regarding the clinical thresholds of the ISI can be found in Table 5. Figure 4 displays the number of participants that fall into the differing clinical thresholds of insomnia symptom severity.

Exploratory Aim 4c: Hypothesis 4c. Increased insomnia symptom severity was associated with increased depression (r = .54, p < .01), and increased anxiety (r = .58, p < .01). Of note, insomnia symptom severity was not related to bereavement for women who miscarried or POWM (r = .09 and r = .17, p >.05).

3.4 Post-hoc Analyses

3.4.1 Post-hoc 1. Bei and colleagues (2014) evidence that women experience more insomnia than men in general. Given this finding, a Mann-Whitney U test was conducted to see how women compare to men on the ISI in our sample. Results indicated that women who miscarried (*Md* = 9, *n* = 88) reported higher insomnia symptom severity than POWM (*Md* = 6, *n* = 67); *U* = 2147.50, *z* = -2.90, *p* = .004, *r* = .23. This is similar in

nature to Hale and colleagues' (2008) study in which women displayed a higher prevalence of insomnia symptoms (27.4%) compared to males (21.6%) and were also 36% more likely to report insomnia symptoms.

3.4.2. Post-hoc 2. In order to gain a full and more comprehensive perspective on the current sample, additional variables were analyzed to see if there were any group differences on any of the dependent variables in the study. Independent t-tests revealed no significant differences between individuals who are experiencing a current pregnancy (N = 17) and those who are not pregnant on the HADS-A and PSQI. Mann Whitney U analyses were conducted for the ISI and HADS-D, which also revealed no significant differences on either measure for individuals who are experiencing a current pregnancy and those who are not. The PBS was not included in these analyses due to the subject matter (i.e., cannot compare the alternate 7-item scale to the full scale due to the nature of the questions regarding the pregnancy loss when an individual is currently pregnant). Results for both parametric and nonparametric comparisons of these two groups can be found in Table 6.

Independent t-tests revealed no significant differences between individuals who experienced one as opposed to two miscarriages within the past year on the HADS-A, PSQI, and PBS. Mann-Whitney U analyses also revealed no significant differences for the ISI and HADS-D scales. Comparisons of these two groups can be found in Table 7

To analyze if women or POWM who are sleep deprived are more mood dysregulated or bereaved, an independent t-test was run on individuals who reported obtaining less than or equal to 6 hours of sleep against those who obtained 6.1 or more hours of sleep on anxiety, depression, and bereavement. Results revealed no statistical

differences for anxiety and depression but did show that those who received less than or equal to 6 hours of sleep (M = 27.63, SD = 8.48) experienced significantly more bereavement than those who received greater than 6 hours of sleep (M = 24.69, SD = 7.47); $t(119) = 2.03$, $p = .045$. Descriptive data shows that on average participants were obtaining 6.63 hours of sleep (SD = 1.54). Both significant and non-significant results of these two groups can be found in Table 8.

Further independent t-tests revealed no significant differences between individuals who experienced additional miscarriages outside of the 1-year study range on the HADS-A, PSQI, and PBS. A Mann Whitney U test revealed no significant difference for the ISI, but did pick up a significant difference of a small effect on the HADS-D for participants who experienced additional miscarriages ($Md = 8$, $n = 25$) and those who did not experience additional miscarriages beyond the study range ($Md = 5$, $n = 127$), $U = 1155.50$, $z = -1.16$, $p = .03$, $r = .18$). Comparisons of these two groups can be found in Table 9.

3.4.3 Post-Hoc 3. After assessing for group differences, correlational analyses were conducted to test the association between possible contributing variables and the dependent variables in the study.

The total number of living children was not found to be associated with anxiety, bereavement, insomnia, depression, or sleep disturbance. The number of months that have passed since experiencing the miscarriage was also not associated with anxiety, bereavement, insomnia, depression, or sleep disturbance. The total number of miscarriages was found to be significantly associated with increased sleep disturbance ($r = .17$, $p <. 05$) but was not significantly associated with anxiety, bereavement, insomnia,

or depression. Full statistical information of all these associations can be found in Table 10. A multiple regression analysis was conducted to analyze if the association found between total number of miscarriages and increased sleep disturbance could be accounted for by depression or anxiety. Preliminary analyses were conducted to ensure no violation of the assumptions of normality, linearity, multicollinearity, and homoscedasticity. The overall model explained a significant proportion of the variance in sleep disturbance r^2 = .22, $F(3, 139) = 12.79$, $p < .001$. Anxiety significantly predicted sleep disturbance b = .08, $t(139) = 3.41$, $p = .001$. Both depression and total number of miscarriages did not significantly contribute to the prediction of sleep disturbance whereas anxiety explained 41% of the variance (*beta* = .41).

Friedman and Gath (1989) found that even within the first 4 months after miscarriage, women were beginning to recover from depression. In light of this research, the sample was divided between those who experienced a miscarriage within the past 0-4 months and those who have experienced a miscarriage more than 4 months ago. A Mann Whitney U test revealed that those who experienced a miscarriage in the last 4 months ($Md = 7$, $n = 57$) did not report significantly higher levels of depression than those who experienced a miscarriage more than 4 months ago ($Md = 5$, $n = 88$), $U = 2088.5$, $z = -1.70$, $p > .05$.

3.4.4 Post-Hoc 4. Considering the current sample did not display significant levels of depression, a multiple regression analysis was conducted to follow-up the exploratory hypothesis 4a (if bereavement significantly accounted for sleep disturbance above and beyond depression). In this post-hoc analysis, anxiety, which is closely related to depression, was included as a predictor variable for sleep disturbance along with

bereavement and depression. The overall model explained a significant proportion of the variance in sleep disturbance (even more so than just the model with bereavement and depression), $r^2 = .25$, $F(3, 113) = 11.92$, $p < .001$. With regard to the individual contribution of each predictor variable, bereavement and depression did not significantly contribute to the variance of sleep disturbance above and beyond anxiety. Anxiety was the only variable to significantly account for variance in sleep disturbance, $b = .09$, $SE = .024$, $t(113) = 3.48$, $p = .001$. Anxiety accounted for 48% of the variance in sleep disturbance (*beta* = .48).

4. Discussion

To our knowledge, this is the only study designed to examine sleep dysregulation in the context of miscarriage and the first study in two decades that has re-evaluated male partner reactions to miscarriage. It is also the only known study to use standardized measures specific to the bereavement of a miscarriage for both women and POWM. In sum, data from our sample shows participants experienced an elevated level of sleep disturbance, bereavement, anxiety, and insomnia in the time range of less than 1 month -1 year following a miscarriage. Depression was not found to be elevated in this sample. Women reported significantly higher levels of sleep disturbance, anxiety, and insomnia compared to POWM. There were no significant differences between women and POWM on their levels of bereavement or depression. Further analyses revealed a significant association between sleep disturbance, anxiety, depression, insomnia and bereavement for women who miscarried. There was no association at a significant level between sleep disturbance and bereavement for POWM. In addition, insomnia was found to be

associated with depression and anxiety but was not found to be significantly associated with bereavement for women or POWM. Planned exploratory analyses indicated that bereavement did not significantly account for the variance in sleep disturbance when controlling for depression. When a follow-up analysis was conducted consisting of anxiety, depression, and bereavement as predictors in the model, anxiety was found to be the only variable to significantly account for the variance in sleep disturbance.

Sleep Disturbance

Our first aim was designed to assess both sleep disturbance and bereavement levels of women who have experienced a miscarriage and POWM. Findings indicated that both females as well as POWM experienced elevated sleep disturbance. Grandner and colleagues' (2012) study revealed that women and men ages 18-45 experience sleep disturbance at a rate of 20.6%-25.1% and 14.6%-18.1% respectively. In comparison, 72% of women and 48% of POWM in the current sample reported sleep disturbances at a clinical level. Our findings show that women and men post-miscarriage experience approximately three times the normal rate of reported sleep disturbance. In light of this, sleep may be critical to assess post-miscarriage, as it may be a clinically relevant target in assisting men and women post-loss.

The noted gender difference in global sleep disturbance is consistent with prior studies which show that sleep disturbances are more common in women than men and are often heterogeneous with a multi-factorial origin (i.e., hormonal changes, age-related physiological changes; Bei, Coo, Baker, & Trinder, 2014). There is a difference of 24% of women who reported sleep disturbances more so than men compared to the average 6.5% difference in Grandner and colleagues' (2012) study. The elevated sleep

disturbance is logical given the psychological consequences of miscarriage and perhaps women who miscarried are going through additional hormonal changes that accounts for the increased percentage compared to male partners who experienced a miscarriage.

Insomnia

Both women who miscarried and POWM were found to experience significant insomnia symptom severity post-miscarriage. Morin, LeBlanc, Daley, Gregoire, and Mérette (2006) identified the prevalence of insomnia syndrome in ages 18-29 (7.3%), 30-39 (9.2%), and 40-49 (10.7%). The prevalence in the current study are higher than those found in Morin's study with 20% of women and 13% of men reporting moderate to severe insomnia. Our findings are also higher than the prevalence reported by the American Academy of Sleep Medicine (2008) where reportedly 10% of adults have insomnia severe enough to cause daytime consequences. Similar to Reddy and Chakrabarty's (2011) research, increased insomnia symptom severity was associated with increased anxiety and depression. An overview of research on sleep and emotions has shown that sleep impairments such as insomnia are only presented in grief when participants also report depression; otherwise only mild impairments in sleep are noted (Baglioni, Spiegelhalder, Lombardo, & Riemann, 2010). Considering there was an absence of clinical depression in the current sample and insomnia was not found to be associated with bereavement, the present study is congruent with previous research. Although insomnia is not directly associated with bereavement, alleviation of these symptoms may result in a decrease of anxiety and depression given their significant associations.

Finally, post-hoc analyses suggest that women experience more insomnia than men post-miscarriage, which is similar to the general trend of women having a higher rate of insomnia than men (1.41:1), which emerges post-menarche (Bei, Coo, Baker, & Trinder, 2014; Johnson, Roth, Schultz, & Breslau, 2006). In order to properly assess for differences between groups within our study on all of our dependent measures, further post-hoc analyses were conducted. Findings revealed that there was no significant difference between individuals who are currently experiencing a pregnancy and those who are not, nor in individuals who had one miscarriage as opposed to two within the past year on all dependent measures. Participants who experienced additional miscarriages beyond the 1-year scope of the study and those who did not revealed no significant differences in anxiety, sleep disturbance, or insomnia but did reveal a significant difference of a small association on depression.

Bereavement

Through our sample, we were also able to establish what elevated levels of grief look like for women and POWM. Data revealed that high levels of grief occurred in 13% of females who miscarried and 15% of POWM. In comparison, Neugebauer and Ritsher (2005), the creators of the PBS scale, found that 20.3% of women were grief stricken at 6-8 weeks post-loss and 19.1% at a 6-month post-loss follow-up. The lower percentages found in the current study may be due to extending the time-frame to 1 year post-loss, which may have allowed participants more time to work through their feelings of grief. In addition, the sample may be slightly biased in that those who are actively searching MTurk or active on the Internet in general may be experiencing lower levels of grief or depressed mood than individuals who did not participate who may be more withdrawn

and depressed. There is currently no PBS data in which to compare POWM; thus the reported levels of partner grief in this study are novel to the miscarriage literature. Although the mean score for the PBS was higher for women than men, there was a higher frequency in the number of bereaved men compared to women. This shows that women may experience higher levels of bereavement but men may be more prone to grieve, only, at a lesser degree than women. The finding that women reported a higher bereavement score compared to men is concurrent with that of Sidmore (1999) who revealed that women experienced higher levels of grief than men. It is also similar to research (which also included stillbirth and neonatal death) that found mothers experienced feelings of depersonalization to a greater extent than fathers at varying time frames post-loss (12 months, 20-26 months, and 2-4 years; Lang & Gottlieb, 1993; Bohannon, 1990-1991; Smith & Borgers, 1988-1989; Fish, 1986). However, the current findings are juxtaposed to Tudehope and Colleagues (1986) study on neonatal death, which revealed that fathers exhibited denial of the child's death. The data from this sample is in opposition to the reactions of neonatal death documented 30 years ago, revealing that fathers do grieve the loss of a miscarriage and do not appear to be in denial but mothers experience a higher level of grief. This again can be due to the fact that the woman was bearing the child prior to the loss and may have been more emotionally invested. A major contribution of the current study was the reassessment of male reaction to miscarriages. The data from this study reveals that male partners do grieve and are now acknowledging their own grief. This is important for medical staff to keep in mind when discussing the miscarriage and the partner perspective/feelings of loss should be taken into account during this situation. If partners are being neglected during this time, it may make their grieving

process as well as their healing process more complex and drawn out than if they were acknowledged. Considering Geller and colleague's 2010 review which revealed that men desired an explanation of the loss, laboratory tests determining the potential cause of loss, and to see the baby after death, it seems imperative that they are included in medical discussions and that their feelings are taken into account.

Sequelae of Miscarriage

While the psychological sequelae of miscarriage is under-researched, Lok and Neugebauer (2007) indicate that grief, depression, and anxiety seem to be the most common psychological reactions. Therefore, our second aim was to assess the level of anxiety and depression experienced post-miscarriage by women and POWM. Findings show that both women and POWM experienced elevated anxiety levels but contrary to previous studies, neither group experienced significant depression levels. This further supports that bereavement and depression are two distinct constructs and in the aftermath of a loss, they should be treated as such. Another consideration is that individuals who are depressed may not be inclined to go online and/or log on to MTurk to fill out research surveys as they may be more withdrawn and less social on Internet platforms. Thus our data may represent less depressed individuals, which may account for some of the lower reporting of depression in the captured sample.

Although research is mixed, substantial evidence maintains the hypothesis that women demonstrate greater fear and anxiety than men across the lifespan (Mclean & Anderson, 2009). The present data supports the findings that women experience more anxiety than POWM; however, women and men did not significantly differ in their level of depression. The current sample may be exhibiting such high levels of anxiety due to

either being currently pregnant or trying to become pregnant again in tandem with their fear of future pregnancies. Between the 17 active pregnancies, 40 attempted future pregnancies, and a concern for the outcome of new pregnancies, the current sample exhibits many reasons to report high anxiety in addition to having gone through a miscarriage which has been marked as a painful, traumatic and sometimes identity-defining event (Hardy & Kukla, 2015).

Potential Pathways

The association between sleep disturbance, insomnia, anxiety, depression, and bereavement was undertaken to better understand correlating and contributing factors that are related to sleep disturbance in the aftermath of a miscarriage. Findings are in accordance with prior research by Reddy and Chakrabarty (2011) as well as Zisook and Shear (2009), and indicate that increased sleep disturbance is associated with increased insomnia, anxiety, depression, and bereavement for women. Sleep disturbance was not, however, found to be associated with bereavement levels for POWM. This finding contrasts with previous studies, which found that bereavement, is associated with poor sleep quality and changes in sleep architecture and continuity (Buckley et al., 2012; Monk, Germaine, & Reynolds, 2008). One hypothesis that could account for this difference is that women in addition to reporting higher levels of bereavement compared to men, are experiencing hormonal changes that may be resulting in more disturbed sleep. The finding that sleep disturbance shares a positive association with bereavement for women merits further study and can become a key component to address in follow-up care for women who have experienced a miscarriage.

The Relationship Between Bereavement, Depression, and Sleep quality

Our fourth aim was exploratory in nature and primarily sought to examine if bereavement significantly predicted poor sleep quality above and beyond the variance accounted for by depression. Previous research has suggested that bereavement can result in or become an independent risk factor for poor sleep and/or sleep disturbance (Buckley et al., 2012; Monk, Germaine, & Reynolds, 2008; Stahl & Shulz, 2013). Our findings did not support our hypothesis and revealed that depression but not bereavement significantly predicts poor sleep quality. Considering that our sample experienced significant sleep disturbance but did not display significant levels of depression, this suggests there could be another variable that predicts sleep quality post-miscarriage that is worth investigating After conducting a post-hoc analysis, anxiety, which is often related to depression, was found to be a leading variable that accounts for poor sleep quality in a miscarriage population. After adding anxiety to the regression analysis, neither bereavement nor depression was found to significantly account for sleep disturbance. Additionally, after the loss of a potential child, feelings of ambivalence (loss of ability to make sense of what the individuals are experiencing and how it fits in with their larger life story, plans, social identity, and embodied sense of self; Hardy & Kukla, 2015) arise that may cause cognitive arousal and sleep disturbances.

Factors That May Affect the Psychological Sequelae of Miscarriage

In addition to assessing for any group differences, further correlational analyses were conducted between variables that could logically contribute to changing the level of any of the dependent measures. Findings indicated that the number of living children and the number of months that have passed since the miscarriage were not associated with

anxiety, bereavement, insomnia, depression, or sleep disturbance. The total number of miscarriages was only found to be associated with increased sleep disturbance but when added in a regression analysis with anxiety and depression, anxiety was the only variable found to significantly account for sleep disturbance. In contrast, prior research has found that the history of previous spontaneous abortions is a supposed risk factor for depression (Friedman & Garth, 1989). One reason for a higher rate of depression in the previous study could be the difference in time frame (4 months post-miscarriage) comparable to our study, which encompasses a one-year range. In Friedman and Gath's (1989) study, the depression present was relatively mild and the researchers suggest that many of the patients were already recovering. Given this information, the present sample was divided into participants who experienced a miscarriage within the last 4 months and those who experienced a miscarriage more than 4 months ago. Analyses indicated a higher level of depression among the first 4 months but not at a statistically significant level. Total sleep time (i.e., those who obtained 6 hours of sleep or less compared to more than 6 hours) revealed a significant difference in grief levels. Specifically, individuals who received less than or equal to 6 hours of sleep experienced significantly more grief than those who received greater than 6 hours of sleep. This reveals an important relationship showing that bereavement may be compromising the amount of sleep people are getting or the lack of sleep reported may contributing to stronger feelings of grief and bereavement. Alternatively, those who obtain only 6 hours of sleep may contribute to the experience of a greater amount of grief or bereavement.

4.1 Limitations

This study was designed as a de-identified, anonymous survey on sleep, anxiety, depression, and bereavement in a miscarriage population for both women as well as male and female partners of women who have experienced a miscarriage. There were no female partners of women who opted to take the survey and this sample remains underrepresented in miscarriage research. Thus, the 'partners' psychological reactions to miscarriage only encompasses male POWM and in future studies, recruitment may be more valuable if it is aimed at also enrolling female POWM. The inclusion of both genders will assist in obtaining a complete exhibition of partner sequelae after a miscarriage. Peel (2009) suggests that bereavement and grief can become even more complex when involving non-normative relational contexts (i.e., lesbian couples).

Our sample was not fully representative due to confining our study to the United States and also obtaining a sample with a majority of participants who reported their ethnic background as Caucasian. This limits other cultural reactions and psychological sequelae that other countries may be experiencing. Qualitative research on the feedback of miscarriage management options revealed five major themes: intervention, experiences of care, finality, the baby, and pain and bleeding (Smith, Frost, Levitas, Bradley, & Garcia, 2006). Individuals in varying parts of the world may contribute to these five aspects differently, which may affect the management of an individual's miscarriage. The inclusion of non-Western industrialized countries may reveal differences in non-Anglo European cultures that are either more or less beneficial to healing post-miscarriage than those experienced in America.

This is a cross-sectional study, making it difficult to determine a temporal relationship. Data must also be interpreted with caution as the associations found are bidirectional in nature and cause and effect cannot be established. Future longitudinal studies must be conducted before theoretical directions and cause and effect can be observed. In addition this study only reached individuals who have access to a computer and the Internet. Supplementary to having Internet access, participants were also MTurk users who displayed an increased SES and education level. Another consideration is that this study contained self-reported data with no objective measures utilized. Lastly, inherent bias for participants who choose to fill out the survey (i.e., the more upset someone is, the more prone they are to respond to the questionnaire or vice versa) is also possible within online research.

4.2 Future Directions

Future studies should seek to include objective measurements of sleep such as those obtained through PSG or actigraphy data. In addition, clinical interviews to aid in the assessment of anxiety, depression, and bereavement may also prove to be helpful.

In the future, the inclusion of female partners of women who miscarry will broaden the generalizability of study findings and also provide a more comprehensive assessment of partner reactions to miscarriage. This additional factor also enables further research on female partner pregnancies and if personally experiencing a miscarriage offers different psychological sequelae than being a partner of a woman who has miscarried. For example, if a female POWM has also previously personally experienced a miscarriage, research could reveal the difference of personal verses partner sequelae

considering they have experienced both. Or simply just being a female partner could prove to have varying sequelae from that of a male partner.

Future studies may also benefit from including additional comparison groups of women who have chosen to abort. This degree of autonomy would be prove to be interesting in contrast to the psychological sequelae of spontaneous abortion. By adding groups that experience an elective abortion and/or a therapeutic abortion (due to a medical anomaly or a risk to the mother's health), researchers can gain access to a fuller spectrum of emotions and sleep changes in the varying situations of losing or terminating a pregnancy. Gaining this perspective on the differing psychological sequelae would assist in adding meaningful knowledge to the current body of science, providing a comprehensive picture of the emotional complexity that occurs post-loss, and in treatment planning for each group post-abortion to see what may be most helpful. An additional direction could be to design a prospective longitudinal study that provides sleep therapy post miscarriage in order to assess if bereavement is significantly improved against a control group who receives treatment as is. Using a prospective longitudinal design to follow participants throughout their bereavement process would better assist in understanding for whom, under what context, and during which specific time periods bereavement and sleep are most exacerbated, leading to when treatment may be most helpful.

Given all of the established research published on sleep, bereavement, anxiety, and depression, it is imperative to replicate studies similar in nature to the present study to fully encompass and understand the associations and connections of these variables within a miscarriage population. In the future, a larger sample size with a more diverse

group of participants (i.e., more equally distributed race categories as well as all types of partners) should be utilized.

4.3 Conclusions

From our sample, it has been established that within the psychological sequelae of miscarriage, sleep disturbance, bereavement, anxiety, and insomnia are found to be present. While depression was not elevated within our sample, this data also support the idea that bereavement and depression are two distinct constructs and should be treated as such. The inclusion of sleep in post-loss research has proven to be important and may be a critical health variable to observe for future treatments and to assist in better understanding the sequelae of miscarriage. Specifically, total sleep time was found to be associated with bereavement levels and individuals who were obtaining 6 hours or less may be at a higher risk for suffering from grief.

Bereavement and sleep quality were ambiguously related in this sample (sleep quality was only associated with female but not male partner bereavement) and further exploration of what is perpetuating and contributing to these two variables is warranted. It may prove to be more important physiologically for women to obtain restorative sleep post-miscarriage due to hormonal changes or other factors related to carrying a child. Despite Germain and colleagues' (2008) revealing that the severity of grief symptoms and depression severity were found to be predictors of poor sleep quality, the current study did not find bereavement to predict sleep quality beyond depression. Even though bereavement did not account for sleep disturbance above and beyond depression, it is unclear whether those who have poor sleep quality may be contributing to bereavement. Also, when anxiety was added to the model, depression no longer significantly accounted

for the variance in sleep disturbance. Future studies should focus on how the treatment of anxiety and sleep after a miscarriage can assist women and POWM post-loss. It may be particularly important to help alleviate these symptoms in patients who are seeking to become pregnant again after a miscarriage in order to assist with mental (anxiety) and physical (sleep) stabilization. It is impossible to definitively establish cause and effect because we are unsure about the order of the relationship of variables but research has also shown that sleep disturbance is thought to contribute to the associated medical morbidity of bereavement (Zisook et al., 2014).

Future research should seek to clarify the relationships between insomnia, sleep quality, bereavement, anxiety, and depression in the hopes of beginning to create a post-miscarriage treatment protocol for women and POWM. Considering there is a small association between sleep quality and bereavement for women who miscarry and that insomnia is often comorbid with anxiety and depression (Reddy & Chakrabarty, 2011; Zisook & Shear, 2009), further research should be conducted to establish for whom and under what conditions insomnia and anxiety may be associated in a miscarriage population. If an association is discovered, it can begin to pave a treatment option for women and POWM post-miscarriage. Due to the limited time and resources of medical staff, shorter behavioral treatments for insomnia have been developed that are between one and four sessions, lead to meaningful improvement in sleep, and can be conducted by nurses and trained masters level interventionist. These sessions can be easily transportable into settings where bereaved individuals typically seek care and/or support. Sleep hygiene and behavioral techniques such as stimulus control and sleep restriction can be easily taught to partners and women who experienced a miscarriage to improve

their sleep (Monk, Germain, & Reynolds, 2008), hopefully helping to manage their grief during their most intense bereavement periods. If a link between bereavement, sleep, and those who suffer within a miscarriage population is established, there are feasible options within our current healthcare system that should be made known to these patients and their partners.

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Table 1. Self-Reported Demographic Characteristics (N=155)

		WOMEN	MEN (POWM)	Total M & F Combined
Variable	**Group**	**Frequency (Percentage)**	**Frequency (percentage)**	**Frequency (percentage)**
Gender		88 (56.8%)	67 (43.2%)	155 (100%)
Education(highest level completed)	9^{th}-11^{th} grade	0 (0%)	1 (.6%)	1 (.6%)
	High school or GED	7 (4.5%)	2 (1.3%)	9 (5.8%)
	Some college but no degree	30 (19.4%)	12 (7.7%)	42 (27.1%)
	Associates degree	11 (7.1%)	8 (5.2%)	19 (12.3%)
	Bachelor's degree	26 (16.8%)	29 (18.7%)	55 (35.5%)
	Master's degree	11 (7.1%)	13 (8.4%)	24 (15.5%)
	Doctoral degree	2 (1.3%)	2 (1.3%)	4 (2.5%)
Ethnicity*	Caucasian	64 (41.3%)	42 (27.1%)	106 (68.4%)
	Black	11 (7.1%)	8 (5.1%)	19 (12.3%)
	Hispanic/Latino	5 (3.2%)	3 (1.9%)	8 (5.1%)
	American Indian	5 (3.2%)	2 (1.3%)	7 (4.5%)
	Asian	4 (2.5%)	10 (6.5%)	14 (9%)
	Brazilian/Other South American	3 (1.9%)	2 (1.3%)	5 (3.2%)
Marital Status	Married	46 (29.7%)	45 (29%)	91 (58.7%)
	In relationship + living with partner	28 (18.1%)	17 (11%)	45 (19.1%)
	In relationship + not living with partner	2 (1.3%)	3 (1.9%)	5 (3.2%)
	Re-married	2 (1.3%)	0 (0%)	2 (1.3%)
	Single and never married	4 (2.6%)	1 (.6%)	5 (3.2%)
	Divorced	6 (3.9%)	0 (0%)	6 (3.9%)
	Separated	0 (0%)	1 (.6%)	1 (.6%)
Employment Status	Full time	58 (37.4%)	58 (37.4%)	116 (74.8%)
	Multiple jobs	1 (.6%)	4 (2.6%)	5 (3.2%)
	Part time	8 (5.2%)	1 (.6%)	9 (5.8%)
	Self-employed	2 (1.3%)	3 (1.9%)	5 (3.2%)
	Homemaker	9 (5.8%)	1 (.6%)	10 (6.4%)
	Student	7 (4.5%)	0 (0%)	7 (4.5%)
	Unemployed < 1 yr	1 (.6%)	0 (0%)	1 (.6%)

Table 1.
Continued

		WOMEN	MEN (POWM)	Total M & F Combined
Variable	**Group**	**Frequency (Percentage)**	**Frequency (percentage)**	**Frequency (percentage)**
	Unable to work	2 (1.3%)	0 (0%)	2 (1.3%)
Sexual Preference*	Heterosexual (straight)	80 (51.6%)	62 (40%)	142 (91.6%)
	Bisexual	7 (4.5%)	2 (1.3%)	9 (5.8%)
	Gay or Lesbian	0 (0%)	1 (.6%)	1 (.6%)
	Not sure/Prefer not to answer	1 (.6%)	1 (.6%)	2 (1.2%)
Total Number of Children	0	41 (26.5%)	38 (24.5%)	79 (51%)
	1	22 (14.2%)	18 (11.6%)	40 (25.8%)
	2	15 (9.7%)	8 (5.2%)	23 (14.9%)
	3	6 (3.9%)	2 (1.2%)	8 (5.1%)
	4	3 (1.9%)	1 (.6%)	4 (2.5%)
	5	1 (.6%)	0 (0%)	1 (.6%)
Number of miscarriages within the last year	1	86 (55.4%)	65 (41.9%)	151 (97.4%)
	2	2 (1.3%)	2 (1.3%)	4 (2.6%)
Number of months since miscarriage	Less than 1m	0 (0%)	2 (1.3%)	2(1.3%)
	1	5 (3.2%)	2 (1.3%)	7 (4.5%)
	2	8 (5.2%)	3 (1.9%)	11 (7.1%)
	3	7 (4.5%)	9 (5.8%)	16 (10.3%)
	4	14 (9%)	9 (5.8%)	23 (14.8%)
	5	10 (6.5%)	5 (3.2%)	15 (9.7%)
	6	9 (5.8%)	4 (2.6%)	13 (8.4%)
	7	9 (5.8%)	5 (3.2%)	14 (9%)
	8	5 (3.2%)	7 (4.5%)	12 (7.7%)
	9	4 (2.6%)	1 (.6%)	5 (3.2%)
	10	6 (3.9%)	6 (3.9%)	12 (7.8%)
	11	6 (3.9%)	5 (3.2%)	11 (7.1%)
	12	5 (3.2%)	2 (1.3%)	7 (4.5%)

Table 1. Continued

Variable	Group	WOMEN **Frequency (Percentage)**	MEN (POWM) **Frequency (percentage)**	Total M & F Combined **Frequency (percentage)**
Have you experienced additional Miscarriages (outside of 1 year range of study)	Yes	17 (11%)	8 (5.2%)	25 (16.2%)
	No	71 (45.8%)	59 (38.1%)	130 (83.9%)
Number of miscarriages (outside 1 year study range)	1	9 (5.8%)	6 (3.9%)	15 (9.7%)
	2	5 (3.2%)	0 (0%)	5 (3.2%)
	3	3 (1.9%)	1 (.6%)	4 (2.5%)
	6	0 (0%)	1 (.6%)	1 (.6%)
Are you actively trying to become pregnant again	Yes	16 (10.3%)	24 (15.5%)	40 (25.8%)
	No	72 (46.5%)	43 (27.7%)	115 (74.2%)

*1 Missing

Females
Black- all 11 = African American
Hispanic/Latino breakdown: 3 (1.9%) Mexican; 2 (1.3%) Puerto Rican
Asian breakdown: Indian/Pakistani/Bangladeshi/Indian Subcontinent 3 (1.9%); Southeast Asian- 1 (.6%)

Males
Black 6 = African American (3.9%); 2=Afro-caribbean (1.3%)
Hispanic/Latino — 2 Mexican (1.3%); 1 Dominican republic (.6%)
Asian breakdown: Indian/Pakistani/Bangladeshi/Indian Subcontinent 5 (3.2%); Chinese Taiwanese 2(1.3%); Korean 1 (.6%); Southeast Asian 2(1.3%)

Table 2. Internal Consistency of Primary Measures

Measure	Mean	Standard Deviation	Cronbach's Alpha	Number of People
Insomnia Severity Index	8.32	6.35	0.90	155
Pittsburgh Sleep Quality Index	6.58	4.07	0.88	146
Hospital Anxiety and Depression Scale—Anxiety Sub	7.78	4.77	0.85	153 (2 ppl missed 1 Q each and were excluded)
Hospital Anxiety and Depression Scale-- Dep. Sub	5.95	4.51	0.84	152 (3 ppl missed 1 Q each and were excluded)
Perinatal Bereavement Scale-MAIN	28.7*	8.48*	0.86	74 (took out alternate and missing scores)
Perinatal Bereavement Scale-PARTNER	25.34*	8.13*	0.86	50 (took out alternate and missing scores)

*Means and SDs are different than that of main analyses because for the reliability analyses, researcher was required to remove "alternate" scores (i.e., if the woman or POWM was currently pregnant) as they repeat some of the main questions.
5 completed alternate scores were removed for this analysis for PBS-Main
12 completed alternate scores were removed for this analysis for PBS-Partner

Table 3. Means of Measures

	Female-women who miscarried (N=88)				POWM- Male partners (N=67)				Amalgamated (N=155)			
Measure	**N**	**Median**	**Mean**	**SD**	**N**	**Median**	**Mean**	**SD**	**N**	**Median**	**Mean**	**SD**
ISI	88	9	9.5	6.33	67	6	6.78	6.08	155	8	8.32	6.35
PSQI	84	7	7.42	4.15	62	5	5.44	3.69	146	6	6.58	4.07
HADS-A	87	9	8.9	5.11	66	6	6.3	3.84	153	7	7.78	4.77
HADS-D	87	6	6.33	4.77	65	5	5.45	4.11	152	5.5	5.95	4.51
PBS*	82	29	27.71	9.6	60	22	23.32	8.94	x	x	x	x

*Includes alternate scores in descriptives (results in different means for reliability analyses and descriptive table). The alternate scale consists of only 7 items, excluding items that would no longer pertain now that the participant is pregnant again (i.e., 'you found yourself walking like a pregnant woman' or 'you felt as if the baby were still inside of you', etc.). Each item is still scored 0 (skip), 1 (rarely/none of the time), 2(some of the time), 3(moderate amount of time) and 4(most or all of the time). This results in a range of 0-28 instead of the full main scale which consists of 15 items (range: 0-60) or the partner scale, which consists of 13 items (range: 0-52).
8 completed alternate scores for PBS for women who miscarry were included in descriptives
10 completed alternate scores for PBS for POWM were included in descriptives

Table 4. Correlation Matrix of Primary Variables of Interest

	ISI	HADS-D	HADS-A	PSQI	PBS-P	PBS-M
ISI						
HADS-D	***.54***					
HADS-A	***.58***	***.79***				
PSQI	***.74***	***.40***	***.49***			
PBS-P	***.09***	***-.02***	-.05	***.12***		
PBS-M	***.17***	***.26****	-.08	***.27****	c	

Insomnia Severity Index (ISI)
Hospital and Anxiety Scale-Depression (HADS-D)
Hospital and Anxiety Scale-Anxiety (HADS-A)
Pittsburgh Sleep Quality Index (PSQI)
Perinatal Bereavement Scale-Partners (PBS-P)
Perinatal Bereavement Scale-Main (PBS-M)
**p<.01
*p<.05
c – Cannot be computed because at least 1 of the variables is constant
Bold/Italicized- Non-parametric correlation analysis performed due to skewed data

Table 5. Clinical Thresholds

	Frequency (%) of women who miscarried				Frequency (%) POWM			
	NCS	**Subthreshold**	**Moderate**	**Severe**	**NCS**	**Subthreshold**	**Moderate**	**Severe**
ISI	34 (38.6%)	37 (42%)	13 (14.8%)	4 (4.5%)	43 (64.2%)	16 (23.9%)	5 (7.5%)	3 (4.5%)
	Normal lvls	**Borderline Abnormal**	**Abnormal lvls**		**Normal lvls**	**Borderline Abnormal**	**Abnormal lvls**	
HADS-A	35 (40.2%)	19 (21.8%)	33 (37.9%)		42 (63.6%)	13 (19.7%)	11 (16.7%)	
HADS-D	55 (63.2%)	15 (17.2%)	17 (19.5%)		42 (64.6%)	14 (21.5%)	9 (13.8%)	
	Normal SD	**Significant SD**			**Normal SD**	**Significant SD**		
PSQI	20 (22.7%)	64 (72.7%)			30 (44.8%)	32 (47.8%)		

NCS = not clinically significant
SD = sleep disturbance

Table 6. Comparison of Individuals Experiencing a Current Pregnancy and Those Who Are Not on Main Measures

	Not Currently Pregnant			Currently Pregnant					
Measure	M	SD	N	M	SD	N	*t*	*df*	*p*
HADS-A	7.69	4.84	136	8.47	4.2	17	0.63	151	0.53
PSQI	6.7	4.18	131	5.47	2.8	15	0.71	144	0.48
			Non-parametric Statistics				***U***	***Z***	***p***
ISI	8.54	6.49	138	6.47	4.81	17	979.5	-1.11	0.27
HADS-D	5.93	4.54	135	6.12	4.39	17	1097	-0.3	0.77

Table 7. One Versus Two Miscarriages In-Study

	Individuals who experienced 1 miscarriage in the past year				Individuals who experienced 2 miscarriages in the past year					
Measure	**M**	**SD**	**N**		**M**	**SD**	**N**	***t***	***df***	***p***
HADS-A	7.72	4.73	149		9.75	6.7	4	-0.84	151	0.4
PSQI	6.55	4.11	142		7.5	2.52	4	-0.68	144	0.5
PBS	26.02	8	122		22.5	7.78	2	0.62	122	0.54
				Non-parametric Statistics				***U***	***Z***	***p***
ISI	8.3	6.41	151		8.75	3.6	4	265	-0.42	0.68
HADS-D	5.92	4.5	148		7.5	5.26	4	230.5	-0.76	0.45

Table 8. Sleep Duration on Dependent Measures

	Less than or Equal to 6 hours of sleep				More than 6 hours of sleep					
Measure	**M**	**SD**	**N**		**M**	**SD**	**N**	**t**	**df**	**p**
HADS-A	8.56	4.97	59		7.26	4.66	91	1.62	148	0.11
PBS	27.63	8.48	54		24.69	7.47	67	2.03	119	0.045
				Non-parametric Statistics				**U**	**Z**	**p**
HADS-D	6.44	4.63	59		5.54	4.45	90	2359	-1.15	0.25

Table 9. Additional Miscarriages Beyond 1 Year Versus Only Miscarriages Experienced in Past Year

Individuals who experienced additional miscarriages outside of study range					Individuals who have not experienced additional miscarriages outside of study range					
Measure	**M**	**SD**	**N**		**M**	**SD**	**N**	***t***	***df***	***p***
HADS-A	9.28	5.21	25		7.48	4.64	128	1.73	151	0.09
PSQI	7.8	3.64	25		6.32	4.12	121	1.6	144	0.11
PBS	26.26	7.54	19		25.9	8.08	105	0.18	122	0.86
				Non-parametric Statistics				***U***	***Z***	***p***
ISI	9.96	5.62	25		8.00	6.45	130	1259.5	-1.78	0.08
HADS-D	7.72	4.74	25		5.61	4.39	127	1155.5	-2.16	0.03*

*p<.05

Table 10. Post-Hoc Correlation Matrix

	1	2	3	4	5	6	7	8	9
1. Total # of children									
2. Months since miscarriage	.06								
3. Total # of miscarriages	.07	.11							
4. Age	.36**	-.01	-.03						
5. HADS-A	.09	-.05	.13	-.11					
6. PBS-C	-.03	-.003	-.03	-.13	.33**				
7. ISI	***.09***	***-.07***	***.13***	***.02***	***.58****	***.20****			
8. HADS-D	***.07***	***-.12***	***.15***	***.01***	***.79****	***.29****	***.54****		
9. PSQI	***.11***	***.02***	***.17****	***.05***	***.48****	***.18***	***.74****	***.41****	

5. Hospital and Anxiety Scale-Anxiety (HADS-A)
6. Perinatal Bereavement Scale-Combined (PBS-C)
7. Insomnia Severity Index (ISI)
8. Hospital and Anxiety Scale-Depression (HADS-D)
9. Pittsburgh Sleep Quality Index (PSQI)

**p<.01
*p<.05
Bold/Italicized- Non-parametric correlation analysis performed due to skewed data

Figure 1

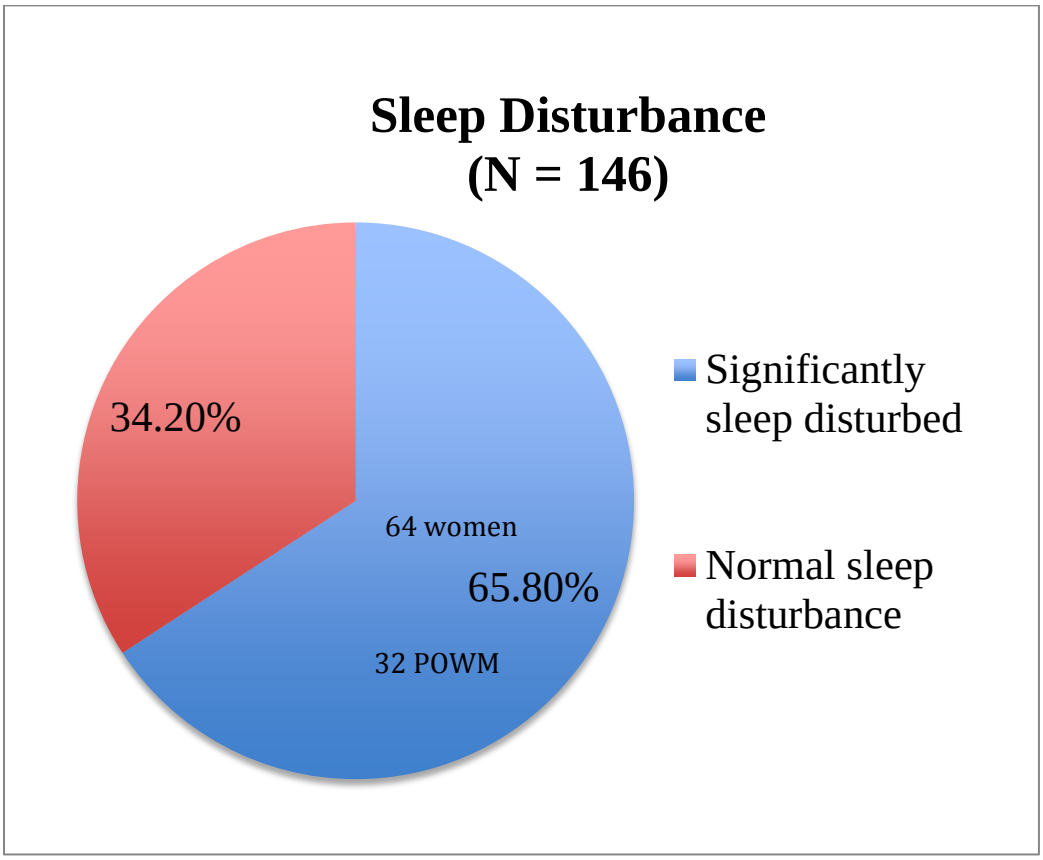

Sleep Disturbance
(N = 146)
34.20%
64 women
65.80%
32 POWM
Significantly sleep disturbed
Normal sleep disturbance

Figure 2

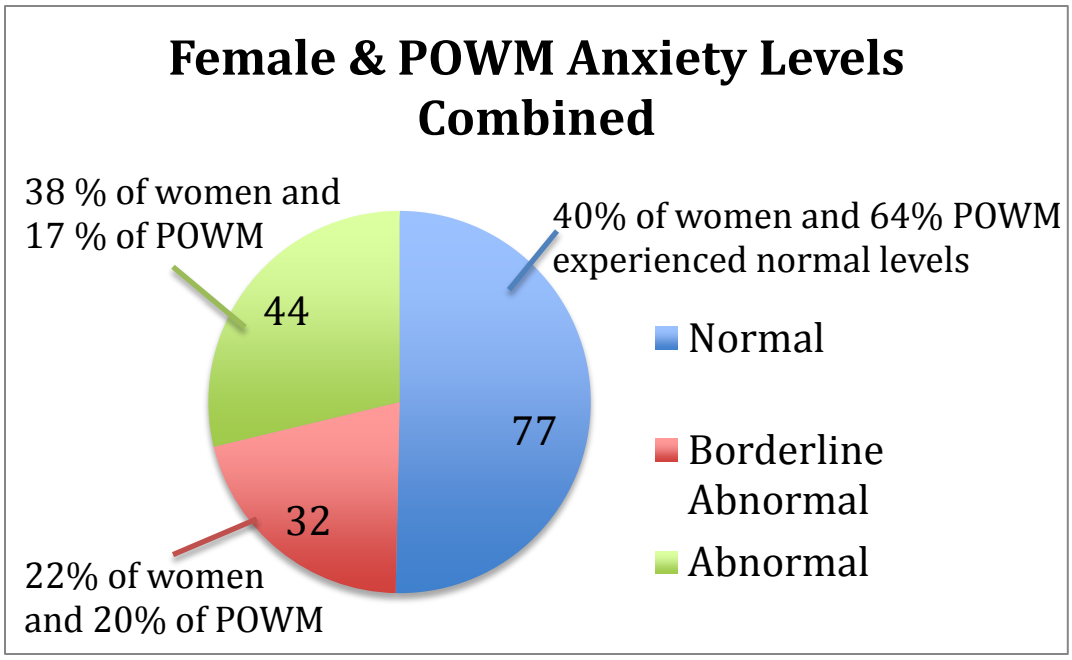

Female & POWM Anxiety Levels Combined
38 % of women and 17 % of POWM
40% of women and 64% POWM experienced normal levels
44
77
32
22% of women and 20% of POWM
Normal
Borderline Abnormal
Abnormal

Figure 3

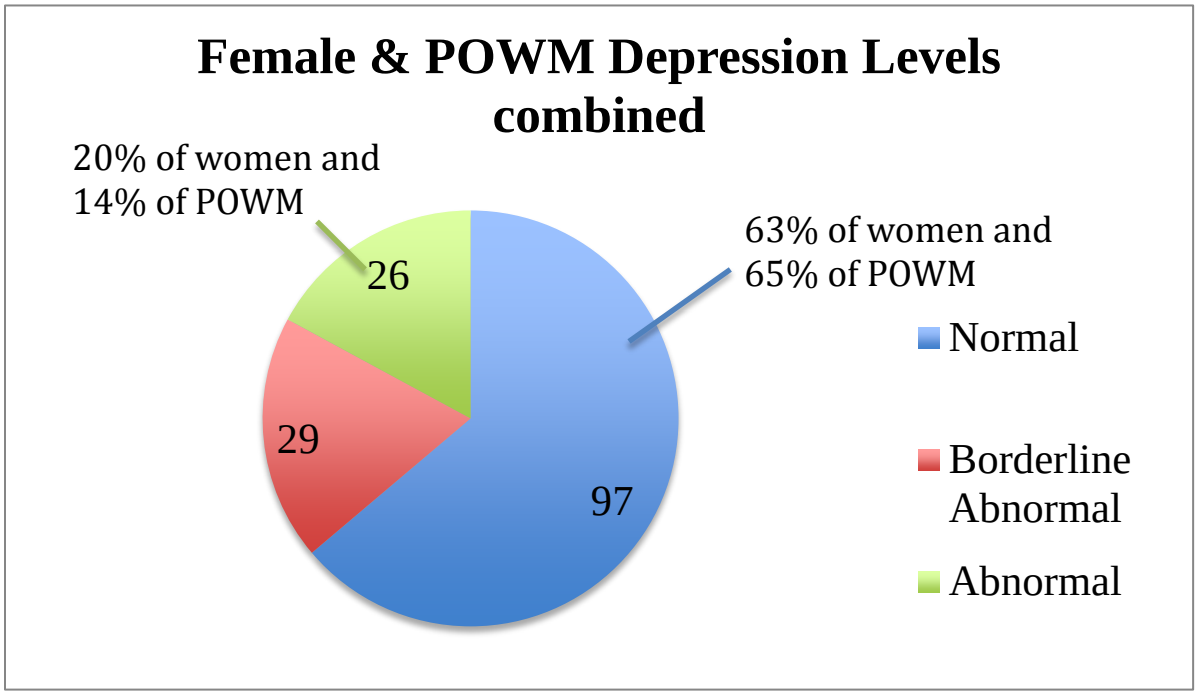
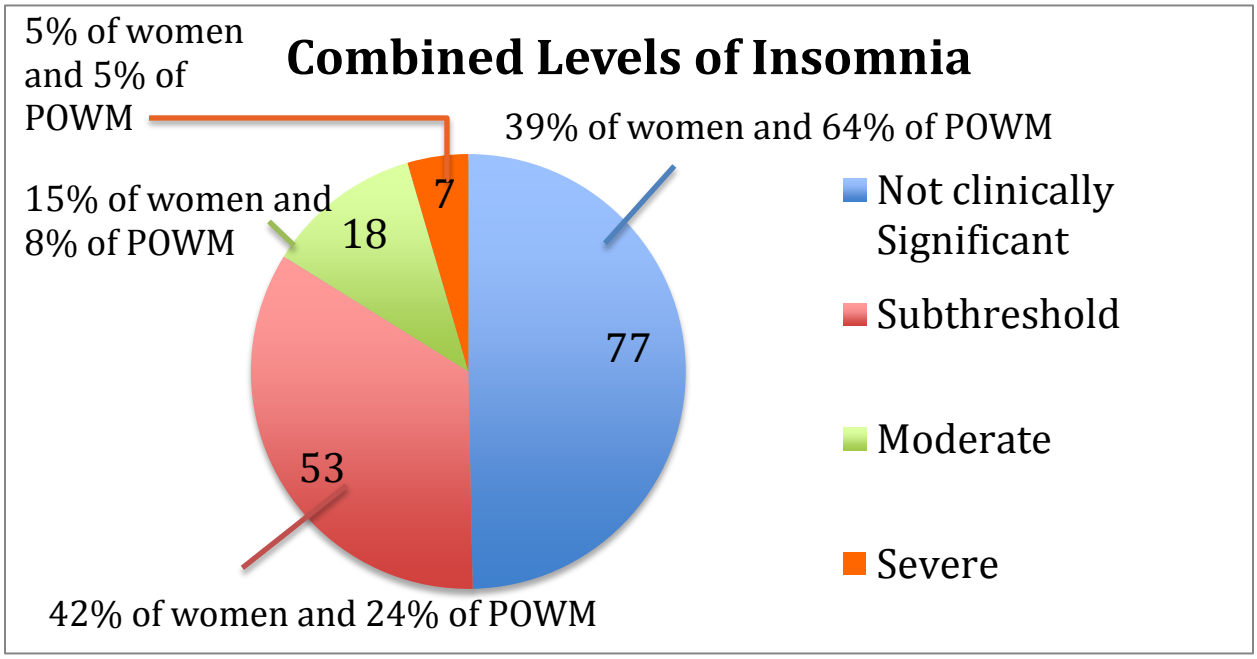

Female & POWM Depression Levels combined
20% of women and 14% of POWM
26
63% of women and 65% of POWM
97
29
Normal
Borderline Abnormal
Abnormal

Figure 4


Combined Levels of Insomnia
5% of women and 5% of POWM
39% of women and 64% of POWM
15% of women and 8% of POWM
42% of women and 24% of POWM
7
18
77
53
Not clinically Significant
Subthreshold
Moderate
Severe

Appendix A: Demographics Questionnaire for Women Who Have Miscarried

Descriptive Information Form

Instructions to Participants*: This study is about sleep and mood following a miscarriage. It involves the study of the emotional well-being of women and male and female partners of women who have experienced a miscarriage. We understand that some of these questions are very personal and might make you feel uncomfortable to answer. Our preference, of course, is for you to answer all the given questions. If you find, however, that some questions make you too uncomfortable to answer, you may choose not to answer those specific items. As described in the consent to participate, all of the information that you provide will be kept private and confidential. Thank you for your willingness to participate.*

1. Where did you hear about us? (Please check what applies)

   □From a YouTube comment
   □From Facebook
   □Searching AmazonTurk
   □My partner completed the questionnaire
   □Other:_____

2. Age: _____

3. Gender

   □Male
   □Female

4. Date of Birth (Month/Day/Year):_____

5. *I am:

   □ The individual who experienced the miscarriage within the past year
   □ A partner of a woman who has miscarried within the past year

6. What is your race/ethnicity (select all that apply)?

   □ Non-Hispanic White
   □ Black (African American)

□ Black (Afro-Caribbean)
□ Black (African)
□ Black (Other): _____
☐ Hispanic/Latino (Mexican)
☐ Hispanic/Latino (Puerto Rican)
☐ Hispanic/Latino (Cuban)
☐ Hispanic/Latino (Other Central American)
☐ Hispanic/Latino (Brazilian)
☐ Hispanic/Latino (Other South American)
□ Hispanic/Latino (Other): _____
☐ Asian (Indian/Pakistani/Bangladeshi/Indian Subcontinent)
□ Asian (Arab/Persian/Middle-Eastern)
☐ Asian (Chinese Taiwanese)
☐ Asian (Japanese)
☐ Asian (Korean)
□ Asian (Southeast Asian – Vietnamese, Laotian, Thai, Hmong, etc.)
□ Asian (Other):_____
☐ American Indian/Native American
□ Alaskan Native
□ Other: _____

7. What is your relationship status?

□ Re-married
☐ Married
☐ In a relationship and living with partner
□ In a relationship and not living with partner
□ Single and never married
☐ Divorced
☐ Widowed
□ Separated

8. Which of the following best describes you?
□heterosexual (straight)
☐bisexual
☐gay or lesbian
☐not sure
□none of the above
□prefer not to answer

9. What is your highest level of education?

□Less than 9th grade

□9th-11th grade
☐High school or GED
☐Some college but no degree
□Associates degree (AA, AS, etc.)
☐Bachelor's degree (BA, BS, etc.)
□Master's degree (MA, MS, MBA, MFA, etc.)
□Doctoral degree (PhD, MD, JD, DO, etc.)

10. What is your employment status?

☐ Full time
☐ Multiple jobs
☐ Part time
□ Self-employed
☐ Retired
☐ Homemaker
☐ Student
☐ Unemployed less than 1 year
□ Unemployed greater than 1 year
□ Unable to work

11. Occupation/Please specify: _____

12. If employed or in school full-time, please select the work schedule that you typically work. Choose the shift that most closely applies to your schedule and indicate how many times per week and month that you engage in that shift.

□Primarily Day 9:00am-5:00pm
Occasions per week 0-7: _____
Occasions per month 0-30: _____
□Primarily Evening 4:00pm-12:00am
Occasions per week 0-7: _____
Occasions per month 0-30: _____
□Primarily Night 12:00am-8:00 am
Occasions per week 0-7: _____
Occasions per month 0-30: _____
□Not applicable-Indicate the start and end times that you are most likely to work (circling a.m. or p.m.):
Start time: hour: _____ Minute: _____ a.m./p.m.

End time: hour: _____ Minute: _____ a.m./p.m.

13. Do you engage in shift work?

□Yes
□No [If 'No', skip to Q15]

14. Is your shift work standard (same every week) or rotating (varies over time)?

□Standard
□Rotating

15. What is your household annual income (before taxes)?

□ Less than $10,000
□ $10,000 - $19,999
□ $20,000 - $29,999
□ $30,000 - $39,999
□ $40,000 - $49,999
□ $50,000 - $59,999
□ $60,000 - $69,999
□ $70,000 - $79,999
□ $80,000 - $89,999
□ $90,000 - $99,999
□ $100,000 - $109,999
□ $110,000 - $119,999
□ $120,000 - $129,999
□ $130,000 - $139,999
□ $140,000 - $149,999
□ $150,000 or more

16. Do you have access to health insurance? (check all that apply)

☐No health insurance
□Health insurance through work or school
□Health insurance bought directly by you or your family
□Public health insurance (Medicare, Medicaid, etc.)

17. Have you been without health insurance during the past year?

☐No
☐Yes (less than 6 months)
□Yes (more than 6 months but not all year)
□Yes (all year)

18. On a scale of 1 – 100 (50 being neutral), how would you rate your

18a. Overall satisfaction with your **life in general**?_____
18b. Overall satisfaction with your **financial situation**?_____
18c. Overall satisfaction with your **health**?_____
18d. Overall satisfaction with your **marriage, current relationship, or relationship status (if not in a relationship)**?_____
18e. Overall satisfaction with your **sleep**?_____

Basic Sleep Information - To get a better idea of your sleeping habits, please answer these questions according to both your weekend and weekday sleeping patterns/schedule

1. I typically (3 or more nights per week; 1-2 for weekends) go to bed with the intent to fall asleep at
   a. _____(h/mm/am or pm) on **weekdays**
   b. _____(h/mm/am or pm) on **weekends**
2. I typically (3 or more nights per week; 1-2 for weekends) spend
   a. _____hours sleeping on **weekdays**
   b. _____hours sleeping on **weekends**
3. I typically (3 or more nights per week; 1-2 for weekends) get out of bed with the intent to start the day at
   a. _____(h/mm/am or pm) on **weekdays**
   b. _____(h/mm/am or pm) on **weekends**

4. On a typical night (4 or more nights per week; 1-2 for weekends) how many minutes does it take you to fall asleep?

   a. _____ minutes on **weekdays**

   b. _____ minutes on **weekends**

5. How many nights a week does it take you more than 30 minutes to fall asleep?
_____

   5a. Do you consider this a problem?

   □Yes
   □No (If 'No' go to 6)

   5b. How long have you had this problem?

   _____ (days, weeks, months, or years)

6. On a typical night (4 or more nights per week), how many times do you awaken in the middle of the night *but fall back asleep*?_____

6a. How many nights a week does this occur? _____

6b. Do you consider this a problem?

□Yes
☐No (If 'No' go to 7)

6c. How long have you had this problem?

_____ (days, weeks, months, or years)

7. On a typical night (4 or more nights per week), how long are you awake altogether across the night (from time to bed to time out of bed) _____ Hours ____minutes

7a. How many nights a week are you awake for 30 minutes or more? _____

7b. Do you consider this a problem?

□Yes
☐No (If 'No' go to 8)

7c. How long have you had this problem?

_____ (days, weeks, months, or years)

8. Do you typically (4 or more nights per week), wake up before you intend to or before the alarm clock goes off in the morning?

□Yes
□ No

8a. Typically, how many minutes before you want to awaken for the day ? _____ minutes

8b. How many mornings a week do you wake up 30 minutes early or more? _____

8c. Do you consider this a problem?

□Yes
□No (If 'No' go to 9)

8d. How long have you had this problem?

_____ (days, weeks, months, or years)

9. On a typical (4 or more nights per week) night, how much sleep do you get ? _____ Hours ____minutes

9a. How many nights a week do you get at least this much sleep? _____

9b. Do you consider this a problem? (If "no" go to 10)

9c. How long have you had this problem?

_____ (days, weeks, months, or years)

10. If you can go to bed and get out of bed any time you choose, can you sleep as much as you want to?

□ Yes
☐ No
If **'yes'**, how long is a typical "long sleep" period for you ?
_____ Hours ____minutes

10a. What is your preferred bed-time? That is, if you could go to bed any time you choose, what time would that be?

Preferred *Bed-time*: hour: _____ Minute: _____a.m./p.m.

10b. What is your preferred wake-time? That is, if you could wake at any time you choose, what time would that be?

Preferred *Wake-time*: hour: _____ Minute: _____a.m./p.m.

11. How often do you take naps, including unintentional naps?

(1) rarely
(2) less than once a month
(3) about twice a month
(4) 1-2 times a week
(5) 3-4 times a week
(6) 5 or more times a week

(7) once a day
(8) more than once a day

12. Average length of naps: (minutes, hours?) _____

13. Have you previously been treated for sleep problems?

□Yes
□No

13a. If yes, please describe:

14. Do you feel your sleep was altered when you were pregnant?

□Yes □No

15. If yes, please describe:

16. Do you feel your sleep was altered after the miscarriage?

□Yes □No

17. If yes, please describe:

Gestational History Questions

1. How many times have you been pregnant?

☐ 1 (Complete 1 Pregnancy History Box)
☐ 2 (Complete 2 Pregnancy History Boxes)
□ 3 (Complete 3 Pregnancy History Boxes)

☐ 4 (Complete 4 Pregnancy History Boxes)
☐ 5 (Complete 5 Pregnancy History Boxes)
☐ 6 (Complete 6 Pregnancy History Boxes)
☐ 7(Complete 7 Pregnancy History Boxes)
☐ 8 (Complete 8 Pregnancy History Boxes)
□ 9 (Complete 9 Pregnancy History Boxes)
□ 10 (Complete 10 Pregnancy History Boxes)
□ More than 10
For each time checked (for each pregnancy indicated), have participant complete pregnancy-related history for that particular pregnancy.

1a. **What was the outcome of this pregnancy?

□ Currently Pregnant
☐ Induced abortion
☐ Spontaneous abortion (Miscarriage)
☐ Ectopic
□ Live birth (IF ENDORSED GO TO LIVE BIRTH SECTION 1b. to 1g.)
☐ Stillbirth
□ Other (please specify)_____

1b. What was the date (month/year) of the outcome of this pregnancy? _____(m) _____(yr)

1c. Was this pregnancy a singleton or multiple pregnancy?

□ Singleton
☐ Multiple (how many) _____
□Unknown

1d. Was this pregnancy planned?

□Yes
□No

1e. How many months did it take you to conceive this pregnancy? _____

1f. Did you receive any fertility treatment (fertility medications, inseminations, or in vitro fertilization) to conceive this pregnancy?

□ Yes IF YES, on how many occasions? ____
□ No

1g. If you did receive fertility treatment, which method(s) did you use (check all that apply)?

□ Oral medications
☐ Injectable Medications
☐ IVF Donor Eggs
☐IVF own eggs
□ Intrauterine insemination (IUI)

2. How many children did you have prior to the miscarriage?

3. Have you had any children after the miscarriage?

4. If so, how many?

5. Are you currently pregnant while taking this survey?

If yes, go to 6 – If NO go to 7

6. How many weeks pregnant are you currently?
_____

7. On a scale of 1-10, how difficult was it for you to originally become pregnant prior to the miscarriage?

Fertility Questions

1. Have you had any additional miscarriages (outside of the 1 year range the study is inquiring about)?

2. If yes, how many? _____

3. How many miscarriages have you had within the last year?_____

4. Referring to the miscarriage within the last year, how long has it been since the miscarriage? _____months

5. Are you trying to become pregnant?

□Yes (if yes, prompt 5a and 5b)
□No (If NO, go to question 6)

(5a) Have you been having a problem getting pregnant?

□ Yes
□ No (If NO, go to question 6)

(5b) For how long have you been trying to become pregnant unsuccessfully (since miscarrying)? _____(months/weeks)

6. On a scale of 1-10, 1 being not at all worried and 10 being extremely worried, how would you rate your concern about future pregnancies?_____

General Health Questions

1. During the past 3-6 months, have you been taking any prescription medications, over-the-counter medications, vitamins, or herbal supplements?

□Yes
□No

2. Other than fertility drugs, please list of all medications that you have taken during past 3-6 months.

Medication	Current	Reason for use:	Past
_____	□Yes/□No	_____	start/stop

3. Are you in good physical health?

□Yes
□No

4. Please rate your overall physical health below next to the scale that most closely describes you

□1 I am in excellent physical condition for my age
□2 I have no chronic conditions, but I am not in peak physical condition
□3 I have a chronic condition, but it is stable and well managed
□4 I have a chronic condition, and it is not stable or well managed
□5 I have multiple chronic conditions, but they are stable and well managed
□6 I have multiple chronic conditions, and they are not stable or well managed

5. Are you in good overall mental health?

□Yes
□No

6. Please rate your overall mental health on the scale below next to the statement that most closely describes you:

☐1 I am in excellent mental health
☐2 I have no mental health conditions
□3 I have a chronic mental health condition, but it is stable and well managed
□4 I have a chronic mental health condition, and it is not stable or well managed
□5 I have multiple chronic mental health conditions, but they are stable and well managed
□6 I have multiple chronic mental health conditions, and they are not stable or well managed

Medical and Psychiatric History

1. Please indicate your current and past history by the checking the appropriate box.

NOTE: FOR EACH CONDITION BELOW (WHEN ENDORSED) PROMPT

□Current
□Past
□No

Conditions:

Depression
Generalized Anxiety Disorder
PTSD
Substance and/or alcohol Use or Dependence

2. Have you EVER taken any psychiatric medications?

□Yes
□No

2a. If yes, please describe:
Duration of use _____ Started _____ Stopped_____

Name _____

3. Based on the past year, how often do you have a drink containing alcohol?

□Never
☐Monthly or Less
□Two to four times per month
□Two or three times per week
□Four or more times per week

4. How many drinks did you have on a typical day when you were drinking in the past year?

□1 or 2
☐3 or 4
☐5 or 6
☐7 to 9
□10 or more

5. How often did you have six or more drinks on one occasion in the past year?

□Never
□Less than monthly
☐Monthly
☐Weekly
□Daily or Almost Daily

6. Have you smoked cigarettes, cigars, or a pipe in the past 12 months?

□Yes
□No

7. Do you currently smoke or use any form of nicotine?

□Yes
□No

8. Please estimate the number of years you have smoked in total. _____years

9. How many caffeinated beverages (1, 8oz cup=1 beverage) do you drink per day?

Coffee _____
Tea _____
Soda _____

10. How many hours per week do you exercise on average? _____

11. What kind of exercise do you typically do?

☐walking
☐running
☐weights
☐dancing
□swimming
□aerobics/cardio
☐yoga/pilates
□sports (boxing, karate)
☐biking
□other _____

Appendix A Notes/Further Explanation:

Directions indicating circling or checking boxes can/will be changed contingent upon website/platform restrictions.

Q5* The answer to this question will prompt either the main questionnaire or the partner questionnaire (found below)

For Q1a** in the "Gestational History Questions" portion, Q1b-1g will only be endorsed if the outcome was a live birth

Appendix B: Demographics Questionnaire for POWM

Descriptive Information Form

Instructions to Participants*: This study is about sleep and mood following a miscarriage. It involves the study of the emotional well-being of women and male and female partners of women who have experienced a miscarriage. We understand that some of these questions are very personal and might make you feel uncomfortable to answer. Our preference, of course, is for you to answer all the given questions. If you find, however, that some questions make you too uncomfortable to answer, you may choose not to answer those specific items. As described in the consent to participate, all of the information that you provide will be kept private and confidential. Thank you for your willingness to participate.*

1. Where did you hear about us? (Please check what applies)

   □From a YouTube comment
   □From Facebook
   □Searching AmazonTurk
   □My partner completed the questionnaire
   □Other:_____

2. Age: _____

3. Gender

   □Male
   □Female

4. Date of Birth (Month/Day/Year):_____

5. I am:

   □ The individual who experienced the miscarriage within the past year
   □ A partner of a woman who has miscarried within the past year

6. What is your race/ethnicity (select all that apply)?

   □ Non-Hispanic White
   □ Black (African American)
   □ Black (Afro-Caribbean)
   □ Black (African)
   □ Black (Other): _____
   ☐ Hispanic/Latino (Mexican)
   ☐ Hispanic/Latino (Puerto Rican)

□ Hispanic/Latino (Cuban)
☐ Hispanic/Latino (Other Central American)
☐ Hispanic/Latino (Brazilian)
☐ Hispanic/Latino (Other South American)
□ Hispanic/Latino (Other): _____
☐ Asian (Indian/Pakistani/Bangladeshi/Indian Subcontinent)
□ Asian (Arab/Persian/Middle-Eastern)
☐ Asian (Chinese Taiwanese)
☐ Asian (Japanese)
☐ Asian (Korean)
□ Asian (Southeast Asian – Vietnamese, Laotian, Thai, Hmong, etc.)
□ Asian (Other):_____
☐ American Indian/Native American
□ Alaskan Native
□ Other: _____

7. What is your relationship status?

□ Re-married
☐ Married
☐ In a relationship and living with partner
□ In a relationship and not living with partner
□ Single and never married
☐ Divorced
☐ Widowed
□ Separated

8. Which of the following best describes you?
□heterosexual (straight)
☐bisexual
☐gay or lesbian
☐not sure
□none of the above
□prefer not to answer

9. What is your highest level of education?

□Less than 9^{th} grade
□9^{th}-11^{th} grade
☐High school or GED
☐Some college but no degree
□Associates degree (AA, AS, etc.)
☐Bachelor's degree (BA, BS, etc.)

□Master's degree (MA, MS, MBA, MFA, etc.)
□Doctoral degree (PhD, MD, JD, DO, etc.)

10. What is your employment status?

☐ Full time
☐ Multiple jobs
□ Part time
□ Self-employed
☐ Retired
☐ Homemaker
☐ Student
☐ Unemployed less than 1 year
□ Unemployed greater than 1 year
□ Unable to work

11. Occupation/Please specify: _____

12. If employed or in school full-time, please select the work schedule that you typically work. Choose the shift that most closely applies to your schedule and indicate how many times per week and month that you engage in that shift.

□Primarily Day 9:00am-5:00pm
Occasions per week 0-7: _____
Occasions per month 0-30: _____
□Primarily Evening 4:00pm-12:00am
Occasions per week 0-7: _____
Occasions per month 0-30: _____
□Primarily Night 12:00am-8:00 am
Occasions per week 0-7: _____
Occasions per month 0-30: _____
□Not applicable-Indicate the start and end times that you are most likely to work (circling a.m. or p.m.):
Start time: hour: _____ Minute: _____ a.m./p.m.

End time: hour: _____ Minute: _____ a.m./p.m.

13. Do you engage in shift work?

□Yes
□No [If 'No', skip to Q15]

14. Is your shift work standard (same every week) or rotating (varies over time)?

□Standard
☐Rotating

15. What is your household annual income (before taxes)?

□ Less than $10,000
□ $10,000 - $19,999
□ $20,000 - $29,999
□ $30,000 - $39,999
□ $40,000 - $49,999
□ $50,000 - $59,999
□ $60,000 - $69,999
□ $70,000 - $79,999
□ $80,000 - $89,999
□ $90,000 - $99,999
□ $100,000 - $109,999
□ $110,000 - $119,999
□ $120,000 - $129,999
□ $130,000 - $139,999
□ $140,000 - $149,999
□ $150,000 or more

16. Do you have access to health insurance? (check all that apply)

☐No health insurance
☐Health insurance through work or school
□Health insurance bought directly by you or your family
□Public health insurance (Medicare, Medicaid, etc.)

17. Have you been without health insurance during the past year?

☐No
☐Yes (less than 6 months)
□Yes (more than 6 months but not all year)
□Yes (all year)

18. On a scale of 1 – 100 (50 being neutral), how would you rate your

18a. Overall satisfaction with your **life in general**?_____
18b. Overall satisfaction with your **financial situation**?_____
18c. Overall satisfaction with your **health**?_____
18d. Overall satisfaction with your **marriage, current relationship, or relationship status (if not in a relationship)**?_____

18e. Overall satisfaction with your **sleep**?_____

Basic Sleep Information - To get a better idea of your sleeping habits, please answer these questions according to both your weekend and weekday sleeping patterns/schedule

1. I typically (3 or more nights per week; 1-2 for weekends) go to bed with the intent to fall asleep at
   a. _____(h/mm/am or pm) on **weekdays**
   b. _____(h/mm/am or pm) on **weekends**
2. I typically (3 or more nights per week; 1-2 for weekends) spend
   a. _____hours sleeping on **weekdays**
   b. _____hours sleeping on **weekends**
3. I typically (3 or more nights per week; 1-2 for weekends) get out of bed with the intent to start the day at
   a. _____(h/mm/am or pm) on **weekdays**
   b. _____(h/mm/am or pm) on **weekends**

4. On a typical night (4 or more nights per week; 1-2 for weekends) how many minutes does it take you to fall asleep?

   a. _____ minutes on **weekdays**

   b. _____ minutes on **weekends**

5. How many nights a week does it take you more than 30 minutes to fall asleep? _____

   5a. Do you consider this a problem?

   □Yes
   □No (If 'No' go to 6)

   5b. How long have you had this problem?

   _____ (days, weeks, months, or years)

6. On a typical night (4 or more nights per week), how many times do you awaken in the middle of the night *but fall back asleep*?_____

   6a. How many nights a week does this occur? _____

   6b. Do you consider this a problem?

   □Yes

☐No (If 'No' go to 7)

6c. How long have you had this problem?

_____ (days, weeks, months, or years)

7. On a typical night (4 or more nights per week), how long are you awake altogether across the night (from time to bed to time out of bed) _____ Hours ____minutes

7a. How many nights a week are you awake for 30 minutes or more? _____

7b. Do you consider this a problem?

□Yes
☐No (If 'No' go to 8)

7c. How long have you had this problem?

_____ (days, weeks, months, or years)

8. Do you typically (4 or more nights per week), wake up before you intend to or before the alarm clock goes off in the morning?

□Yes
□ No

8a. Typically, how many minutes before you want to awaken for the day ? _____ minutes

8b. How many mornings a week do you wake up 30 minutes early or more? _____

8c. Do you consider this a problem?

□Yes
□No (If 'No' go to 9)

8d. How long have you had this problem?

_____ (days, weeks, months, or years)

9. On a typical (4 or more nights per week) night, how much sleep do you get ? _____ Hours ____minutes

9a. How many nights a week do you get at least this much sleep? _____

9b. Do you consider this a problem? (If "no" go to 10)

9c. How long have you had this problem?

_____ (days, weeks, months, or years)

10. If you can go to bed and get out of bed any time you choose, can you sleep as much as you want to?

□ Yes
☐ No
If **'yes'**, how long is a typical "long sleep" period for you ?
_____ Hours ____minutes

10a. What is your preferred bed-time? That is, if you could go to bed any time you choose, what time would that be?

Preferred *Bed-time*: hour: _____ Minute: _____a.m./p.m.

10b. What is your preferred wake-time? That is, if you could wake at any time you choose, what time would that be?

Preferred *Wake-time*: hour: _____ Minute: _____a.m./p.m.

11. How often do you take naps, including unintentional naps?

(1) rarely
(2) less than once a month
(3) about twice a month
(4) 1-2 times a week
(5) 3-4 times a week
(6) 5 or more times a week
(7) once a day
(8) more than once a day

12. Average length of naps: (minutes, hours?) _____

13. Have you previously been treated for sleep problems?

□Yes
□No

13a. If yes, please describe:

14. Do you feel your sleep was altered during your spouse or partner's pregnancy?

□Yes □No

15. If yes, please describe:

16. Do you feel your sleep was altered after your spouse or partner's miscarriage?

□Yes □No

17. If yes, please describe:

Gestational History Questions

1. How many times has your spouse or partner been pregnant?

☐ 1 (Complete 1 Pregnancy History Box)
☐ 2 (Complete 2 Pregnancy History Boxes)
☐ 3 (Complete 3 Pregnancy History Boxes)
☐ 4 (Complete 4 Pregnancy History Boxes)
□ 5 (Complete 5 Pregnancy History Boxes)
☐ 6 (Complete 6 Pregnancy History Boxes)
☐ 7(Complete 7 Pregnancy History Boxes)

☐ 8 (Complete 8 Pregnancy History Boxes)
☐ 9 (Complete 9 Pregnancy History Boxes)
□ 10 (Complete 10 Pregnancy History Boxes)
□ More than 10
For each time checked (for each pregnancy indicated), have participant complete pregnancy-related history for that particular pregnancy.

1a. What was the outcome of this pregnancy?

□ Currently Pregnant
☐ Induced abortion
□ Spontaneous abortion (Miscarriage)
☐ Ectopic
□ Live birth (IF ENDORSED GO TO LIVE BIRTH SECTION 1b. to 1g.)
☐ Stillbirth
□ Other (please specify)_____

1b. What was the date (month/year) of the outcome of this pregnancy? _____(m) _____(yr)

1c. Was this pregnancy a singleton or multiple pregnancy?

□ Singleton
☐ Multiple (how many) _____
□Unknown

1d. Was this pregnancy planned?

□Yes
□No

1e. How many months did it take your spouse or partner to conceive this pregnancy? _____

1f. Did your spouse or partner receive any fertility treatment (fertility medications, inseminations, or in vitro fertilization) to conceive this pregnancy?

□ Yes IF YES, on how many occasions? ____
□ No

1g. If your spouse or partner did receive fertility treatment, which method(s) did she

use (check all that apply)?

□ Oral medications
☐ Injectable Medications
☐ IVF Donor Eggs
☐IVF own eggs
□ Intrauterine insemination (IUI)

2. How many children did you have prior to the miscarriage?

3. Have you had any children after the miscarriage?

4. If so, how many?

5. Is your spouse or partner currently pregnant while taking this survey?

If yes, go to 6 – If NO go to 7

6. How many weeks pregnant is your spouse or partner currently? _____

7. On a scale of 1-10, how difficult was it for your spouse or partner to become pregnant prior to the miscarriage?

Fertility Questions

1. Has your spouse or partner had any additional miscarriages (outside of the 1 year range the study is inquiring about)?

2. If yes, how many? _____

3. How many miscarriages has she had within the last year?_____

4. Referring to the miscarriage within the last year, how long has it been since the miscarriage? _____months

5. Are you and your spouse or partner trying to become pregnant?

□Yes (if yes, prompt 5a and 5b)
□No (If NO, go to question 6)

(5a) Have you been having a problem getting pregnant?

□ Yes
□ No (If NO, go to question 6)

(5b) For how long have you and your spouse or partner been trying to become pregnant unsuccessfully (since miscarrying)? _____ (months/weeks)

6. On a scale of 1-10, 1 being not at all worried and 10 being extremely worried, how would you rate your concern about future pregnancies?_____

General Health Questions

1. During the past year, have you been taking any prescription medications, over-the-counter medications, vitamins, or herbal supplements?

□Yes
□No

2. Please list of all medications that you have taken during past year.

Medication	Current	Reason for use:	Past
_____	□Yes/□No	_____	start/stop

3. Are you in good physical health?

□Yes
□No

4. Please rate your overall physical health below next to the scale that most closely describes you

□1 I am in excellent physical condition for my age
□2 I have no chronic conditions, but I am not in peak physical condition
□3 I have a chronic condition, but it is stable and well managed
□4 I have a chronic condition, and it is not stable or well managed
□5 I have multiple chronic conditions, but they are stable and well managed
□6 I have multiple chronic conditions, and they are not stable or well managed

5. Are you in good overall mental health?

□Yes
□No

6. Please rate your overall mental health on the scale below next to the statement that most closely describes you:

☐1 I am in excellent mental health
☐2 I have no mental health conditions
□3 I have a chronic mental health condition, but it is stable and well managed
□4 I have a chronic mental health condition, and it is not stable or well managed
□5 I have multiple chronic mental health conditions, but they are stable and well managed
□6 I have multiple chronic mental health conditions, and they are not stable or well managed

Medical and Psychiatric History

1. Please indicate your current and past history by the checking the appropriate box.

NOTE: FOR EACH CONDITION BELOW (WHEN ENDORSED) PROMPT

□Current
□Past
□No

Conditions:

Depression
Generalized Anxiety Disorder
PTSD
Substance and/or alcohol Use or Dependence

2. Have you EVER taken any psychiatric medications?

□Yes
□No

2a. If yes, please describe: Name _____
Duration of use _____ Started _____ Stopped_____

3. Based on the past year, how often do you have a drink containing alcohol?

□Never
☐Monthly or Less
□Two to four times per month
□Two or three times per week
□Four or more times per week

4. How many drinks did you have on a typical day when you were drinking in the past year?

□1 or 2
☐3 or 4
☐5 or 6
☐7 to 9
□10 or more

5. How often did you have six or more drinks on one occasion in the past year?

□Never
□Less than monthly
☐Monthly
☐Weekly
□Daily or Almost Daily

6. Have you smoked cigarettes, cigars, or a pipe in the past 12 months?

□Yes
□No

7. Do you currently smoke or use any form of nicotine?

□Yes
□No

8. Please estimate the number of years you have smoked in total. _____years

9. How many caffeinated beverages (1, 8oz cup=1 beverage) do you drink per day?

Coffee _____
Tea _____
Soda _____

10. How many hours per week do you exercise on average? _____

11. What kind of exercise do you typically do?

☐walking
☐running
☐weights
☐dancing
□swimming
□aerobics/cardio
☐yoga/pilates
□sports (boxing, karate)
☐biking
□other _____

Appendix B Notes/Further Explanation

Directions indicating circling or checking boxes can/will be changed contingent upon website/platform restrictions.

For Q1a** in the "Gestational History Questions" portion, Q1b-1g will only be endorsed if the outcome was a live birth

Appendix C: The Pittsburg Sleep Quality Index

AM Subject's Initials _____ID# _____Date _____Time _____PM

PITTSBURGH SLEEP QUALITY INDEX

INSTRUCTIONS:

The following questions relate to your usual sleep habits during the past month only. Your answers should indicate the most accurate reply for the majority of days and nights in the past month. Please answer all questions.

1. During the past month, what time have you usually gone to bed at night?

   BED TIME _____

2. During the past month, how long (in minutes) has it usually taken you to fall asleep each night?

   NUMBER OF MINUTES _____

3. During the past month, what time have you usually gotten up in the morning?

   GETTING UP TIME _____

4. During the past month, how many hours of actual sleep did you get at night? (This may be different than the number of hours you spent in bed.)

   HOURS OF SLEEP PER NIGHT _____

For each of the remaining questions, check the one best response. Please answer all questions.

5. During the past month, how often have you had trouble sleeping because you . . .

a) Cannot get to sleep within 30 minutes

Not during the past month_____ Less than once a week_____ Once or twice a week_____ Three or more times a week_____

b) Wake up in the middle of the night or early morning

Not during the past month_____ Less than once a week_____ Once or twice a week_____ Three or more times a week_____

c) Have to get up to use the bathroom

Not during the past month_____ Less than once a week_____ Once or twice a week_____ Three or more times a week_____

d) Cannot breathe comfortably

Not during the past month_____ Less than once a week_____ Once or twice a week_____ Three or more times a week_____

e) Cough or snore loudly

Not during the past month_____ Less than once a week_____ Once or twice a week_____ Three or more times a week_____

f) Feel too cold

Not during the past month_____ Less than once a week_____ Once or twice a week_____ Three or more times a week_____

g) Feel too hot

Not during the past month_____ Less than once a week_____ Once or twice a week_____ Three or more times a week_____

h) Had bad dreams

Not during the past month_____ Less than once a week_____ Once or twice a week_____ Three or more times a week_____

i) Have pain

Not during the past month_____ Less than once a week_____ Once or twice a week_____ Three or more times a week_____

j) Other reason(s), please describe_____

_____

How often during the past month have you had trouble sleeping because of this?

Not during the Less than Once or twice Three or more pastm onth_____ once a week_____ a week_____ times a week_____

6. During the past month, how would you rate your sleep quality overall?

Very good _____
Fairly good _____

Fairly bad _____
Very bad _____

7. During the past month, how often have you taken medicine to help you sleep (prescribed or "over the counter")?

   Not during the past month_____ Less than once a week_____ Once or twice a week_____ Three or more times a week_____

8. During the past month, how often have you had trouble staying awake while driving, eating meals, or engaging in social activity?

   Not during the past month_____ Less than once a week_____ Once or twice a week_____ Three or more times a week_____

9. During the past month, how much of a problem has it been for you to keep up enough enthusiasm to get things done?

No problem at all

Only a very slight problem

Somewhat of a problem

A very big problem

10. Do you have a bed partner or room mate?
    No bed partner or room mate

    Partner/room mate in other room

    Partner in same room, but not same bed

    Partner in same bed

If you have a room mate or bed partner, ask him/her how often in the past month you have had . . .

a) Loud snoring

Not during the past month_____ Less than once a week_____ Once or twice

a week_____ Three or more times a week_____

b) Long pauses between breaths while asleep

Not during the past month_____ Less than once a week_____ Once or twice a week_____ Three or more times a week_____

c) Legs twitching or jerking while you sleep

Not during the past month_____ Less than once a week_____ Once or twice a week_____ Three or more times a week_____

d) Episodes of disorientation or confusion during sleep

Not during the past month_____ Less than once a week_____ Once or twice a week_____ Three or more times a week_____

e) Other restlessness while you sleep; please describe_____

_____

___

Not during the past month_____ Less than once a week_____ Once or twice a week_____ Three or more times a week_____

Buysse DJ, Reynolds CF, Monk TH, Berman SR, Kupfer DJ: Psychiatry Research, 28:193-213, 1989.

Appendix D: Perinatal Bereavement Scale

GRIEF SCALE

[IF WOMAN IS CURRENTLY PREGNANT, *MODIFY INTRODUCTION AS SHOWN AND ASK ONLY Q's 111P-117P.*]

Now there are just a very few questions I want to ask you about your feelings after the miscarriage. I asked about these feelings during our last conversation. Some of the questions may apply to you, others may not. They are questions we ask of all women in our study, so I hope you won't mind answering them even if you think they don't apply. After these few questions, we'll talk about changes which may have occurred in your life since the miscarriage.

Let me read you a list of thoughts or feelings you might have had in the past week. Please tell me if you have felt or done these things rarely, some of the time, a moderate amount of time or most of the time in the past week. *[IF CURRENTLY PREGNANT, ADD: PLEASE KEEP IN MIND THAT EACH OF THESE QUESTIONS IS ABOUT THE BABY YOU LOST, NOT ABOUT YOUR CURRENT PREGNANCY.]*

[ASK 111P-117P ONLY IF CURRENTLY PREGNANT.]	SKIP	Rarely or none of the time (Less than 1 day)	Some of the time (1-2 days)	A moderate amount of time (3-4 days)	Most or all of the time (5-7 days)	
. You found yourself walking like a pregnant woman P. *You felt physically ill when you thought about the miscarriage.*	0	1	2	3	4	32
. You felt as if the baby were still inside you P. *You longed for the baby you lost.*	0	1	2	3	4	33
. You dreamed that you were still pregnant P. *You wondered whether you would have had a boy or a girl.*	0	1	2	3	4	34
. You felt physically ill when you thought about the miscarriage P. *You imagined what the baby would have looked like.*	0	1	2	3	4	35
. You felt as if you were still pregnant P. *You dreamt about the baby you lost.*	0	1	2	3	4	36
. You wanted to hold the baby in your arms P. *You found it easy to think about things other than the baby you lost.*	0	1	2	3	4	37

	SKIP	Rarely or none of the time (Less than 1 day)	Some of the time (1-2 days)	A moderate amount of time (3-4 days)	Most or all of the time (5-7 days)	
. You found yourself planning things for the baby as though you were still pregnant	0	1	2	3	4	38
P. *You wanted to hold the baby you lost in your arms*						
. You found it easy to think about things other than the baby	0	1	2	3	4	39
. You patted or held your belly as though you were still pregnant	0	1	2	3	4	40
. You felt as if there was an empty space inside of you	0	1	2	3	4	41
. You longed for the baby	0	1	2	3	4	42
. You felt like wearing maternity clothes	0	1	2	3	4	43
. You wondered whether you would have had a boy or girl *[IF KNEW SEX CODE 7.]*	0	1	2	3	4	44
You imagined what the baby would have looked like	0	1	2	3	4	45
You dreamt about the baby	0	1	2	3	4	46

Appendix D Notes/Further Explanation

"You felt like wearing maternity clothes" will not be used for POWM.

"You found yourself walking like a pregnant woman" will be substituted with "you felt physically ill when thinking about the miscarriage" for POWM.

-Most likely will use for women as well considering < or = to 28 weeks, you may not be "walking like a pregnant woman"

"You felt as if the baby were still inside you" will be substituted with "you longed for the baby you lost" for POWM

Wherever else appropriate will be phrased as "your partner" when giving the scale to POWM (i.e., you dreamed *your partner* were still pregnant; you found yourself planning things for the baby as though *your partner* were still pregnant).

The instructions contained in the present study will not include, "after these few questions, we'll talk about changes which may have occurred in your life since the miscarriage".

If the woman who miscarried or a partner of a woman who miscarried is currently experiencing another pregnancy, the (P.) questions will be asked as an alternative to the above scale.

Appendix E: Hospital Anxiety and Depression Scale

Hospital Anxiety and Depression Score (HADS)

This questionnaire helps your physician to know how you are feeling. Read every sentence. Place an "X" on the answer that best describes how you have been feeling during the LAST WEEK. You do not have to think too much to answer. In this questionnaire, spontaneous answers are more important

A

TV

program:
Often
Sometimes
Not often
Very seldom

Appendix F: Insomnia Severity Index

Insomnia Severity Index

The Insomnia Severity Index has seven questions. The seven answers are added up to get a total score. When you have your total score, look at the 'Guidelines for Scoring/Interpretation' below to see where your sleep difficulty fits.

For each question, please CIRCLE the number that best describes your answer.

Please rate the CURRENT (i.e. LAST 2 WEEKS) SEVERITY of your insomnia problem(s).

Insomnia Problem	None	Mild	Moderate	Severe	Very Severe
1. Difficulty falling asleep	0	1	2	3	4
2. Difficulty staying asleep	0	1	2	3	4
3. Problems waking up too early	0	1	2	3	4

4. How SATISFIED/DISSATISFIED are you with your CURRENT sleep pattern?

Very Satisfied	Satisfied	Moderately Satisfied	Dissatisfied	Very Dissatisfied
0	1	2	3	4

5. How NOTICEABLE to others do you think your sleep problem is in terms of impairing the quality of your life?

Not at all Noticeable	A Little	Somewhat	Much	Very Much Noticeable
0	1	2	3	4

6. How WORRIED/DISTRESSED are you about your current sleep problem?

Not at all Worried	A Little	Somewhat	Much	Very Much Worried
0	1	2	3	4

7. To what extent do you consider your sleep problem to INTERFERE with your daily functioning (e.g. daytime fatigue, mood, ability to function at work/daily chores, concentration, memory, mood, etc.) CURRENTLY?

Not at all Interfering	A Little	Somewhat	Much	Very Much Interfering
0	1	2	3	4

Guidelines for Scoring/Interpretation:

Add the scores for all seven items (questions 1 + 2 + 3 + 4 + 5 +6 + 7) = _____ your total score

Total score categories:
0–7 = No clinically significant insomnia
8–14 = Subthreshold insomnia
15–21 = Clinical insomnia (moderate severity)
22–28 = Clinical insomnia (severe)

Used via courtesy of www.myhealth.va.gov with permission from Charles M. Morin, Ph.D., Université Laval

Appendix G: Waiver of Consent

Agreement to Participate

You are being invited to participate in the survey "Assessing the Role of Sleep, Bereavement, Anxiety, and Depression in a Miscarriage Population." This study is conducted by Jacqueline D. Kloss, Ph.D. and Amy M. Gencarelli, B.A. of the Drexel University Department of Psychology. To participate in the study, you must read this page and allow us to use your responses for research purposes.

Purpose

The purpose of this study is to better understand the relationship between mood, grief, and sleep following a miscarriage or your spouse/partner's miscarriage.

To be eligible for the study, you must be at least 18 years of age.

Procedure

If you participate in the study, you will be asked questions about your age, education, race and ethnicity, emotions, and sleep. It will take between 20 and 25 minutes to complete the questionnaire.

Risks/Benefits

Participating in this study poses no physical risk to you. There are no direct benefits to you from participating in this study. You will be compensated $1.00 for successfully completing the survey.

Privacy and Confidentiality

All of your responses will be anonymous and confidential. We are not asking any questions about your name or any information that could be traced back to your identity. Your responses will be stored in a secure, password-protected database. In any publication or presentation that results from this study, your responses will be combined with those of all of the other participants who have completed the survey.

Voluntary Nature of Participation

Participating in the study is voluntary. You may choose not to participate, or you may stop participating after you begin responding to the survey questions. If you choose to stop participating after you begin the survey, simply close your browser window and your responses will not be saved. However, when you complete the survey and click the button labeled "Done," your responses will be saved in the database. Because we will not have any identifying information in your responses, we will not be able to remove your responses once you have submitted them.

Contact Information

If you have any questions regarding this study, you may contact the Principal Investigator, Dr. Jacqueline Kloss, Ph.D., or the research coordinator, Amy Gencarelli B.A., at amg445@drexel.edu. If you have any adverse reactions to the study, you may contact the Drexel University Office of Research Compliance at 215-762-3452.

Consent

By clicking "Yes, I agree and wish to participate" below, you are agreeing that you have read this cover page and you are voluntarily agreeing to participate in this research study. If you would not like to participate in the study, simply click "No, I do not agree to these terms" and you will exit the survey. You may wish to print a copy of this page for your records.

○Yes, I agree and wish to participate.
○No, I do not agree to these terms.