MOTHER-INFANT TOUCH IN THE CONTEXT OF RISK

By

Nicola Bernard

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ABSTRACT

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Touch is a primary form of communication for mother-infant dyads in the infant's first year of life. Mothers use touch to soothe their infants, communicate safety, and teach self-regulatory skills. Infants, in turn, increasingly use touch to communicate their internal states and get their needs for care and regulation met. Stressors such as intimate partner violence (IPV) and maternal depression experienced during pregnancy and the first year postpartum may interfere with mother-infant touch by disrupting the communicative function of touch and affecting maternal representations, which guide mothering behavior postpartum. It was hypothesized that exposure to IPV or depression during pregnancy or postpartum would be associated with fewer positive and more negative maternal and infant touch behaviors, and that the relationship between these risk factors and maternal touch would be mediated by maternal representations. Mother-infant touch behaviors were coded in 173 mother-infant dyads while they engaged in a free play. One half of the mothers had been exposed to IPV during pregnancy and one third experienced clinically significant levels of pregnancy depression. The findings indicated that pregnancy IPV predicted increased use of positive touch behaviors by mothers with infant sons, whereas pregnancy and postpartum IPV predicted more negative touch behavior by infants, primarily in males. Pregnancy and postpartum depression were associated with more intrusive touch by mothers with male and female infants, and more negative touch behavior in male infants. Maternal representations did not mediate the relationship between IPV/depression and maternal touch. The results suggest that mothers may attempt to compensate for one type of risk

– IPV – specifically with their male infants. In addition, male infant touch may be more susceptible to alterations in the context of risk than female infant touch.

To my parents – you are instrumental in who I am and where I am today.

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INTRODUCTION

Within the context of the mother-infant relationship, infants typically learn important self-regulatory skills and develop expectations of interactive behavior that guide their understanding of present and future relationships (Beebe, Lachmann, & Jaffe, 1997; for review see Fonagy, 2010). During infancy, touch is an important form of interactive behavior between mother and infant, particularly when the infant is pre-verbal (e.g., Hertenstein, 2002). Mothers use touch to communicate safety and teach self-regulatory skills to their infants, and infants increasingly use touch to communicate their needs and internal states to their mothers (Hertenstein, 2002; Kaye & Fogel, 1980). However, mother-infant interactive touch behavior may be disrupted by risk factors that interfere with mother-infant contact, self-regulatory behavior, and the psychological or physiological perception of touch, such as maternal mental health problems, intimate partner violence (IPV), and infant factors (e.g., preterm birth, infant illness) (e.g., D'Andrea, Pole, DePierro, Freed, & Wallace, 2013; Feldman, Keren, Gross-Rozval, & Tyano, 2004; Herrera, Reissland, & Shepherd, 2004; Mantis, Stack Ng, Serbin, & Schwartzman, 2014).

Maternal depression and IPV (defined here as physical, sexual, or psychological violence perpetrated by a male towards his female partner) are prevalent risk factors among young adult women of child-bearing age (Tjaden & Thoennes, 2000; Whiteford et al., 2013). Moreover, women are at increased risk of experiencing depressive symptoms and IPV during pregnancy (e.g., Campbell, Oliver, & Bullock, 1998; Goodman, Rouse, Long, Ji, & Brand, 2011). Pregnancy and postpartum IPV exposure have been shown to negatively affect mothers and their children, and are associated with more negative maternal parenting behaviors; maternal and child affective, behavioral and physiological dysregulation; and insecure attachment (e.g., Boeckel,

Blasco-Ros, Grassi-Oliveira, & Martinez, 2014; Bogat, DeJonghe, Levendosky, Davidson, & von Eye, 2006; Kessler, Molnar, Feurer, & Applebaum, 2001; Leung & Slep, 2006). Maternal depression is associated with similar problems for mothers and their children (Campbell, Cohn, & Meyers, 1995; Korja et al., 2008; Lyons-Ruth, Wolfe, Lyubchik, & Steingard, 2002).

Despite the detrimental effects of depression and IPV on the mother-infant relationship, interactive behavior, and physical and psychological health, research has not yet examined their effects on mother-infant touch. Specifically, maternal touch behaviors have been examined in relation to maternal mental health problems, but infant touch behaviors have not. Maternal parenting more broadly has been studied in the context of IPV, but maternal touch and infant touch have not been explicitly examined in IPV-exposed dyads. Research on mother-infant touch behaviors in the context of other risk factors (e.g., preterm birth, infant feeding disorders), however, suggests that maternal and infant touch behaviors are negatively affected by risk (e.g., Herrera et al., 2004; Mantis et al., 2014).

IPV and maternal mental health problems may affect mother-infant touch behavior by informing an important component of the maternal caregiving system – maternal representations. Maternal representations are defined as the thoughts/attributions a woman has about her child and the maternal role (Ammaniti, 1991; Cohen & Slade, 2000; Zeanah, Zeanah, & Stewart, 1990). These representations primarily develop during pregnancy, as a woman is physically and psychologically preparing for her new maternal role. Research suggests that the representations are shaped by a woman's experiences within her own attachment relationships (childhood and adulthood) and by the exogenous and endogenous environment within which the representations develop (for review, see George & Solomon, 2008). Thus, factors like maternal mental health and the quality of a woman's adult romantic attachment relationship in pregnancy and the

postpartum period may affect how a woman thinks about her child and her capacity to meet the child's needs. Consequently, once the child is born, the past or concurrent experience of stressors likely has implications for maternal parenting behaviors such as touch.

The goal of the current study was to examine mother and infant touch behaviors within the context of IPV and maternal depression. The first aim was to investigate whether the experiences of pregnancy and postpartum IPV and maternal depression are associated with alterations in maternal touch behaviors. Specifically, types of touch behavior and amount of time spent touching were studied. While maternal touch has been examined in the context of other types of risk, including maternal depression, the effect of IPV exposure on maternal touch has not yet been elucidated. Moreover, possible mechanisms through which risk affects maternal touch behaviors, such as maternal representations, have not yet been studied. Research suggests that there may be sensitive periods during which risk factors may have a greater effect on maternal functioning. In particular, stress during the prenatal period, when maternal representations are developing most rapidly, may play a critical role in postpartum maternal parenting behaviors (e.g., Flykt, Kanninen, Sinkkonen, & Punamäki, 2010), such as touch. Therefore, in addition to the role of severity of risk on touch behaviors, the timing of risk exposure (pre- versus postpartum) was also examined.

The second aim examined the role of IPV and maternal depression in infant touch behaviors. Infant touch behaviors are also shaped by the environment within which they develop (Mantis et al., 2014; Moszkowski & Stack, 2007). Exposure to stressors like IPV and depression during gestation may affect fetal development and postnatal outcomes, and exposure postnatally may further contribute to an infant's understanding and use of touch by either demonstrating how touch can be harmful (e.g., if an infant witnesses physical IPV) or creating a context within

which touch may yield either unpredictable, inadequate, or harsh responses (e.g., if an infant initiates touch and his mother withdraws or responds in a way that the infant does not expect or understand). The types of touch that infants used and the amount of time infants spent touching their mothers was examined.

The third aim investigated maternal and infant touch responses to the other's touch behavior. Mother-infant touch is a process in which mother and infant organize their behavior in response to the other within the dynamically-changing interaction and the developing relationship. By the time the infant is one year of age, mother and infant can actively approach one another to engage in patterns of touch initiation and touch responses, which build on experiences and expectations developed in prior interactions (Kaye, 1982; Cohn & Tronick, 1989; Tronick, Als, Adamson, Wise, Brazelton, 1978). In this way, both mother and infant interact to create touch patterns that develop and adapt in response to the environment and the infant's development. Therefore, the present study examined whether pregnancy and postpartum IPV and depression were associated with differences in maternal and infant touch responses to one another's touch behavior.

In sum, the goal of the current study was to examine mother-infant touch behaviors within an interaction and within the broader context of risk factors that may influence maternal caregiving. Specifically, this study examined the effects of IPV exposure and maternal depression on maternal representations, and the role of these three predictors in maternal and infant touch behaviors. The following sections will review the existing literature on maternal caregiving, IPV, depression, and mother-infant touch. This will be followed by a description of the proposed association between the predictors and mother-infant touch. Where there is limited information on touch, parenting behavior more broadly will be discussed.

Maternal Caregiving System

When parenting her child, a mother must integrate multiple sources of information to determine a response that is appropriate to the context, the child's needs, and the mother's capacity to meet those needs. The sources of information are endogenous (e.g., maternal health) and exogenous (e.g., environmental, relational), and they are understood both within the immediate context and the broader mother-child relationship. The focus of the caregiving system is to protect and care for the child, particularly in the context of potential threat, making it complementary to the child's attachment system (George & Solomon, 2008). The caregiving system helps a mother to provide physical and psychological safety for offspring. In other words, the caregiving system guides what a mother perceives as a threat to her child, what she understands the child's need to be, what she decides is the appropriate and sensitive response, and her emotional and physical capacity to respond.

Maternal Representations. Solomon and George (1996) theorize that the caregiving system begins to develop from childhood into adulthood, with puberty and pregnancy being the most intense periods of development. They propose that this system is shaped by experiences from early childhood, such as childhood working models (which originated in the context of her own early attachment relationships; Bowlby, 1969/1982), through adulthood, such as the present caregiving environment. These working models are templates that guide her perception in and expectations of close relationships (Slade & Cohen 1996). As a woman gets older, new experiences are integrated into the models of self and other, and the models become distinct complex working models (Solomon & George, 1996). When a woman becomes pregnant, her role transition, and her fantasies and expectations of her child and of herself as a mother are integrated into the higher-order working models. This process is a kind of "mental pregnancy,"

which psychologically prepares her for parenthood. The mental pregnancy involves changes to her representations of herself in her romantic relationship, her professional and social life, her role as a soon-to-be mother, and her fantasies about her infant's role in the family (Stern, 1999).

The newly developed maternal pregnancy representations are considered to be the earliest form of parenting (Stern, 1995). Postpartum, maternal representations guide maternal perceptions of the infant and the self-as-mother, and maternal behavior. Representations typically remain stable from pregnancy to postpartum, although experiences in the postpartum period may continue to modify maternal representations to help mothers integrate new information and adapt (for review, see George & Solomon, 2008). Ideally, maternal representations help a mother to be sensitive to her infant and respond appropriately. However, negative experiences with her own primary attachment figure(s) (which can include an adult romantic partner), the experience of trauma, or the experience of environmental stressors may lead a mother to develop maternal representations that distort how she perceives herself and her infant, and how she engages with her infant (e.g., Malone, Levendosky, Dayton, & Bogat, 2010). IPV and maternal mental health problems, for example, have been associated with alterations in maternal representations (Huth-Bocks, Levendosky, Theran, & Bogat, 2004; Korja et al., 2008).

Intimate Partner Violence. IPV is a common stressor among young adult women (O'Leary, 1999). Consequently, pregnant women, and young mothers and their children are disproportionately exposed to IPV, particularly if they are from high-risk populations (e.g., racial and ethnic minority women, low socioeconomic status women; Charles & Perreira, 2007; Gazmararian et al., 2000; Fantuzzo, Boruch, Beriama, Atkins, & Marcus, 1997; McDonald, Jouriles, Ramisetty-Mikler, Caetano, & Green, 2006). Therefore, a number of mothers and their infants are exposed to violence prepartum and/or postpartum during periods that are critical for

the developing mother-infant relationship. Exposure to IPV is associated with detrimental effects to mothers (e.g., mental health, bonding, parenting behaviors) and infants (e.g., mental health, psychosocial development, attachment, self-regulation) (Bogat et al., 2006; Kessler et al., 2001; Leung & Slep, 2006; Levendosky, Leahy, Bogat, Davidson, & von Eye, 2006).

IPV experienced during pregnancy and postpartum may affect the development and stability of the maternal caregiving system. In particular, research suggests that a mother may integrate her experience of IPV into her maternal representations. Indeed, research suggests that women who experience IPV during pregnancy are more likely to perceive their infants in disengaged (i.e., emotionally removed, indifferent, and/or superficial) or distorted (i.e., confusing, unrealistic, and/or dysregulated) ways, rather than in a balanced (i.e., thoughtful, sensitive, and/or accepting) way (Huth-Bocks et al., 2004). Mothers with disengaged or distorted maternal representations may interpret fetal movements as violent or experience role confusion (Huth-Bocks et al., 2004). Pregnancy representations predict postpartum representations (Theran, Levendosky, Bogat, & Huth-Bocks, 2005) and postpartum parenting behavior (Dayton, Levendosky, Davidson, & Bogat, 2010), suggesting that IPV experienced during pregnancy may continue to affect maternal parenting into the postpartum period via maternal representations (Theran et al., 2005). Indeed, maternal IPV exposure may lead to distortion in how fetal and child behaviors are perceived (Huth-Bocks et al., 2004; Levendosky, Bogat, & Huth-Bocks, 2011).

Research suggests that women who experience IPV postpartum are more likely to engage in negative parenting behaviors, including inappropriate discipline, intrusive parenting, and more authoritarian parenting (e.g., Boeckel et al., 2014; Holden & Ritchie, 1991; Levendosky et al., 2006; McElwain & Volling, 1999). However, a smaller subset of research has also suggested that

IPV-exposed mothers may engage in more positive and effective parenting behaviors to "compensate" for the IPV exposure (e.g., Letourneau et al., 2013; Levendosky & Graham-Bermann, 2000; Levendosky, Huth-Bocks, Shapiro, & Semel, 2003). The discrepancy in findings suggests that the effect of IPV on maternal parenting may be influenced by additional factors, such as maternal representations, other aspects of the maternal caregiving system, or characteristics of the child. For example, a mother who experiences postpartum IPV may conflate her partner's behavior with her infant's, perceiving a fussy baby to be "just like his father". This may cause a mother to parent her child differently in response to her distorted perception of the infant's cues. However, if a mother develops balanced maternal representations prepartum, the negative effect of postpartum IPV on parenting may be mitigated by her sensitivity to her child's needs. Still, research also suggests that IPV-exposed mothers worry about their sons engaging in violent behavior and their daughters being victims of violent behavior in adulthood (Levendosky et al., 2000), which may also result in differences in how IPV-exposed mothers parent their sons and daughters.

Thus, IPV has the potential to influence the caregiving system via the multiple inputs that inform the system. Information that typically guides the caregiving system may be altered or distorted. The effects of IPV on maternal caregiving may be immediate – such as difficulty perceiving an infant's cues due to shifted attentional resources – or long-term.

Maternal Depression. Research suggests that maternal mental health problems, such as depression, are associated with changes in maternal caregiving. During pregnancy and postpartum, women are at greater risk of experiencing depressive symptoms (Beck, 2001; Goodman et al., 2011). 10-22% of women develop postpartum depression within a year of giving birth (Cox, Murray, & Chapman, 1993; Gress-Smith, Luecken, Lemery-Chalfant, & Howe,

2012). In the postpartum period, mothers with depression have been found to be less sensitive, more intrusive, and more rejecting (Campbell et al., 1995; Lovejoy, Graczyk, O'Hare, & Neuman, 2000; Murray, Fiori-Cowley, Hooper, & Cooper, 1996). Depressed mothers also demonstrate less positive affect when interacting with their infants (Righetti-Veltema, Conne-Perreard, Bousquet, & Manzano, 2002). Moreover, depressed mothers have also been found to use different speech patterns with their infants, such as an increased expression of negative affect and a decreased focus on the infant's internal state and experience, with the effects also differing by infant sex (Murray, Kempton, Woolgar, & Hooper, 1993). Postpartum depression is also associated with more negative perceptions of infant temperament (Britton, 2011), though observational research does not consistently find that infants of depressed mothers actually demonstrate more negative emotionality (Feldman et al., 2009; Pauli-Pott, Mertesacker, & Beckmann, 2004). Extant research suggests that pregnancy depression also predicts postpartum parenting, primarily by reducing maternal sensitivity to infant cues, resulting in lower quality interactions (Pearson, Cooper, Penton-Voak, Lightman, & Evans, 2010; Pearson, Lightman & Evans, 2011). Indeed, antepartum depressive symptoms are associated with a greater reduction in maternal responsiveness to infant cues than postpartum depressive symptoms (Flykt et al., 2010). This finding suggests that maternal mental health problems during the pregnancy period, when the maternal caregiving system and maternal representations are developing most rapidly, have significant implications for postpartum parenting.

While the link between maternal depression and increased risk of negative parenting behaviors is well-established, the mechanism(s) by which depression affects parenting have only more recently been examined (Trapolini, Ungerer, & McMahon, 2008). Research on depression and maternal representations has produced mixed findings, suggesting both a greater percentage

of mothers with distorted representations in samples of depressed women (Korja et al., 2008; Rosenblum, McDonough, Muzik, Miller, & Sameroff, 2002) and no difference in depressed versus nondepressed women (Sokolowski, Hans, Bernstein, & Cox, 2007). However, women in the study by Sokolowski et al. were at greater risk of developing nonbalanced representations if they reported higher levels of hostility. The authors argued that hostility may be a symptom of depression. Trapolini and colleagues (2008) found that cognitive symptoms of depression affected maternal sensitivity via the effect of cognitive distortions on maternal representations. The findings from these studies provide evidence for a relationship between depressive symptoms, maternal representations, and maternal parenting behaviors.

IPV and depression typically occur over an extended period of time and are associated with changes in how mothers perceive and parent their male and female children (e.g., Boeckel et al., 2014; Holmes, 2013; Leung & Slep, 2006; Levendosky et al., 2000; Levendosky, Lannert, & Yalch, 2012; Murray et al., 1993). Moreover, IPV and depression often co-occur (e.g., Kessler et al., 2001; Pico-Alfonso et al., 2006). While the caregiving system ideally is flexible and able to withstand unexpected day-to-day stressors, research suggests that the caregiving system may be derailed by experiences that interfere with the physical and psychological well-being of the mother and child, such as IPV and maternal depression (e.g., Borghini et al., 2006; Solomon & George, 1996). Given the associations between these risk factors and maternal parenting, it is likely that IPV and maternal depression may specifically influence touch behaviors. Though the research is limited, it is possible that the effects of IPV on maternal touch behaviors may differ depending on the sex of the infant.

Risk and Infant Outcomes

Maternal experience of stress, such as IPV and depression, during pregnancy when fetal brains are undergoing rapid development, is associated with differences in infant social-emotional, cognitive, and behavioral outcomes postnatally (Kingston, Tough, & Whitfield, 2012; Monk, Spicer, & Champagne, 2012; Zhang et al., 2018). Research suggests that prenatal exposure to maternal stress can result in epigenetic and developmental changes to a fetus (for review, see Hicks, Swales, Garcia, Driver, & Davis, 2019). These changes may be evident postpartum in physiological, behavioral, and emotion regulation differences, particularly in response to stress (Hicks et al., 2019). More specifically, research has found that prenatal exposure to stress is associated with increased negative affectivity (e.g., Austin, Hadzi-Pavlovic, Leader, Saint, & Parker, 2005), HPA axis (the long-acting stress response system) dysregulation (e.g., de Bruijn, van Bakel, Wijnen, Pop, & van Baar, 2009), differences in brain development (e.g., Sandman, Buss, Head, & Davis, 2015), and increased risk for later psychopathology (e.g., Bergh et al., 2017; Essau, Sasagawa, Lewinsohn, & Rohde, 2018). Maternal stress is thought to enact these changes via alterations to the maternal HPA axis and changes to the placenta, which in turn alter fetal development (Carpenter, Grecian, & Reynolds, 2017). In the postnatal period, these early differences may, in turn, influence the child's developmental trajectory beyond infancy (for review, see Bergh et al., 2017). Research suggests that the effects of prenatal stress on infant outcomes may differ by infant sex (e.g., Gerardin et al., 2011; Khashan et al., 2011).

Exposure to IPV postnatally is associated with increased risk of insecure attachment by age 1 (Levendosky, Bogat, Huth-Bocks, Rosenblum, & von Eye, 2011). In addition, infants exposed to IPV postnatally show greater difficulty with emotion regulation, with increased rates of internalizing behavior problems among females and externalizing behavior problems among

males (for reviews, see Evans, Davies, DiLillo, 2008; Tailor & Letourneau, 2012). Indeed, research has demonstrated that infants of mothers exposed to IPV show more distress to simulated adult conflict (DeJonghe, Levendosky, von Eye, & Davidson, 2005), and in the context of severe IPV, will even demonstrate trauma symptoms such as avoidance, hyperarousal, and regression in previously achieved developmental skills (Bogat, DeJonghe, Levendosky, Davidson, & von Eye, 2006).

Exposure to maternal depression in the postnatal period is similarly associated with an increased risk of insecure attachment (Campbell et al., 2004) and increased affective reactivity, particularly among male infants (Beeghly et al., 2017; Carter, Mayes, & Pajer, 1990; Weinberg, Tronick, Cohn, & Olson, 1999). However, other research has not found sex differences in the effects of postpartum depression on infant interactive behavior with mothers postpartum (e.g., Granat, Gadassi, Gilboa-Schechtman, & Feldman, 2017). Chronic maternal depression during the first year of life is especially pernicious for infant development, increasing the risk for cognitive and psychomotor deficits (Cornish et al., 2005). The effects of postnatal exposure to IPV and depression on infants may be due to direct exposure (e.g., witnessing IPV being perpetrated, which is thought to result in both a fearfulness for the mother's well-being and, paradoxically, a fear of the mother; Zeanah et al., 1999) and alterations in maternal parenting and the postnatal environment as a result of the IPV and maternal depression. The effects also have implications for how an infant interacts with his mother, particularly if the infant feels fearful of his mother or has learned that his mother does not respond appropriately to his cues or predictably meet his needs for care (e.g., Granat et al., 2017). Notably, the negative effects of IPV and depression on infant outcomes may be mitigated by other infant and maternal factors that promote resilience, such as infant positive temperament, shorter duration of exposure, and

maternal sensitivity (Bowen, 2015; Feldman et al., 2009; Martinez-Torteya, Bogat, von Eye, & Levendosky, 2009; Tomlinson, Cooper, & Murray, 2005).

Touch

Mother-infant touch is an important component of the early caregiving relationship. Touch communicates intimacy and availability, and promotes security, which increase a person's sense of well-being and interconnectivity (Andersen, 1985; Guerrero & Andersen, 1991; Jakubiak & Feeney, 2016). Although touch is a critical component of interpersonal relationships across the lifespan, touch takes on additional importance in the mother-infant relationship (Feldman, 2011). During this time, the infant is entirely dependent on the mother for care and regulation. However, a mother is more limited in how she can communicate safety and promote regulation in her infant due to the infant's immature cognitive and emotional developmental state (Brazelton & Cramer, 1990; Hertenstein, 2002; Stack, 2001). The infant, in turn, can use touch to help his mother organize her behavior in a way that is responsive to his needs (Kaye & Fogel, 1980).

Mother-infant touch is a dynamic process that involves mutual influence and co-regulation (Hertenstein, 2002). During an interaction, mother and infant continuously adjust to one another (Fogel & Garvey, 2007). How they adjust is informed by maternal and infant states, prior behaviors, the immediate context, and expectations developed within the context of the mother-infant relationship. For touch specifically, prior mother-infant touch interactions create patterns and expectations that continue to be shaped by experience and infant development. Despite the dyadic nature of touch, research has typically focused on maternal touch of the infant, and the implications of this touch for mothers and infants. Thus, infant touch and the significance of infant touch for mother and infant have been understudied. Without the

consideration of infant touch, touch patterns within a mother-infant dyad have rarely been examined. Therefore, an essential component of touch between mother and infant – that is, the consideration of the role of the other member of the dyad – has been neglected. Consequently, although an aim of the present research is to examine mother-infant touch, the examination of infant touch will be more exploratory and will be informed by a broader range of literature. As touch has typically been examined individually in mothers and infants, the maternal touch and infant touch literatures will first be reviewed separately. The integrated mother-infant touch literature will follow.

Maternal Touch. A mother's first experience of touching her infant skin-to-skin frequently occurs during or shortly after birth. This early skin-to-skin contact (SSC) is associated with immediate effects, such as increased physiological stability (e.g., breathing, glucose levels, temperature, blood pressure, etc.) for the infant, synchrony between mother and infant body temperatures (Moore, Anderson, Bergman, & Dowswell, 2012; Phillips, 2013) and increased maternal oxytocin, which promotes maternal bonding (e.g., Matthiesen, Ransjö-Arvidson, Nissen, & Uvnäs-Moberg, 2001). Physical contact immediately after birth between mothers and infants is associated with an increase in maternal touch during breastfeeding for several days following (Carlsson et al., 1978). The effect of early maternal touch on mothers and their infants is also evident one year later (Bystrova et al., 2009). Bystrova and colleagues (2009) found that at 1 year postpartum, mothers who had physical contact directly after birth demonstrated greater maternal sensitivity, whereas infants had improved self-regulation and greater dyadic reciprocity relative to dyads who were separated for the first 2 hours following birth. These findings provide support for the importance of touch in the early mother-infant relationship.

Mothers typically touch their infants most during the first six months of the infant's life, when touch is one of the primary ways in which a mother can communicate with her infant and modulate the infant's arousal (Hertenstein, 2002; Kaye & Fogel, 1980; Stern, 1985; Tronick, 1995). As a mother perceives changes in her infant's needs across infancy, she may adjust the quality and quantity of her touch in response (e.g., Field, Vega-Lahr, Goldstein, & Scafidi, 1987; Jean, Stack, & Fogel, 2009). Jean and colleagues (2009) examined maternal touch longitudinally in mother-infant dyads when the infants were 1, 3, and 5 months old. Maternal touch quantity decreased over time, and the quality of touch also changed. Mothers used more stroking touch in early infancy and more static touch by 5 months. The use of more static touch may be related to maternal responsiveness to the infant's increasingly independent movement, as this kind of touch would allow a mother to be in contact with her child without interfering with the infant's exploration and play. In addition, the mother's increased use of a more passive type of touch may be in response to an increase in infant-initiated touch behaviors by 5 months (Ferber, Feldman, & Makhoul, 2008; Jean et al., 2009).

Research suggests that over the second 6 months of life, mothers continue to adjust their touch in response to the infant's increased independence (Crnic, Ragozin, Greenberg, Robinson, & Basham, 1983; Ferber et al., 2008; Field et al., 1987). For example, Ferber and colleagues (2008) examined maternal touch cross-sectionally across the first year of life and found that maternal touch decreased for all types of touch (affectionate, stimulating, and instrumental) in mothers of older infants. In particular, affectionate and stimulating touch decreased significantly between mothers of infants aged 6 months and 9 months. However, dyadic reciprocity increased over the second 6 months of life. Thus, the increasing independence of older infants may have

led mothers to reduce their active touch behavior, thereby allowing older infants to become more dominant and touch to become more reciprocal within an interaction.

Touch between mothers and their infants contributes to maternal and infant physical and psychological health (Field, 2002; Montagu, 1986). Maternal touch may reduce maternal anxiety and depressive symptoms, and promote the mother-infant relationship (Ferber et al., 2005; Moszkowski & Stack, 2007). Research suggests that maternal touch may also stimulate infant growth and help with infant physiological, behavioral and emotional regulation (Montagu, 1986; Stack, 2010). Moreover, maternal touch plays an important role in infant cognitive development (Field, 2010; Hertenstein, 2002; Stack, 2004). Maternal touch also promotes the expression of positive emotions in infants (e.g., Stack & Arnold, 1998). The importance of touch for infant development is underscored by research on touch deprivation, which further suggests that physical contact is critical for emotional and interpersonal development (e.g., Harry Harlow's monkeys; Harlow & Harlow, 1962), and for cognitive and physical development (e.g., infants in eastern European orphanages; Kuhn & Schanberg, 1998).

There are many different ways that a mother may touch her child, and the touch that she uses may depend on multiple factors, such as the context, the purpose of the touch (e.g., to get the infant's attention, feed, or soothe), maternal and infant health (e.g., depressed mothers may touch their infants differently, or mothers of fragile preterm infants may handle their infants differently; Herrera et al., 2004; Harrison & Woods, 1991), and infant sex (e.g., mothers may use more stimulating touch with their sons, but more instrumental touch with their daughters; Feldman & Eidelman, 2004). In addition to these, maternal touch may also depend on the touch a mother experienced from her primary attachment figure when she was a child (Weiss, Wilson, Hertenstein, & Campos, 2000), and the touch she is currently receiving in her romantic

relationship from her adult attachment figure (Weiss & Goebel, 2003). Weiss and Goebel (2003) examined maternal and paternal touch in parents of preterm infants 3 months postpartum, also assessing for each parent's "felt security regarding tactile experience as a child" (assessing the degree to which the need for positive (affectionate and comforting) touch was met when the respondent was a child) and "felt security regarding current tactile experience" (assessing the degree to which the respondent feels their need for positive (affectionate and comforting) touch is satisfied by the current romantic partner) (subscales taken from the Physical Contact Assessment Questionnaire; Weiss et al., 2000). While childhood touch did not predict how mothers touched their infants, the degree of maternal satisfaction with partner touch predicted how mothers touched their infants. Specifically, the more that mothers felt their need for affectionate and comforting touch was being met, the more frequently they touched their infants. These findings suggest that a mother's internalization of her own touch experiences in her adult attachment relationship may be transmitted to her infant via her touch.

Types of Maternal Touch. There are multiple qualitative and quantitative features through which touch can be described and examined, such as the action, location, intensity, frequency, or duration of touch (e.g., Hertenstein, 2002). Hertenstein argued that these components of touch combine to communicate distinct and valenced emotions (Hertenstein, Holmes, McCullough, & Keltner, 2009). In a study by Stack and LePage (1996), the authors found evidence to suggest that mothers communicated distinct emotions to their 5-month-old infants using nonverbal touch behaviors. Mothers were instructed to maintain still faces to minimize the communicative effect of facial expressions. Additional studies by Jean and Stack (e.g., Jean & Stack, 2009; Stack & Jean, 2011) support Hertenstein's hypothesis that mothers can communicate emotions to their infants using touch, and that mothers may use certain kinds of

touch depending on the infant's needs (with the ultimate goal of infant emotional and behavioral regulation; Jean & Stack, 2012).

Coding Maternal Touch. Multiple coding schemes have been developed to study maternal touch behavior, such as the Touch Scoring Instrument (TSI; Polan & Ward, 1994), Caregiver Infant Touch Scale (CITS; Stack, LePage, Hains, & Muir, 1996), and Functions of Touch Scale (FTS; Jean & Stack, 2009). The TSI and CITS primarily describe the type of maternal touch (e.g., proprioceptive stimulation, stroking/shaking/rocking) whereas the FTS describes the purpose of the touch behavior (e.g., nurturing touch, harsh touch). While understanding how specific touch types change over time is informative, assessing the purpose of the touch is critical to understanding the role of touch in communication because it provides a context within which the touch can be understood (Jean & Stack, 2009).

The FTS was developed by Jean and Stack (2009) to better understand the function or purpose of maternal touch during a mother-infant interaction. The authors perceived a gap in the maternal touch literature, given that most studies on maternal touch examine the properties of touch without understanding the communicative function of touch. During each second of an interaction, the function of a touch is coded using 1 of 9 possible functions: passive accompaniment (i.e., when touch co-occurs with another form of communication, and touch is not the main form); active accompaniment (i.e., when touch co-occurs with another form of communication, and touch is a focus); nurturing touch; playful touch; attention-getting touch; accidental touch; utilitarian touch; harsh or negative touch, and touch with no obvious purpose. Jean and Stack (2009) coded interactions between 40 mother-infant dyads using the FTS. Infants were approximately 5.5 months of age. A two minute normal interaction period was coded,

which was followed by a Still Face Task[1], and another two minute normal interaction period, which was again coded. Jean and Stack found that the amount of maternal touch did not significantly vary between the first normal interaction period and the second. During both periods, mothers tended to use playful touch, active accompaniment, and passive accompaniment most. However, the results suggested that some of the functions of the touch that mothers provided between the two periods differed. During the first normal interaction, mothers used more attention-getting touch than during the second normal interaction. When the level of infant distress during the still face was taken into account, the results suggested that mothers of more distressed infants used significantly more nurturing touch during the second period than did mothers of infants with low levels of distress. These results suggest that the function of maternal touch changed in response to maternal perception of the infant's needs. Therefore, if an infant becomes distressed, a mother may attune to her infant's changing needs, and the goal of maternal touch may become to provide warmth and nurturance to soothe the infant. These findings are also consistent with research that suggests the important role of maternal touch in infant emotion regulation (Feldman, Singer, & Zagoory, 2010).

Infant Touch. Despite the importance of touch in the early caregiving relationship, research on infant communication and interactive behavior has primarily examined other modalities, such as vocalizations, gaze, body movements, and facial expressions (e.g., Ellsworth, Muir, & Hains, 1993; Moszkowski & Stack, 2007; Segal et al., 1995; Weinberg & Tronick, 1994). Moreover, the research that has been conducted on infant touch has typically been an

[1] During the Still Face Experiment (Tronick et al., 1978), a parent and child face one another for three episodes: play, still-face, and reunion. The play and reunion episodes are considered "normal interactions". During the still face, the parent maintains a still and unresponsive facial expression. The parent resumes normal behavior for the reunion. Studies vary as to whether the parent can or cannot touch the infant during the still-face. The still face has been used to study the child's reactivity and ability to self-regulate, and the quality of the parent-child interaction during the reunion episode.

examination of touch outside of an interaction (e.g., touching objects; Rochat, 1997; Stack & Tsonis, 1999) or self-touch within an interaction (e.g., Murray & Trevarthen, 1985; Toda & Fogel, 1993). Thus, this research has not provided insight into touch as a form of communication and as an interactive, dynamic behavior (Moszkowski & Stack, 2007).

Infants are active participants in their environments, and by approximately 2 months of age, infants respond with shifts in facial expression and gaze during an interaction to perceived changes in others' behavior (Trevarthen, 1977). By 3-4 months of age, infants can initiate interactions with others (Kaye & Fogel, 1980). These early mutual interactions can include mutual gaze, facial mirroring, turn-taking with vocalizations, mutual approach and avoidance, and touch behavior (Beebe et al., 2012; Feldman, 2007; Jaffe et al., 2001; Malatesta, Culver, Tesman, & Shepard, 1989; Messinger, 2002; Stern, 1985; Tronick, 1989). As an infant's social-emotional and physical development progresses across time, infant touch becomes more complex. By the time the infant is one year of age, the infant can initiate touch, understands reciprocity in touch, and has developed expectations about whether and how his needs will be met when he touches his mother (Cohn & Tronick, 1989; Feldman, 2010; Kaye, 1982; Moszkowski, Stack, & Chiarella, 2009; Tronick et al., 1978). When these expectations are violated, infants have been found to react with changes in touch behavior. For example, Moszkowski et al. (2009) examined infant touch during a Still Face task and found that infant touch of self, object, and mother varied across the Still Face and Normal periods as infants attempted to engage their mothers, self-soothe, and distract themselves from their nonresponding mothers.

The limited research that has been conducted on infant touch suggests that infant touch has implications for both infants and their mothers. Infant touch, including self-touch, is

associated with the development of infant self-regulation (Murray & Trevarthen, 1985; Toda & Fogel, 1993). Infant self-touch has typically been examined during the unmodified Still Face Task, with research indicating that infants engage in more self-touch during the still-face period when they are emotionally dysregulated than during the normal periods (Weinberg & Tronick, 1996). The goal of self-touch may be two-fold – engaging in self-soothing touch to manage distress and eliciting maternal caregiving behaviors by alerting a mother to her infant's inner state (Tronick, 1989; Gianino & Tronick, 1988). Infant touch of the mother may also cue the mother in to the infant's need for attention or regulation. In addition, infant touch may also affect maternal biology to promote caretaking behavior. Infant touch during breastfeeding (i.e., hand stimulation and sucking behavior) or during an interaction, for example, may increase maternal oxytocin production, which is associated with increased maternal bonding (Feldman, Gordon, & Zagoory-Sharon, 2011; Matthiesen et al., 2001). Research has not demonstrated sex differences with regard to infant touch of the mother (Moszkowski & Stack, 2007).

Coding Infant Touch. Infant touch coding has typically examined self-touch and object-touch (e.g., Rochat, 1989; Stack & Tsonis, 1999), or coded touch along with other modes of communication (e.g., gesturing; Murray & Trevarthen, 1985). However, recent research has noted that infant touch behavior has been neglected in studies of "mother-infant touch" (Crucianelli et al., 2019; Moszkowski et al., 2009). To address this gap, Moszkowski and Stack (2007) created a scale intended solely for coding infant touch. The Infant Touch Scale (ITS; Moszkowski & Stack, 2007) was intended to complement the CITS and provides codes for the type of touch and the area touched. However, as with the CITS, the communicative function of the coded touch behavior is unclear. In addition, the scale is primarily focused on self-touch, which may provide insight into infant self-regulation, rather than other-touch, which could

provide insight into the communicative function of the touch. Although the ITS does not assess infant touch purpose, a review of the literature suggests that infant touch purpose has been examined in mother-infant touch coding schemes (see below), providing support for the feasibility and meaningfulness of examining the function of infant touch.

Mother-Infant Touch. From a dynamic systems theory perspective, a mother-infant interaction is a dynamic interplay between mother and infant, in which they are responsive to one another and their environment (Fogel & Garvey, 2007). This dynamic responsivity facilitates stability within the mother-infant interaction through co-regulation. How a mother responds to her infant depends on the maternal caregiving system, which integrates her perception of the environment, her maternal role, the needs of her infant, and her ability to respond to those needs (George & Solomon, 2008). How her infant responds is shaped by the infant's perception of threat in the environment, his sense of security with his mother, and his needs (for review, see Mikulincer, Shaver, & Pereg, 2003). Thus, a mother-infant interaction involves a dynamic interplay between maternal and infant perceptions and needs within the current environment, and their expectations based on experiences in prior interactions.

Mother-infant touch is a dyadic process that is ideally responsive, flexible, and sensitive. While mother-infant touch is a nascent field of study, studies of broader mother-infant interactive behavior can provide a model for understanding touch specifically. Within the context of the dyad, the infant learns social behavior and develops expectations for relationships and reciprocity. The mother, in turn, adapts her childhood models for interactive behavior in response to her perception of the infant and her changing role. Within any given interaction, mother and infant engage in a continuous process in which their behaviors, intentions, and feelings become more detailed as a result of the interactive context (Fogel & Garvey, 2007).

During an interaction, mother and infant adapt their behavior and affect in response to changes in the other's behavior and affect (Cohn & Tronick, 1987; 1989; Kaye, 1982). When mother and infant are out of sync, the dyad works to correct the interaction and return mother and infant to synchrony within the interaction (Gianino & Tronick, 1988; Tronick, 1989; Tronick, Als, & Brazelton, 1977). Through this reparative process, infants learn emotion regulation and develop expectations of patterns of interactive behavior. When these learned expectations are not met, infants will work to alter their behavior to elicit the expected maternal reaction. During the Still Face Task, for example, mothers maintain a still and unresponsive facial expression while facing their infants. This behavior typically violates infant expectations of maternal responsivity, and infants are frequently observed modifying their behavior (e.g., reaching towards their mothers, becoming more affectively expressive) to elicit the expected behavior (e.g., responsive engagement) from the mother (e.g., Tronick et al., 1978). If mothers are able to touch their infants during the Still Face, however, the infant remains better-regulated emotionally despite the violation of infant expectation, suggesting that maternal touch helps the infant to modulate arousal in spite of the absence of maternal facial cues (Jean & Stack, 2009).

However, in the context of risk, such as when mothers have mental health problems or mother and infant experience IPV, mother-infant interactions can also become a context within which risk is transferred from mother to infant. If maternal or infant ability to engage in responsive co-activity with one another is impaired, the infant may become distressed rather than regulated within the mother-infant interactive context (Crockenberg & Leerkes, 2005; Jahromi & Stifter, 2007; Shaver & Mikulincer, 2002).

Coding Mother-Infant Touch. A review of the literature suggests that a few studies have examined mother-infant touch, with one study focusing solely on touch, while other studies

coded multiple interactive behaviors (Beebe et al., 2012; Crucianelli et al., 2019; Feldman et al., 2004; Mantis et al., 2014). Mantis and colleagues (2014) coded mother-infant touch in 121 mothers and their 5.5-month-old infants. One third of the infants were born preterm, one third were at psychosocial risk (low SES), and one third were low risk. Using a simple coding scheme (Co-Touch Scale; Mantis, Ng, & Stack, 2010) that assessed whether mother and infant were engaged in mutual (mother and infant are both touching each other), one-sided (only mother or infant is touching the other), or no touch (neither mother nor infant is touching the other), Mantis and colleagues found that the mother-infant interactions during normal periods of a modified Still Face[2] were characterized primarily by mutual or one-sided touch. Risk was differentially associated with the amount of mutual touch used, with dyads in which the infant was born preterm engaging in significantly less mutual touch than dyads with psychosocial or low risk. While this study provides support for the presence of maternal and infant touch in co-regulation and the detrimental effect of one form of risk (preterm birth), it does not provide insight into the quality of the touch.

Beebe and colleagues (2012) studied mother-infant interactive behavior in 4-month old infants. Mothers were seated across from their infants and instructed to play for 10 minutes without the use of toys. Maternal and infant interactive behaviors, such as gaze, facial affect, and touch were coded. Maternal touch was coded for affectionate to intrusive touch, and infant touch was examined via infant-initiated touch (touch that is initiated and completed by the infant, of self, object, or mother). Maternal and infant behaviors were coded second-by-second, and eight interactive patterns were identified. At 12 months, infant attachment was examined using the Strange Situation Procedure (Ainsworth, Blehar, Waters, & Wall, 1978). In infants who were

[2] Maternal touch was permitted during the still-face period.

later classified as secure, more frequent infant-initiated touch was associated with more affectionate maternal touch behaviors. Maternal touch overall did not specifically predict infant touch initiation. In infants who were later classified as disorganized, infants initiated fewer touch behaviors overall (of self, object, and mother). When infants did increase touch initiation with their mothers, mothers were less likely to respond with affectionate touch than mothers of future-secure infants. The results suggest that future disorganized infants were less able to use touch for self-soothing (self-touch) and for eliciting maternal interactive behavior (other-touch). Moreover, mothers of future disorganized infants engaged in less coordinated touch and were less responsive to infant touch. Therefore, long before the infant was classified as disorganized, mother and infant engaged in less interactive touch behavior, and the touch that did occur was less attuned and more dysregulated. Conversely, in mothers of future secure infants, infant touch initiation functioned as a signal for mothers to increase their affectionate touch behaviors. The differences may have been due to differences in self- and other-regulation. In dyads with future disorganized infants, mother and infant may have experienced more physiological and affective dysregulation, which was then reinforced and maintained by mother-infant interactive dysregulation (Beebe et al., 2012).

Feldman and colleagues (2004) examined mother-child touch behaviors and interactive behaviors in children aged 9 months to approximately 3 years (average age: 25 months). Some of the children had a feeding disorder (FD). Mothers were videotaped during a 15-minute free play and a 15-minute feeding session. The free play was coded for child proximity to mother, maternal and child touch patterns (no touch, affectionate touch, proprioceptive touch, instrumental touch, unintentional touch, and negative touch), partner's response to touch (approach, acceptance, practical response, withdrawal, or rejection), and joint gaze patterns. The

feeding session was coded for interactive behaviors (not specific to touch). During the free play, mothers of children with FDs used less affectionate, proprioceptive and unintentional touch than mothers of children without FDs. Mothers of children with FDs tended to respond to their child's touch with more practical and rejecting responses. Children with FDs used less affectionate touch and more negative touch with their mothers. When touched, children with FDs tended to withdraw from or reject their mothers. The results indicate a pattern of more negative touch and rejecting touch behaviors in mother-child dyads. This suggests that disruptions to basic functions (such as feeding) in early infancy may have more global implications for mother-child interactive behavior. Mothers may feel ineffective and worry about causing their children harm and their children may associate interactions with their mothers with stress and physical discomfort.

Crucianelli and colleagues (2019) recently developed the Mother-Infant Touch Scale (MITS), which codes maternal and infant touch in terms of valence, functionality, and purpose. The coding system also assesses maternal and infant touch in parallel and, for mothers, allows for the examination of whether or not the touch is contingent with the infant's emotional state and experience. The researchers noted a gap in the literature, not only of coding systems for infant touch behavior, but specifically of coding systems that examine infant touch of the mother. Crucianelli et al. applied the MITS to a mother-infant book-reading interaction when infants were 1 year of age. They also assessed maternal ability to mentalize the infant (i.e., maternal ability to understand the infant's mental state). Findings suggested that mothers who were less able to mentalize their infants used touch behaviors that were less attuned (contingent) to the infant. Unattuned maternal touch predicted less affectionate infant touch. However, the reverse was not true – mothers who were able to mentalize their infant did not use more attuned touch

behavior, and more attuned maternal touch behavior was not associated with more infant affectionate touch. Thus, mothers who have greater difficulty understanding their infants are at greater risk of using touch behaviors that are not sensitive to the infant needs, which in turn elicits fewer positive touch behaviors from the infant. The authors did not find any interactive or main effects of infant sex.

This research suggests that various forms of risk are associated with alterations in mother-infant touch. Beebe et al. (2012) and Feldman et al. (2004) capture more specific, meaningful effects of risk on interactive behavior by coding mother and infant touch individually, and assessing both initiated touch behaviors and responses to touch. Crucianelli et al. (2019) capture a broader type of risk (maternal difficulty understanding infant internal states) and the resulting lack of attunement in maternal touch and reduction in affectionate infant touch. Consequently, the coding scheme in the present study also proposes to examine touch behaviors and responses to touch in mothers and their infants to better understand the effect of other forms of risk on mother-infant touch.

IPV, Maternal Depression, and Touch

As reviewed, maternal and infant touch behaviors are likely to be shaped by factors within the immediate context (e.g., the other person's touch behavior) and broader factors within which the relationship developed (e.g., IPV, maternal depression, and maternal representations). Some research exists on the relationship between other risk factors and maternal touch, and very limited research exists on infant touch. However, maternal and infant touch have not yet been examined together within the context of IPV and maternal depression, which are common stressors. Maternal and infant touch behaviors may be affected directly by risk, and indirectly via

the effect of risk on the other person's touch behavior. In addition, risk may affect maternal touch behavior by shaping how a mother perceives her child and the maternal role.

Given the association between IPV and other types of negative parenting behavior, IPV is likely associated with the use of more negative touch behavior (e.g., harsh, intrusive touch) as well. IPV may also lead to altered physical and psychological touch perception, which in turn affect touch behaviors. Mothers may psychologically associate touch with violence and pain, and/or experience an altered physiological response (i.e., hyper- or hypo-reactivity) to touch due to the trauma of IPV (e.g., physiological reactivity, which is associated with somatosensory function, has been found to be altered in individuals with trauma-exposure, leading to hyper- and hypo-arousal; D'Andrea et al., 2013; Gupta, Lanius, & van der Kolk, 2005; van der Kolk, Greenberg, Orr, & Pittman, 1989). Consequently, mothers may avoid being touched by their infants, or respond negatively when touched (e.g., flinch, become upset). Infants may, in turn, perceive this negative reaction to touch and therefore reduce touch and touch-seeking behaviors. In addition, infants may also experience physiological hyper- or hypo-reactivity as a consequence of increased prenatal stress exposure (Glover, O'Connor, & O'Donnell, 2010), which could affect infant temperament and touch behaviors (initiation and response) postnatally. For example, if the infant experiences hypo- or hyper-responsivity to stressful stimuli postpartum, normative infant touch behaviors to seek help with co-regulation may be disrupted. Consequently, infants may also reduce or otherwise alter their touch behaviors.

IPV may also influence maternal touch indirectly via changes to maternal representations. For example, if a mother perceives her child to be a victim like her, experiences role reversal and perceives her child to be taking care of her, or perceives her child to be violent towards her like her perpetrator, this likely has implications for how she engages with and touches her child. That

is, her distorted perception of her maternal role and of the infant may cause her to misinterpret the infant's (tactile or other) cues and alter how she responds with touch to the cues. As a result, maternal touch behaviors may be unpredictable for the infant, and mothers may instead become a source of dysregulation rather than regulation.

Maternal mental health problems are associated with changes in maternal touch behaviors. Depressed mothers have demonstrated differences in touch behaviors relative to their non-depressed counterparts (e.g., more intrusive, over-stimulating, and developmentally inappropriate touch; Cohn & Tronick, 1989; Fergus, Pickens, & Schmidt, 1998; Herrera, Reissland, & Shepherd, 2004). Maternal depressive symptoms may contribute to distorted maternal representations (e.g., Korja et al., 2008), which may in turn lead to mismatched and developmentally inappropriate maternal touch behaviors. These kinds of maternal touch behaviors have been found to elicit withdrawal, conflict behaviors, frustration, and anxiety in infants and young children (e.g., Apter-Levy, Feldman, Vakart, Ebstein, & Feldman, 2013), likely leading to less or more aggressive child touch. When maternal touch is taken into account, maternal mental health problems have not been found to predict infant touch behaviors (e.g., Feldman et al., 2004). Thus, the effect of maternal mental health problems on infant touch may be largely through the effect of mental health problems on maternal touch.

In sum, IPV and maternal depression may significantly undermine mother-infant touch by (1) altering touch behaviors; (2) influencing the perception of the other's touch behaviors; and (3) affecting maternal representations, which may influence a mother's capacity to respond appropriately, predictably, and sensitively to her infant's cues.

Current Project

The present study was designed to address several limitations of extant research on mother-infant touch. First, this study aimed to examine maternal touch in the context of risk. IPV and maternal depression have been shown to affect maternal caregiving, infant outcomes, and the mother infant relationship. This study also examined maternal representations as a mechanism by which risk affects maternal touch behaviors. That is, a mother's representations of her infant's needs and her ability to fulfill those needs were posited to be affected by maternal depression and IPV, which could in turn interfere with her ability to emotionally engage with and mentalize her infant. These representations, in turn, were theorized to shape how she touched her infant. Second, this study aimed to understand infant touch in the context of risk. IPV and maternal depression are known to affect infant development, and social-emotional outcomes, such as interactive behavior. Therefore, it followed that these risk factors could also be associated with differences in infant touch behavior. Third, this study aimed to identify common patterns in touch interactions in the context of risk, including how mother and infant respond to the other's touch in the moment. Increased understanding of the effect of these risk factors on mother and infant touch behavior may help to explain how the detrimental effects of exposure to these risk factors persist over time. For all of the hypotheses, the pregnancy and postpartum periods were examined separately for IPV and depression to assess the role of timing of exposure in the effect of these risk factors on touch outcomes. When examining the role of maternal representations, representations from the postpartum period were used to allow for the potential effect of risk during the pregnancy or postpartum periods on maternal representations to occur. Given research to suggest potential sex differences in the effects of risk on mother-infant interactive behavior,

infant sex was included in the analyses. As research is limited, no specific hypotheses were made regarding infant sex.

The current project assessed mother-infant touch with a coding scheme that is informed by existing studies of mother and infant touch behaviors. The coding scheme captured the function of touch behaviors, intrusiveness, and tactile responses to the other's touch behaviors. These aspects of touch are hypothesized to vary between IPV and maternal depression-exposed and non-exposed dyads, based on prior research and the maternal caregiving system theory. Please see Figure 1 for a theoretical model of the present study.

Hypotheses

Aim 1. The first aim was to determine whether IPV and maternal depression will predict maternal touch behaviors.

Hypothesis 1a. Controlling for maternal depression, mothers with pregnancy or postpartum IPV were predicted to use less affectionate and more negative touch compared to non-exposed mothers. In addition, mothers with IPV were predicted to use more intrusive touch than non-exposed mothers. In addition, mothers with IPV were expected to touch their infants less overall.

Hypothesis 1b. Controlling for IPV, mothers with pregnancy or postpartum depression were predicted to use more intrusive touch. In addition, mothers with depression were expected to touch their infants more overall.

Hypothesis 1c. The detrimental effect of IPV on touch behaviors was predicted to be partly explained by postpartum maternal representations. Pregnancy and postpartum IPV were predicted to affect developing maternal representations, which in turn were predicted to affect

how a mother touches her child. Thus, postpartum maternal representations were expected to partially mediate the relationship between IPV and maternal touch behaviors.

Hypothesis 1d. The detrimental effect of maternal depression on touch behaviors was predicted to be partly explained by postpartum maternal representations. Pregnancy and postpartum maternal depression were predicted to affect developing maternal representations, which in turn were predicted to affect how a mother touches her child. Thus, postpartum maternal representations were expected to partially mediate the relationship between maternal depression and maternal touch behaviors.

Aim 2. The second aim was to examine the relationship between IPV-exposure, maternal depression, and infant touch.

Hypothesis 2a. Controlling for maternal depression, infant touch was predicted to differ between IPV-exposed and non-exposed infants. Types of touch used, overall amount of touch, and proportions of each type of touch were predicted to vary. Given the more exploratory nature of the infant touch analyses, the predictions were intentionally broad.

Hypothesis 2b. Controlling for IPV, infant touch was predicted to differ between infants of mothers with depression and infants of mothers without depression. Types of touch used, overall amount of touch, and proportions of each type of touch were predicted to vary.

Aim 3. The third aim was to determine mother and infant tactile responses to touch in relation to IPV and maternal depression.

Hypothesis 3a. During an interaction, touch and attempts to touch may elicit a range of tactile responses from the recipient of the touch or touch attempts. It was predicted that maternal and infant tactile responses to touch would vary between mother-infant dyads who have

experienced pregnancy or postpartum IPV and mother-infant dyads who have not. Mothers and infants with IPV exposure were predicted to respond with more no touch or negative touch (e.g., push) than mothers and infants without IPV exposure.

Hypothesis 3b. It was predicted that maternal and infant tactile responses to touch would vary between mother-infant dyads who have experienced pregnancy or postpartum maternal depression and mother-infant dyads who have not. Infants with exposure to maternal depression were predicted to respond to maternal touch with more no touch or negative touch (e.g., push) than infants without exposure to maternal depression. Mothers with depression were predicted to more often respond to infant touch with a touch response than mothers without depression.

METHODS

Participants

This study will use existing data collected as part of a larger longitudinal study on the effect of IPV on women and their children from pregnancy to age 10. Participants were recruited during pregnancy from 4 counties in the mid-Michigan area. They were oversampled for IPV exposure, which was defined as exposure to physical, sexual, or psychological violence in the past year. IPV-exposed women and non-exposed women were matched on demographic characteristics. The larger study involved 10 waves of data collection, and mothers were financially compensated for their participation. All procedures were approved by the university Institutional Review Board (IRB). The current study uses data from the first 2 waves of data collection.

Two hundred and six pregnant women were enrolled in the larger study and interviewed during the last trimester of pregnancy. By the next in-person interview at 1 year postpartum, 189 of the original participants were reached and interviewed. Of the 189 dyads, 16 had missing data due to loss of custody, living out of state, or technical problems during the interview. Therefore, 173 mothers and their 1-year-old infants were included in the final sample of this study. The diversity of the participants was reflective of the population in these areas, with 63% of the women identifying as White, 25% as African American, 5% as Latina, and 7% as being of other ethnic/racial backgrounds. 44% of the women were single, 44% were married, and 12% were separated, divorced, or widowed. 38% of the women had a high school education or less, 42% had some college, 14% had an AA/BA/BS degree or some graduate school, and 6% had a graduate degree. Their monthly incomes ranged from $267 to $10,000, with a median household income of $1600 per month.

Procedures

Women were first screened over the phone for eligibility. In order to be included in the study, they needed to be (1) in the last trimester of pregnancy; (2) between 18 and 40 years old; (3) English speakers; and (4) in a romantic relationship for at least 6 weeks during the pregnancy. To ensure that a number of participants would have experienced IPV during pregnancy, additional recruitment and screening procedures were implemented. As noted earlier, two waves of data from the larger longitudinal study were used for this research. The first interview took place when women were in their third trimester of pregnancy. The second interview took place when infants were approximately 12 months old. Interviews were conducted by trained graduate and undergraduate students. The pregnancy interview was conducted either in the woman's home or in the research office, depending on the participant's preference, and the follow up interview at 1 year postpartum was conducted in the research office.

At the first interview, the pregnant mothers completed a consent form, demographic questionnaire, and mental health questionnaires. Following these, the mothers completed IPV questionnaires. At the second interview, mothers again completed a consent form and demographic questionnaire. Mothers and infants then participated in the free play episode. At the start of the 12 minute free play, mothers were instructed to interact with their infant as they normally would at home, including feeding or changing if need be. The room contained two chairs, a box of age-appropriate toys, anything mothers brought with them (e.g., toys, food, or diapers) and strategically placed mirrors to assist with viewing the interaction. The free play was taped with a video camera. Research assistants operated the video camera and observed from behind a 2-way mirror. After the free play, mother and infant were separated to complete the

remaining assessments, including the Working Model of the Child Interview (WMCI) and questionnaires pertaining to IPV.

Measures

Intimate Partner Violence. To assess IPV, women completed the *Severity of Violence Against Women Scales* (SVAWS; Marshall, 1992) at both in-person interviews. The SVAWS is a 46-item measure that assesses psychological, physical, and sexual violence on a 4-point scale ranging from "Never" to "Many Times". Examples of items include "punched you" and "destroyed something belonging to you". Women completed the SVAWS for two specific time periods: at the first visit for the prenatal time period, and at the second visit for the first year postpartum. Marshall reported coefficient alphas of .89 to .96 for subscales of the SVAWS. A continuous IPV variable was created by summing items 9-46, and a dichotomous yes/no variable was created, with mothers categorized as "yes" if they endorsed items 9 or above.

Maternal Depression. To assess pre- and postpartum maternal depression, women completed the *Beck Depression Inventory* (BDI; Beck, Ward, Mendelson, Moch, & Erbaugh, 1961) at the first and second visits. The BDI is a 21-item scale that assesses depressive symptoms over the prior 2 weeks. Examples of symptoms assessed are guilt and suicidality. Beck and colleagues reported a coefficient alpha of .91 (Beck, Steer, Ball, & Ranieri, 1996) and a test-retest correlation of .93 (Beck, Steer, & Brown, 1996). A continuous sum score was created, as was a dichotomous yes/no. For the dichotomous variable, women were categorized as having depression if they were at or above the recommended clinical cutoff of 10 (10 yields good sensitivity and specificity; e.g., Norris, Gallagher, Wilson & Winograd, 1987).

Maternal Representations. The *Working Model of the Child Interview* (WMCI; Zeanah, Benoit, Hirshberg, Barton & Regan, 1994) is a semi-structured interview to examine mothers' perceptions about their infants and motherhood. The WMCI interview was conducted postpartum and was coded along qualitative and content scales. Maternal representations were coded on six qualitative scales assessing representations of the infant (Zeanah, Benoit, Barton, & Hirshberg, 1996) and one code assessing representations of the self (Huth-Bocks, Levendosky, Bogat, & von Eye, 2004; modified from Slade et al., 1994). The qualitative scales encompassed (1) Richness of Perceptions, how richly the mother describe the infant; (2) Openness to Change, how flexibly the mother integrates new information about the infant; (3) Intensity of Involvement, how psychologically involved the mother is in the relationship with the infant; (4) Coherence, how organized and logical the mother's narrative about her infant and their relationship is; (5) Caregiving Sensitivity, how descriptive the mother is of her infant's biological needs and emotional states; and (6) Acceptance, how accepting the mother is of her infant and the challenge of parenting. Mothers were given a 1 (none) to 5 (extreme) rating for each scale, with 5 indicating higher levels of each construct. The Maternal Self-Efficacy scale assessed whether the mother perceives herself to be a competent, effective parent and her expectations of herself in the mothering role. Mothers were again rated from 1 (total lack of self-efficacy) to 5 (overestimating self-efficacy). For this scale, a score of 3 represented the most secure representation of the self as mother. The scales were used to create a latent maternal representation variable (a similar latent variable was confirmed and created by Huth-Bocks and colleagues (2004) for prepartum representations). A higher score on this latent factor suggested a higher quality maternal representation.

Interviews were audiotaped and transcribed by trained transcribers. Two graduate students were trained to code the WMCI. The graduate students were supervised by a master coder, who coded half of the interviews. Inter-rater reliability was assessed using percent agreement (80%) and Cohen's kappa (.62, $p < .001$).

Demographic Risk. Given the potential effect of demographic risk on maternal parenting behaviors like touch (such as through increased maternal stress, reduced resources, and systemic inequality; e.g., Aber, Jones, & Cohen, 2000; Angley, Divney, Magriples, & Kershaw, 2015), demographic risk was controlled. Participants provided information regarding their race, marital status, education, and income (assessed via Medicaid status). These variables were coded dichotomously with a score of "1" indicating risk. Previous research has supported the use of cumulative risk scores over the use of individual risk variables (Sameroff, Seifer, Baldwin, & Baldwin, 1993). Risk variables were summed to create a 0-4 total risk score.

Infant Sex. Research has suggested that mothers may parent their young sons and daughters differently (e.g., Ahl, Fausto-Sterling, Garcia-Coll, & Seifer, 2013; Barnett & Scaramella, 2017), although research is mixed (for review, see Endendijk, Groeneveld, Bakermans-Kranenburg, & Mesman, 2016). Infant sex was assessed in the demographic questionnaire when infants were 1 year old. Sex was coded dichotomously (-1 = female, 1 = male) and examined in each analysis.

Mother-Infant Touch. Mother-infant touch was examined during an 8 minute segment of the 12 minute free play. Maternal touch behaviors and infant touch behaviors were coded at 5-second intervals to describe the purpose of the touch, tactile responses to the other's touch, and for mothers, whether the touch was intrusive. Touch purpose codes were adapted from Jean and Stack's Functions of Touch Scale (2009), and included affectionate, instrumental,

accidental/passive, negative, and no touch. Each time a touch occurred, the other member of the dyad received a code for his or her response to the touch. Only touch responses that occurred within the same or the subsequent interval were considered to be a response. Responses were coded as positive/neutral, negative, and no touch.

Coding Plan and Ethogram

Maternal and infant touch were examined during the middle 8 minutes of the 12 minute free play. Coders watched the tapes on a large monitor to code maternal touch and infant touch at 5 second intervals. The videos were viewed through a program that stopped the video at 5-second intervals to allow the research assistants to record their codes. Each video was watched twice, and maternal touch and infant touch were coded during separate viewings. The codes were recorded and compiled in Qualtrics. Touch was coded along three streams – touch initiation (affectionate, instrumental, accidental/passive, negative, and no touch), other touch response (positive/neutral, negative, and no touch), and whether touch was intrusive (maternal touch only). Touch bids (mother or infant initiate a touch but do not make physical contact and do not complete the touch behavior) were also coded, although were ultimately not examined due to a low incidence rate. Each touch purpose type that occurred during an interval was marked as present. If a touch initiation code was assigned, a touch response code was also assigned. It was possible for more than one touch purpose and more than one touch response to be assigned during one 5-second interval. See Appendix A for the description of the coding scheme and procedures that was provided to coders.

Coding

Mother-infant touch videos were coded by the author and 3 trained undergraduate coders. The undergraduate coders were trained to reliability by the author, such that each undergraduate coder was reliable with the author (80% agreement or greater), who was the gold standard coder. The undergraduate coders were blind to the study hypotheses, IPV exposure status, and maternal depression codes. Mothers and infants in the same dyad were coded by different coders to ensure within-dyad independence in coding practices. Each coder (undergraduate and the author) coded approximately 25% of the videos. In addition, the author double-coded an additional 15% of the videos to assess interrater reliability. The double-coded videos were chosen at random. Reliability was assessed throughout the coding process, to ensure that coders remained reliable and did not drift. Discrepancies were discussed and resolved by the coders during meetings. Cohen's kappa (Cohen, 1960) was used to calculate reliability. This calculation takes the probability of chance agreement into account, and has been used by prior research on mother-infant touch with similar methods (multiple observations per minute, several qualitative streams), suggesting that Cohen's kappa is a parsimonious and appropriate choice.

The results suggest acceptable agreement across all touch initiation codes. Cohen's kappa for maternal affectionate touch was .91 (very good), maternal instrumental touch was .90 (very good), maternal passive touch was .87 (very good), maternal negative touch was .80 (good), infant affectionate touch was .74 (good), infant instrumental was .74 (good), infant passive touch was .59 (moderate), and infant negative touch was .89 (very good). Maternal and infant bids were not examined for agreement or included in the analyses due to low incidence rates. Results also suggested acceptable agreement across touch response codes, except for negative maternal touch responses, which did not occur in the double-coded videos and could not be assessed for

agreement. Cohen's kappa for maternal positive/neutral touch response was .58 (moderate), maternal no touch response was .62 (good), infant positive/neutral touch response was .81 (very good), infant no touch response was .73 (good), and infant negative touch response was .90 (very good). As negative maternal touch responses did not occur in the double-coded videos, the overall incidence was assessed across the 174 mothers. Four mothers responded with negative touch once and two mothers responded with negative touch twice across the interactions. Given the low incidence rate, this variable was removed from the analyses.

Missing Data

Missing data for the 174 dyads was minimal. One dyad was missing the WMCI coding due to taping problems during the interview and was therefore not included in the mediation analyses. During the mother-infant free play, occasionally mother and/or infant were not visible on camera due to moving out of the frame, facing away from the camera, or over-exposure of the tape. These instances were coded as "no visible touch".

Data Analytic Approach

Because touch behavior was assessed for both mothers and infants, multilevel modeling was used to evaluate Aims 1, 2 and 3, except for Hypotheses 1c and 1d. In these analyses, the dyad was treated as the upper-level unit and the individual (i.e., mother or infant) was treated as the lower level unit. Each model predicted a particular type of touch behavior that the mother and infant engaged in. Random effects included in the models were separate residual variances for mothers and infants, as well as a covariance between mothers and infants to model nonindependence between scores. Three types of fixed effects models were run. The first type of model tested for differences in touch behavior as a function of role (i.e., differences in touch

behavior for mothers versus infants). These models included an IPV variable from either the pregnancy or postpartum period which was measured either continuously or categorically, a depression variable likewise measured in either pregnancy or postpartum and either continuously or categorically, as well as infant sex, which was effect coded 1 = boys -1 = girls. In addition, each model included demographic risk as a control variable. Continuous measures of IPV and depression were grand-mean centered, as was the risk variable. The fixed effect model also included interactions between role and IPV to test whether the effect of IPV on touch differed for mothers and infants. Similarly the models included interactions between role and depression. The three-way interactions between role, IPV (or depression) and infant sex were also included to test for differences in effects as a function of infant sex. The models did not include interactions between IPV and depression.

If role differences emerged, simple slope multilevel analyses were used to estimate effects of IPV and depression separately for touch behavior by mothers and infants. Furthermore, if there was evidence that results differed by infant sex, a follow-up analysis to estimate separate results for mothers and infants in which the infant was either male or female was conducted.

The mediation analyses in Hypotheses 1c and 1d were conducted using structural equation modeling (SEM). For the analyses, a maternal representation latent factor was created. In the full model, pregnancy and postpartum IPV and pregnancy and postpartum depression were entered as predictors of maternal affectionate, instrumental, passive, negative, and no touch behavior. IPV and depression were again examined as both continuous and categorical variables. The continuous IPV and depression variables, as well as demographic risk, were grand-mean centered. Demographic risk and infant biological sex were controlled for in the model. The

maternal representation factor was entered as a mediator of the relationship between the predictors (IPV, depression) and the dependent variables (maternal touch behavior).

RESULTS

Descriptive statistics were calculated for each variable. Means, standard deviations, and correlations are presented in Tables 1-5. Hypotheses 1a, 1b, 2, and 3 were tested using SPSS Version 24. Hypotheses 1c and 1d were examined using MPlus Version 8.1 (Muthén & Muthén, 1998-2017).

For ease of presentation, the results section is divided by hypotheses such that results relevant to hypotheses involving IPV effects on mothers' behavior are presented first, then results for the effects of depression on mothers' behavior are presented. Results concerning infant behavior follow in the same order. The results of each aim are followed by a brief summary of the significant findings.

In the following results sections, for the analyses treating IPV and depression as continuous variables "A" tables will present the interaction model that tests for differences for mothers versus infants, "B" tables will show the simple slopes for role effects and estimates the regression coefficients separately for mothers and infants, and "C" tables will present the simple slopes for follow-up for infant sex interactions, thus estimating regression coefficients when infants were male or female. If there was no evidence of interactions with role "B" tables will not be presented, and if there was no evidence of interactions with infant sex, "C" tables will not be presented. For the analyses treating IPV and depression as categorical variables, "A" tables will present the interaction model, and "B" tables will show the estimated marginal means for the significant interactions. For the mediation analyses, estimates are presented for the 3 pathways (direct path from predictor to mediator, direct path from mediator to outcome, and indirect path from predictor to outcome), with one table for each mediation analysis.

Aim 1

The first aim was to determine whether IPV and maternal depression predict maternal touch behaviors.

Hypothesis 1a. Controlling for maternal depression, mothers with pregnancy or postpartum IPV were predicted to use less affectionate and more negative touch compared to non-exposed mothers. In addition, mothers with IPV were predicted to use more intrusive touch than non-exposed mothers. In addition, mothers with IPV were expected to touch their infants less overall.

With regard to affectionate touch, Table 6a presents the MLM results predicting affectionate touch as a function of role, continuous pregnancy IPV, continuous maternal depression, and infant sex. As can be seen in the Table, there was a role main effect indicating that mothers engaged in more affectionate touch than babies. There was also a main effect of IPV which was qualified by a role by IPV interaction as well as a role by IPV by infant sex interaction. Table 6b presents the simple slopes for IPV and depression separately for mothers and babies, and indicates that the effects of IPV on affectionate touch are limited to mothers. The role by IPV by infant sex interaction suggests that the effect of IPV on affectionate touch by mothers differs for male and female infants. Specifically, as shown in Table 6c, for mothers of boys, greater pregnancy IPV is associated with more affectionate touch. No such effects emerged for mothers of female infants.

Table 7a presents the results predicting affectionate touch as a function of continuous postpartum IPV, continuous postpartum depression, and infant sex. There was again a role main

effect indicating that mothers engaged in more affectionate touch than infants. There were no main effects or interactions for postpartum IPV or infant sex on maternal affectionate touch.

No significant main effects or interactions were found in the categorical pregnancy IPV analysis aside from a role main effect, again demonstrating that mothers engaged in more affectionate touch than infants (Table 8a). Likewise, only the role main effect emerged as significant in analyses with the categorical postpartum IPV variable predicting affectionate touch (Table 9a).

With regard to negative touch, Table 10a presents the MLM results predicting negative touch as a function of role, continuous pregnancy IPV, continuous maternal depression, and infant sex. There was a role main effect indicating that mothers engaged in less negative touch than infants. There were no main effects or interactions for pregnancy IPV or infant sex on maternal negative touch. In addition, there was a main effect of demographic risk, with greater demographic risk predicting increased negative touch.

Table 11a presents the results predicting negative touch as a function of continuous postpartum IPV, continuous postpartum depression, and infant sex. There was again a role main effect indicating that mothers engaged in less negative touch than infants. As was the case for pregnancy IPV, there were no main effects or interactions of postpartum IPV or infant sex on maternal negative touch.

The results for analyses treating pregnancy IPV as categorical are presented in Table 12a. The results again demonstrate a role main effect indicating that mothers engaged in less negative touch than infants. There was also a role by infant sex and a role by IPV by infant sex interaction. Table 12b presents the estimated marginal means for the interactions. The interaction

effects were driven by infant touch behavior and will therefore be further elucidated in Hypothesis 2a.

The results for categorical postpartum IPV are presented in Table 13a. The findings indicate a main effect of role demonstrating that mothers engaged in less negative touch than their infants. In addition, the findings demonstrate a main effect for IPV and infant sex, suggesting that postpartum IPV exposure was associated with increased negative touch as was male infant sex. There was also an interaction between role, IPV, and infant sex. Table 13b presents the estimated marginal means for the interaction. The interaction effects were specific to infant touch behavior and will therefore be examined further in Hypothesis 2a.

With regard to intrusive touch, Tables 14a-17a present the MLM results predicting intrusive touch as a function of IPV, maternal depression, and infant sex. As can be seen in the tables, IPV (pregnancy and postpartum; continuous and categorical) and infant sex did not show evidence of main effects or interactions predicting maternal intrusive touch.

With regard to no touch, Table 18a presents MLM results predicting total intervals without touch as a function of role, continuous pregnancy IPV, continuous pregnancy depression, and infant sex. There was a main effect of role indicating that mothers had fewer intervals in which there was no touch than infants. The main effect of role was also qualified by a role by IPV interaction. Table 18b presents the simples slopes, and indicates that mothers with pregnancy IPV had fewer no touch intervals than mothers without pregnancy IPV.

Table 19a presents the results predicting total intervals without touch as a function of continuous postpartum IPV, continuous postpartum depression, and infant sex. There was again a role main effect indicating that mothers had fewer intervals in which there was no touch than

infants. There were no main effects or interactions for postpartum IPV or infant sex on intervals without touch.

The results of the categorical analysis predicting total intervals without touch as a function of categorical pregnancy IPV, categorical pregnancy depression, and infant sex are presented in Table 20a. There was a role main effect indicating that mothers had fewer intervals in which there was no touch than infants did. There were no main effects or interactions for pregnancy IPV or infant sex on intervals without touch.

Table 21a presents the results of the categorical analysis predicting total intervals without touch as a function of categorical postpartum IPV, categorical postpartum depression, and infant sex. Again, there was a role main effect indicating that mothers had fewer intervals in which there was no touch than infants did. There were no main effects or interactions for categorical postpartum IPV or infant sex on intervals without touch.

Instrumental and passive touch were also coded. Given that it was not hypothesized that these touch types would be predicted by IPV, the results are presented in Appendix B.

Hypothesis 1b. Controlling for IPV, mothers with pregnancy or postpartum depression were predicted to use more intrusive touch. In addition, mothers with depression were expected to touch their infants more overall.

With regard to intrusive touch, as noted above, Table 14a presents the MLM results predicting intrusive touch as a function of continuous pregnancy IPV, continuous pregnancy depression, and infant sex. As can be seen in the table, there was a main effect of pregnancy depression, suggesting that mothers with more pregnancy depression engaged in more intrusive touch behavior. There were no interactions involving depression.

Table 15a presents the results for the analysis assessing intrusive touch as a function of continuous postpartum IPV, continuous postpartum depression, and infant sex. As with pregnancy depression, there was a main effect of postpartum depression, indicating that mothers with higher postpartum depression engaged in more intrusive touch behavior than mothers without lower postpartum depression. No interactions involving depression emerged.

Tables 16a and 17a present the MLM results predicting intrusive touch as a function of categorical IPV, categorical maternal depression, and infant sex. As can be seen in the tables, there was no evidence of main effects or interactions of maternal depression (pregnancy and postpartum) or infant sex on maternal intrusive touch.

With regard to no touch, Tables 18a-21a present the MLM results predicting total intervals without touch as a function of role, IPV, maternal depression, and infant sex. As can be seen in the tables, maternal depression (pregnancy and postpartum; continuous and categorical) neither material depression nor infant sex predicted maternal intrusive touch.

Affectionate, negative, instrumental and passive touch were also coded. Given that it was not hypothesized that these touch types would be predicted by maternal depression, the results are presented in Appendix B.

Hypothesis 1c. The detrimental effect of IPV on touch behaviors was predicted to be partly explained by postpartum maternal representations. Pregnancy and postpartum IPV were predicted to affect developing maternal representations, which in turn were predicted to affect how a mother touches her child. Thus, postpartum maternal representations were expected to partially mediate the relationship between IPV and maternal touch behaviors.

For the analyses, a maternal representation latent factor was created. This factor was initially predicted to have 7 indicators. However, 2 indicators were removed due to problems with the variables. Specifically, Openness to Change and Maternal Self-Efficacy were not used due to low coding reliability (calculated as a Pearson correlation coefficient; Openness to Change $r = .58$; Maternal Self-Efficacy $r = .55$). In addition, several of the indicators were highly correlated ($r > .70$), which was accounted for in the final factor (see Figure 2). Model fit was excellent. Higher scores on the factor suggest a more balanced maternal representation of the infant.

Pregnancy IPV, postpartum IPV, pregnancy depression, and postpartum depression were entered as predictors of maternal affectionate, instrumental, passive, negative, and no touch behavior. Demographic risk and infant biological sex were controlled for in the model. The maternal representation factor was entered as a mediator of the relationship between the predictors and dependent variables. For both the continuous and the categorical models, the models did not converge. Therefore, each touch type was run in a separate analysis. Demographic risk predicted less balanced maternal representations in each of the following analyses. See Figure 3 for an example of the mediation model using affectionate touch with continuous risk predictors.

Table 22 presents the SEM results for the continuous model predicting maternal representations as a mediator between the predictors (pregnancy IPV and postpartum IPV) and maternal use of affectionate touch behavior. As can be seen in the table, maternal representations did not mediate the relationship. However, maternal representations did predict affectionate touch, with more balanced representations predicting increased use of affectionate touch.

Consistent with findings from the analyses in hypothesis 1a, pregnancy IPV predicted increased use of affectionate touch in this model.

Table 23 presents the SEM results for the categorical model predicting maternal representations as a mediator between the predictors (pregnancy IPV and postpartum IPV) and maternal use of affectionate touch behavior. Maternal representations did not mediate the relationship between the predictors and maternal use of affectionate touch behavior. As with the continuous analysis, maternal representations predicted affectionate touch, with more balanced representations predicting increased use of affectionate touch.

Table 24 presents the SEM results for the continuous model predicting maternal representations as a mediator between the predictors (pregnancy IPV and postpartum IPV) and maternal use of instrumental touch behavior. Maternal representations did not mediate the relationship between the predictors and maternal use of instrumental touch behavior.

The SEM results for the categorical model predicting maternal representations as a mediator between the predictors (pregnancy IPV and postpartum IPV) and maternal use of instrumental touch behavior are presented in Table 25. As can be seen in the table, maternal representations did not mediate the relationship between the predictors and maternal use of instrumental touch behavior.

Table 26 presents the SEM results for the continuous model predicting maternal representations as a mediator between the predictors (pregnancy IPV and postpartum IPV) and maternal use of passive touch behavior. Maternal representations did not mediate the relationship between the predictors and maternal use of passive touch behavior.

Table 27 presents the SEM results for the categorical model predicting maternal representations as a mediator between the predictors (pregnancy IPV and postpartum IPV) and maternal use of passive touch behavior. Maternal representations did not mediate the relationship between the predictors and maternal use of passive touch behavior.

Table 28 presents the SEM results for the continuous model predicting maternal representations as a mediator between the predictors (pregnancy IPV and postpartum IPV) and maternal use of negative touch behavior. Maternal representations did not mediate the relationship between the predictors and maternal use of negative touch behavior.

Table 29 presents the SEM results for the categorical model predicting maternal representations as a mediator between the predictors (pregnancy IPV and postpartum IPV) and maternal use of negative touch behavior. Maternal representations did not mediate the relationship between the predictors and maternal use of negative touch behavior.

Table 30 presents the SEM results for the continuous model predicting maternal representations as a mediator between the predictors (pregnancy IPV and postpartum IPV) and maternal no touch behavior. Maternal representations did not mediate the relationship between the predictors and maternal no touch behavior.

The SEM results for the categorical model predicting maternal representations as a mediator between the predictors (pregnancy IPV and postpartum IPV) and maternal no touch behavior are presented in Table 31. As can be seen in the table, maternal representations did not mediate the relationship between the predictors and maternal no touch behavior.

Hypothesis 1d. The detrimental effect of maternal depression on touch behaviors was predicted to be partly explained by postpartum maternal representations. Pregnancy and

postpartum maternal depression were predicted to affect developing maternal representations, which in turn were predicted to affect how a mother touches her child. Thus, postpartum maternal representations were expected to partially mediate the relationship between maternal depression and maternal touch behaviors.

Table 22 presents the SEM results for the continuous model predicting maternal representations as a mediator between the predictors (pregnancy depression and postpartum depression) and maternal use of affectionate touch behavior. As can be seen in the table, maternal representations did not mediate the relationship. As noted in Hypothesis 1c, maternal representations predicted affectionate touch, with more balanced representations predicting increased use of affectionate touch.

Table 23 presents the SEM results for the categorical model predicting maternal representations as a mediator between the predictors (pregnancy depression and postpartum depression) and maternal use of affectionate touch behavior. Maternal representations did not mediate the relationship between the predictors and maternal use of affectionate touch behavior.

Table 24 presents the SEM results for the continuous model predicting maternal representations as a mediator between the predictors (pregnancy depression and postpartum depression) and maternal use of instrumental touch behavior. Maternal representations did not mediate the relationship between the predictors and maternal use of instrumental touch behavior.

Table 25 presents the SEM results for the categorical model predicting maternal representations as a mediator between the predictors (pregnancy depression and postpartum depression) and maternal use of instrumental touch behavior. As can be seen in the table,

maternal representations did not mediate the relationship between the predictors and maternal use of instrumental touch behavior.

Table 26 presents the SEM results for the continuous model predicting maternal representations as a mediator between the predictors (pregnancy depression and postpartum depression) and maternal use of passive touch behavior. Maternal representations did not mediate the relationship between the predictors and maternal use of passive touch behavior.

Table 27 presents the SEM results for the categorical model predicting maternal representations as a mediator between the predictors (pregnancy depression and postpartum depression) and maternal use of passive touch behavior. Maternal representations did not mediate the relationship between the predictors and maternal use of passive touch behavior.

Table 28 presents the SEM results for the continuous model predicting maternal representations as a mediator between the predictors (pregnancy depression and postpartum depression) and maternal use of negative touch behavior. Maternal representations did not mediate the relationship between the predictors and maternal use of negative touch behavior.

Table 29 presents the SEM results for the categorical model predicting maternal representations as a mediator between the predictors (pregnancy depression and postpartum depression) and maternal use of negative touch behavior. Maternal representations did not mediate the relationship between the predictors and maternal use of negative touch behavior.

Table 30 presents the SEM results for the continuous model predicting maternal representations as a mediator between the predictors (pregnancy depression and postpartum depression) and maternal no touch behavior. Maternal representations did not mediate the relationship between the predictors and maternal no touch behavior.

The SEM results for the categorical model predicting maternal representations as a mediator between the predictors (pregnancy depression and postpartum depression) and maternal no touch behavior are presented in Table 31. As can be seen in the table, maternal representations did not mediate the relationship between the predictors and maternal no touch behavior.

Aim Summary. In sum, mothers of male infants used more affectionate touch if they were exposed to pregnancy IPV than mothers without pregnancy IPV exposure. In addition, mothers with pregnancy IPV touched their male and female infants more overall. IPV was not associated with the use of negative touch. Mothers with pregnancy or postpartum depression engaged in more intrusive touch with their infants than mothers without pregnancy or postpartum depression. Postpartum maternal representations did not mediate the relationship between pregnancy or postpartum IPV/depression and maternal touch behavior.

Aim 2

The second aim was to examine the relationship between IPV-exposure, maternal depression, and infant touch.

Hypothesis 2a. Controlling for maternal depression, infant touch was predicted to differ between IPV-exposed and non-exposed infants. Types of touch used, overall amount of touch, and proportions of each type of touch were predicted to vary. Given the more exploratory nature of the infant touch analyses, the predictions were intentionally broad.

With regard to affectionate touch, as noted, the results in Table 6a indicated the presence of interactions involving role and infant sex predicting affectionate touch. However, as seen in Table 6c, the statistically significant effects of pregnancy IPV were limited to the mothers'

behavior. The same finding emerged in analyses of postpartum IPV (Table 7a). Tables 8a and 9a indicated no effects of either categorical IPV variable on infant affectionate touch.

With regard to instrumental touch, the results in Table 32a indicated the presence of interactions involving role, the continuous pregnancy IPV variable, and infant sex predicting instrumental touch. However, as seen in Tables 32b and 32c, the statistically significant effects of pregnancy IPV were specific to mothers. The same finding emerged in the categorical analysis of pregnancy IPV (Tables 34a and 34b). Tables 33a and 35a indicated no effects of the continuous postpartum IPV variable or the categorical postpartum IPV variable on infant instrumental touch.

With regard to passive touch The results in tables 36a-39a indicated that IPV (pregnancy and postpartum; continuous and categorical) and infant sex did not exert main effects on infant passive touch. No interactions involving IPV emerged.

With regard to negative touch, Tables 10a and 11a present results indicating that the continuous IPV variable (pregnancy and postpartum) and infant sex did not exert main effects on infant negative touch. No interactions involving IPV emerged.

Table 12a indicated the presence of a role by infant sex interaction. Table 12b presents the estimated marginal means, and indicates that male infants engage in more negative touch than female infants. There was also a role by infant sex by IPV interaction. The estimated marginal means of the interaction suggest that male infants exposed to pregnancy IPV (when calculated as a categorical variable) use more negative touch than males not exposed to pregnancy IPV.

Table 13a indicated that there was a role by infant sex interaction, IPV by infant sex interaction, and role by IPV by infant sex interaction. The estimated marginal means for the interactions are presented in Table 13b. The results suggest that male infants exposed to postpartum IPV (when calculated as a categorical variable) use more negative touch than male infants not exposed to postpartum IPV.

With regard to no touch, the results in tables 18a-21a indicated that IPV (pregnancy and postpartum; continuous and categorical) and infant sex did not exert main effects on infant no touch behavior. No interactions involving IPV emerged.

Hypothesis 2b. Controlling for IPV, infant touch was predicted to differ between infants of mothers with depression and infants of mothers without depression. Types of touch used, overall amount of touch, and proportions of each type of touch were predicted to vary.

With regard to affectionate touch, the results in tables 6a-9a indicated that maternal depression (pregnancy and postpartum; continuous and categorical) and infant sex did not exert main effects on infant affectionate touch. No interactions involving depression emerged.

With regard to instrumental touch, the results in table 32a indicated that the continuous pregnancy depression variable and infant sex did not exert main effects on infant instrumental touch. No interactions involving depression emerged.

Table 33a indicated the presence of a role by depression by infant sex interaction. Table 33b presents the simple slopes for the interaction. As can be seen in Table 33c, male infants of mothers with postpartum depression (when calculated as a continuous variable) used more instrumental touch than male infants of mothers without postpartum depression. The same pattern was not demonstrated in female infants.

Table 34a indicated the presence of a role by depression interaction, and a role by depression by infant sex interaction. The estimated marginal means are presented in Table 34b, and suggest that the effect of the categorical pregnancy depression variable on instrumental touch is specific to mothers and not to infants.

The results in table 35a indicated that the categorical postpartum depression and infant sex did not exert main effects on infant instrumental touch. No interactions involving depression emerged.

With regard to passive touch, the results presented in tables 36a-39a indicated that maternal depression (pregnancy and postpartum; continuous and categorical) and infant sex did not exert main effects on infant passive touch. No interactions involving depression emerged.

With regard to negative touch, the results presented in tables 10a-13a indicated that maternal depression (pregnancy and postpartum; continuous and categorical) and infant sex did not exert main effects on infant negative touch. No interactions involving depression emerged.

With regard to no touch, the results presented in tables 18a-21a indicated that depression (pregnancy and postpartum; continuous and categorical) and infant sex did not exert main effects on infant no touch behavior. No interactions involving depression emerged.

Aim Summary. In sum, male infants who were exposed to pregnancy or postpartum IPV engaged in more negative touch with their mothers than nonexposed male infants. In addition, male infants of mothers with postpartum depression engaged in more instrumental touch with their mothers than male infants of mothers without postpartum depression. The same patterns were not demonstrated in female infants.

Aim 3

The third aim was to determine mother and infant tactile responses to touch in relation to IPV and maternal depression.

Hypothesis 3a. During an interaction, touch and attempts to touch may elicit a range of tactile responses from the recipient of the touch or touch attempts. It was predicted that maternal and infant tactile responses to touch would vary between mother-infant dyads who have experienced pregnancy or postpartum IPV and mother-infant dyads who have not. Mothers and infants with IPV exposure were predicted to respond with more no touch or negative touch (e.g., push) than mothers and infants without IPV exposure.

With respect to maternal positive/neutral touch responses, Table 40a presents the MLM results predicting maternal positive/neutral touch response to infant touch as a function of role, continuous pregnancy IPV, continuous maternal depression, and infant sex. As can be seen in the table, there was a role main effect indicating that mothers engaged in fewer positive/neutral touch responses than infants. IPV demonstrated a main effect, which was qualified by a role by IPV interaction, and a role by IPV by infant sex interaction. The interaction effects, which are presented in Tables 40b and 40c, were specific to infant touch response behavior and will therefore be examined further below.

Table 41a presents the results predicting maternal positive/neutral touch response to infant touch as a function of continuous postpartum IPV, continuous postpartum depression, and infant sex. There was again a role main effect indicating that mothers engaged in fewer positive/neutral touch responses than infants. There were no main effects or interactions for postpartum IPV or infant sex on maternal positive/neutral touch responses.

Tables 42a-43a present the results predicting maternal positive/neutral touch response to infant touch as a function of the categorical IPV variable, categorical maternal depression, and infant sex. As can be seen in the tables, IPV (pregnancy and postpartum) and infant sex did not show evidence of main effects or interactions predicting maternal positive/neutral touch response to infant touch.

With respect to maternal negative touch responses, Tables 44a and 45a present the results predicting maternal negative touch response to infant touch as a function of the continuous IPV variable, continuous maternal depression, and infant sex. As can be seen in the tables, IPV (pregnancy and postpartum) and infant sex did not demonstrate main effects or interactions for maternal negative touch response to infant touch.

Table 46a presents the results predicting maternal negative touch response to infant touch as a function of role, categorical pregnancy IPV, categorical pregnancy depression, and infant sex. As can be seen in the table, there was a role main effect indicating that mothers used fewer negative touch responses to infant touch than infants did to maternal touch. There was also a role by IPV interaction, which was specific to infant touch response behavior and will therefore be further described below. The interaction is presented in Table 46b.

Table 47a presents the results predicting maternal negative touch response to infant touch as a function of role, categorical postpartum IPV, categorical postpartum depression, and infant sex. As can be seen in the table, there was a role main effect indicating that mothers used fewer negative touch responses to infant touch than infants did to maternal touch. There was also a main effect of IPV, which was qualified by a role by IPV interaction. Table 47b presents the simple slopes, and indicates that the effect of postpartum IPV on negative touch responses is limited to infants.

With respect to maternal no touch responses, Tables 48a-51a present the MLM results predicting maternal no touch response to infant touch as a function of IPV, maternal depression, and infant sex. As can be seen in the tables, IPV (pregnancy and postpartum; continuous and categorical) and infant sex did not exert main effects on maternal no touch response. There was a main effect of role indicating that mothers used fewer no touch responses than infants did.

With respect to infant positive/neutral touch responses, as noted, the results in Table 40a indicated the presence of a role by IPV interaction, and a role by IPV by infant sex interaction. Table 40b presents the simple slopes for the effect of role, and indicates that the effect was limited to babies. The role by IPV by infant sex, which is presented in Table 40c, suggests that effect of pregnancy IPV (when calculated as a continuous variable) on infant positive/neutral touch responses differs by infant sex. Specifically, for male infants, pregnancy IPV is associated with more positive/neutral touch responses. The effect was not found in female infants.

The results presented in Table 41a indicated that there were no main effects of postpartum IPV (when calculated as a continuous variable) or infant sex on infant positive/neutral touch responses. No interactions involving IPV emerged.

The results presented in tables 42a and 43a indicated that IPV (pregnancy and postpartum, calculated as categorical variables) and infant sex did not exert main effects on infant positive/neutral touch response to maternal touch. No interactions involving IPV emerged.

With respect to infant negative touch response, the results presented in tables 44a and 45a indicated that IPV (pregnancy and postpartum, calculated as continuous variables) and infant sex did not demonstrate main effects on infant negative touch response to maternal touch. No interactions involving IPV emerged.

The results presented in table 46a indicated the presence of a role by pregnancy IPV (calculated as a categorical variable) interaction, which is presented in Table 46b. The interaction suggests that the effect of pregnancy IPV on negative touch responses was limited to infants. Specifically, greater pregnancy IPV was associated with more negative touch responses by infants. No sex differences emerged.

The results presented in table 47a indicated the presence of a role by postpartum IPV interaction (calculated as a categorical variable), which is presented in Table 47b. The interaction suggests that the effect of postpartum IPV on negative touch responses was limited to infants. Specifically, greater postpartum IPV was associated with more negative touch responses by infants. No sex differences emerged.

With respect to infant no touch responses, the results presented in tables 48a-51a indicated that IPV (pregnancy and postpartum; continuous and categorical) and infant sex did not exert main effects on infant no touch response. No interactions involving IPV emerged.

It was not hypothesized that IPV would predict differences in maternal and infant touch responses to specific touch types. However, these analyses were run and are presented in Appendix D.

Hypothesis 3b. It was predicted that maternal and infant tactile responses to touch would vary between mother-infant dyads who have experienced pregnancy or postpartum maternal depression and mother-infant dyads who have not. Infants with exposure to maternal depression were predicted to respond to maternal touch with more no touch or negative touch (e.g., push) than infants without exposure to maternal depression. Mothers with depression were predicted to more often respond to infant touch with a touch response than mothers without depression.

With respect to maternal positive/neutral touch responses, Table 40a presents the MLM results predicting maternal positive/neutral touch response to infant touch as a function of role, continuous pregnancy IPV, continuous maternal depression, and infant sex. As can be seen in the table, there was a role main effect indicating that mothers engaged in fewer positive/neutral touch responses than infants. There was also a role by depression interaction, which is presented in Table 40b. The interaction effect was specific to infant touch response behavior and will be discussed further below.

Table 41a presents the results predicting maternal positive/neutral touch response to infant touch as a function of continuous postpartum IPV, continuous postpartum depression, and infant sex. There was again a role main effect indicating that mothers engaged in fewer positive/neutral touch responses than infants. There were no main effects or interactions for postpartum depression or infant sex on maternal positive/neutral touch responses.

Tables 42a and 43a present the results predicting maternal positive/neutral touch response to infant touch as a function of categorical IPV, categorical maternal depression, and infant sex. As can be seen in the tables, depression (pregnancy and postpartum) and infant sex did not demonstrate main effects or interactions for maternal positive/neutral touch response to infant touch.

With respect to maternal negative touch responses, Tables 44a and 45a present the results predicting maternal negative touch response to infant touch as a function of continuous IPV, continuous maternal depression, and infant sex. As can be seen in the tables, depression (pregnancy and postpartum) and infant sex did not demonstrate main effects or interactions for maternal negative touch response to infant touch.

Table 46a presents the results predicting maternal negative touch response to infant touch as a function of role, categorical pregnancy IPV, categorical pregnancy depression, and infant sex. As can be seen in the table, there was a role main effect indicating that mothers used fewer negative touch responses to infant touch than infants did to maternal touch. The main effect of role was qualified by a role by depression by infant sex interaction. Table 46b presents the estimated marginal means. The results suggested that the effect of pregnancy depression was specific to infants and varied by sex, which will be further described below.

Table 47a presents the results predicting maternal negative touch response to infant touch as a function of role, categorical postpartum IPV, categorical postpartum depression, and infant sex. As can be seen in the table, there was a role main effect indicating that mothers used fewer negative touch responses to infant touch than infants did to maternal touch. Postpartum depression and infant sex did not exert main effects on maternal negative touch response to infant touch.

With respect to maternal no touch responses, Tables 48a-51a present the results predicting maternal no touch response to infant touch as a function of IPV, maternal depression, and infant sex. As can be seen in the tables, depression (pregnancy and postpartum; continuous and categorical) and infant sex did not exert main effects on maternal no touch response. There was a main effect of role indicating that mothers used fewer no touch responses than infants did.

With respect to infant positive/neutral touch responses, the results presented in table 40a indicated the presence of a role by depression interaction, and the simple slopes are presented in Table 40b. The interaction suggests that infants exposed to pregnancy depression engaged in fewer positive/neutral touch responses than infants who were not exposed to pregnancy depression. The effect did not vary by infant sex.

The results presented in tables 41a-43a indicated that there were no main effects of continuous postpartum depression, categorical depression (pregnancy and postpartum) or infant sex on infant positive/neutral touch responses. No interactions involving depression emerged.

With respect to infant negative touch responses, the results presented in tables 44a and 45a indicated that depression (pregnancy and postpartum, calculated as continuous variables) and infant sex did not exert main effects on infant negative touch response to maternal touch. No interactions involving depression emerged.

The results presented in table 46a indicated the presence of a role by pregnancy depression (calculated as a categorical variable) by infant sex interaction, which is presented in Table 46b. The results suggest that pregnancy depression was associated with negative touch responses by infants, and the effect varied by infant sex. Specifically, for female infants pregnancy depression was associated with fewer negative touch responses than female infants not exposed to pregnancy depression, while for male infants pregnancy depression was associated with more negative touch responses than male infants not exposed to pregnancy depression. The interaction is also presented in Figure 4.

The results presented in table 47a indicated that there were no main effects of postpartum depression (calculated as a categorical variable) or infant sex on infant negative touch response to maternal touch. No interactions involving depression emerged.

With respect to infant no touch responses, the results presented in tables 48a-51a indicated that depression (pregnancy and postpartum; continuous and categorical) and infant sex did not exert main effects on infant no touch response to maternal touch. No interactions involving depression emerged.

It was not hypothesized that maternal depression would predict differences in maternal and infant touch responses to specific touch types. However, these analyses were run and are presented in Appendix D.

Aim Summary. In sum, IPV and depression predicted differences in infant touch responses but not maternal touch responses. Male infants who were exposed to pregnancy IPV engaged in more positive/neutral touch responses in response to maternal touch behavior. Both male and female infants who were exposed to pregnancy IPV also engaged in more negative touch responses to maternal touch. In addition, male and female infants who were exposed to pregnancy depression engaged in fewer positive touch responses to maternal touch. Male infants of mothers with pregnancy depression engaged in more negative touch responses than male infants of mothers with no pregnancy depression. The reverse pattern was demonstrated in female infants (see Figure 4).

DISCUSSION

The overarching aim of the current study was to examine mother-infant touch within a free-play interaction, taking into account the broader context within which maternal caregiving and the mother-infant relationship were occurring. The first objective was to examine the effect of two common forms of risk on maternal touch behavior, considering the timing and severity of the risk factors. An additional aim was to propose and examine a potential mechanism through which risk might exert effects on maternal touch. The second objective was to better understand the effect of risk on infant touch behavior, again considering timing, severity, and type of risk. The final objective was to obtain a basic understanding of interactive touch behavior between mother and infant by examining how each responds to the other's touch, and how these responses may be influenced by risk. While several of the hypotheses were not supported by the findings in the current study, the results highlight the effect of risk on maternal caregiving and on mother-infant interactive behavior.

The results provide support for touch as an important form of communication in mother-infant interactive behavior. How and how much mother and infant touched one another varied across dyads. As noted above, Solomon and George (1996) theorized that maternal caregiving is influenced by caregiving across the lifespan, particularly early experiences of caregiving and the proximal caregiving environment (e.g., maternal representations of infant and self, maternal health, environmental stressors, partner relationship, infant cues). In the present study, proximal factors that have been established as predictors of caregiving – IPV and maternal depression – were examined specifically as predictors of maternal touch and infant touch behavior. The effects of IPV and maternal depression on maternal and infant touch varied, with the results

suggesting that both the timing and the type of stressor had different, and at times antithetical, implications for maternal and infant touch.

With regard to the first aim, it was hypothesized that IPV victimization would be associated with fewer affectionate, more negative, and more intrusive touch behaviors, and that mothers exposed to IPV would touch their infants less overall. However, the results demonstrated that more pregnancy IPV was associated with the use of more touch throughout the interaction, no differences in use of negative or intrusive touch behavior, and more affectionate touch in mothers of baby boys. Postpartum IPV was not associated with maternal touch behavior. These results underscore the importance of the pregnancy period for postpartum parenting, which is consistent with existing research that supports pregnancy as a critical time for the development of the maternal identity and maternal parenting (Ammaniti et al., 1992). The finding that pregnancy IPV predicts more maternal touch initiated throughout an interaction suggests that the increased maternal touch may serve a particular role. First, research suggests that male partners who engage in IPV provide less parenting support overall and engage in more negative parenting behaviors than male partners who do not perpetrate IPV (Bancroft, Silverman, & Ritchie, 2011; Burnette, Ferreira, & Buttell, 2017; Peled, 2000; Simmons, Lehmann, & Dia, 2009). Therefore, it may be that these mothers received less support from their partners during pregnancy and have taken on more parenting responsibilities postpartum, which was then reflected in mothers' use of more touch behavior throughout the lab interaction. Second, the increased touch may suggest that the IPV experienced during pregnancy may have led mothers to see themselves as needing to compensate for or protect the infant postpartum. As a result, these mothers may engage in more hands-on parenting postpartum to make up for the IPV or to control the infant's behavior to protect the infant from a previously or currently violent partner. This

would be consistent with extant research that has found that mothers may engage in certain parenting behaviors to protect their children from the emotionally and physically harmful effects of IPV, either by engaging in warmer, more nurturing parenting (Levendosky et al., 2003) or by engaging in more controlling parenting (Buchanan, Power, & Verity, 2013; Lapierre, 2010).

The potential that mothers in this sample engaged in compensatory parenting is further underscored by the finding that mothers specifically used more affectionate touch behaviors with their male infants if they were exposed to pregnancy IPV. Mothers in this sample may have increased their use of affectionate touch with their male infants if they were exposed to pregnancy IPV in an attempt to model positive interactive behaviors and prevent their sons from becoming like their fathers. There is limited research on the differential effect of IPV on maternal compensatory parenting of infants based on child sex, but research in mothers of older children has suggested that mothers report using sex-specific strategies to combat the effects of IPV, such as engaging in parenting that encourages assertiveness in female children and empathy in male children (Pels, Rooij, & Distelbrink, 2015). It may be that sex-specific compensatory strategies are evident already in infancy.

It is notable that IPV-exposed mothers did not engage in more negative touch behaviors with their infants. Research suggests that IPV-exposed mothers may engage in more punitive, harsh parenting (e.g., Boeckel et al., 2014; Holden & Ritchie, 1991), perhaps as a result of their own emotional dysregulation, limited emotional resources, distorted perceptions of the child's behavior or more maladaptive parenting models (e.g., early parental attachment figures and later romantic attachment figures). It is possible that the IPV-exposed mothers in the present sample engage in more negative parenting behaviors, but that these behaviors were not captured within the interaction, either because the behaviors are not touch-related (e.g., they may be verbal,

gestural, or related to neglect), the behaviors occur infrequently, or the present paradigm indirectly discouraged a full range of parenting behavior. Mothers were aware of being watched and recorded, and may have been concerned about the child being removed from their care. In addition, the instructions that mothers were given (interact with your child as you normally would at home, including feeding or changing if need be) may have prompted certain types of caregiving over other interactive behaviors. Lastly, the setting – though potentially stressful for the infant because it was unfamiliar – may have been devoid of stressors that may make negative parenting behaviors more likely (e.g., the abusive partner, stressful home responsibilities).

It was also hypothesized that mothers with depression would engage in more intrusive touch and touch their infants more overall than their nondepressed counterparts. As predicted, mothers with pregnancy and/or postpartum depression engaged in more intrusive touch behavior, which is consistent with existing research (e.g., Cohn & Tronick, 1989; Fergus et al., 1998; Herrera et al., 2004). Mothers with pregnancy or postpartum depression have been found to engage in more developmentally inappropriate parenting behaviors that are mismatched with the child's cues, such as more invasive or disrupting touch. However, contrary to predictions, mothers with pregnancy and/or postpartum depression did not touch their infants in more time intervals than nondepressed mothers. Thus, the mothers with pregnancy or postpartum depression in the present study engaged in a similar amount of touch throughout the interaction than nondepressed mothers, but the touch they engaged in was more likely to be intrusive.

Given that postpartum IPV did not predict differences in maternal touch but postpartum depression did, this may suggest different ways in which these stressors affect maternal touch (or parenting behavior more broadly). It may be that the effect of IPV on parenting is more dependent on the external environment (e.g., is there a present threat of violence or is the child's

safety at risk), and therefore postpartum IPV may exert a noticeable effect on parenting when parenting is observed in environments in which the IPV is salient. The effect of depression on parenting may be more related to the disruptive effect of depression on a mother's ability to appropriately read and respond to her child's cues, which may be more stable across environments during a depressive episode.

With respect to the second objective of the first aim, which predicted that maternal representations would mediate the relationship between risk (IPV and depression) and maternal touch behavior, the findings did not support the hypotheses. It was posited that risk factors such as IPV and depression would shape how mothers think of themselves in the maternal role and their ability to care for a baby, which would in turn be reflected in differences in maternal touch behavior. In the present study, IPV did not predict postpartum maternal representations. While pregnancy depression predicted less balanced maternal representations, representations did not mediate the relationship between pregnancy depression and any maternal touch. Maternal representations were associated with affectionate touch behavior, with more balanced representations predicting more affectionate touch. One would expect that how a mother thinks about herself as a caregiver and her ability to recognize and provide for her child's needs would be shaped by the mother's environment. Indeed, past research on the same sample has found that maternal representations were predicted by IPV (Huth-Bocks, Levendosky, Theran et al., 2004) and that maternal representations predicted parenting (Dayton et al., 2010). However, both of the aforementioned studies examined maternal representations as mutually exclusive categories (balanced, disengaged, and distorted) rather than as a continuous latent variable. This represents

a different way of conceptualizing maternal representations[3] and these studies aimed to answer a different type of question. In addition, while Dayton et al. examined parenting in the same free play as the current project, parenting was assessed using 6 global codes of parenting behavior (sensitivity, disengagement, controlling manipulation, covert hostility, warmth, and joy) and did not specifically focus on aspect of parenting such as touch behavior[4]. Prior research that has found a relationship between IPV and a continuous latent representations variable (Huth-Bocks, Levendosky, Bogat et al., 2004) combined IPV with demographic risk to create a latent risk variable. In the present study, it may be that IPV and depression did not predict representations because both often occur episodically (American Psychiatric Association, 2013; Devries et al., 2013), which would suggest that many of the women in the present study would have had periods of time during which IPV or depression levels were lower. This may have allowed for maternal representations to develop also during periods of lower stress, less threat, and less emotional disengagement. Conversely, the demographic risk variable in the present study, which encompassed more stable stressors like SES, did predict less balanced representations. Therefore, it may be that maternal representations are not the mechanism through which IPV and depression affect maternal touch behavior.

The findings of the second aim, which was to examine risk and infant touch, suggested that both IPV and depression predict differences in infant touch behavior. Notably, exposure to pregnancy or postpartum IPV predicted increased negative touch behavior, such as hitting,

[3] To examine whether the present mediation findings differed from prior research as a consequence of examining maternal representations as a latent continuous variable rather than a categorical variable, the mediation analyses were re-run with an effects coded categorical maternal representations variable (balanced and nonbalanced (distorted or disengaged)) as the mediator. The mediation analyses remained nonsignificant, suggesting that the present findings were not nonsignificant as a consequence of how the mediator was calculated.

[4] Of note, both the Huth-Bocks and Dayton studies used pregnancy representations rather than postpartum representations in their analyses. To ensure that the difference in findings was not due to the timing of the representations, the analyses were replicated in the present study with pregnancy representations, and the findings remained consistent (see Appendix C and Figure 5).

kicking, and pushing, by male infants only. The effect was found when IPV was examined categorically, suggesting that the effect may have been less dependent on the severity of the IPV and rather was associated with the presence of IPV. The sex-specific effects suggest several possible pathways through which IPV could result in differences in touch by baby boys. First, the effect may be due to exposure: for the pregnancy period, exposure to maternal stress hormones *in utero,* resulting in prenatal programming and more negative emotionality or reactive behavior postpartum; and for the postpartum period, exposure to the IPV itself, resulting in increased stress and dysregulation. Second, the effect of IPV may be indirect: maternal experience of IPV at the hands of her male partner during pregnancy or postpartum may result in differences between how mothers parent their baby boys versus their baby girls[5]. These differences in parenting may result in differences in infant emotion regulation and expression of negative emotions. These potential pathways will be examined further in the following paragraphs.

As noted previously, research suggests that prenatal exposure to maternal stress can result in prenatal programming of the fetus, which may be evident in developmental differences in the postnatal period (for review, see Hicks et al., 2019). Though research has found sex-specific differences in how maternal stress affects child outcomes, the results are mixed as to whether male offspring or female offspring are at greater risk of negative outcomes. Gerardin and colleagues (2011), for example, found that maternal pregnancy depression predicted greater difficulty in "regulation of states" for newborn male infants relative to female infants, and increased anxiety in those same male infants at 1 year of age. The early assessment within

[5] Importantly, these differences are not suggested to be exclusive to mothers. Maternal parenting is examined in the present paper due to the focus on mother-infant touch and because paternal parenting was not assessed.

several days of birth allowed the authors to postulate that the sex effects were due to the pregnancy environment and not due to differences in parenting behavior or the postpartum environment. Similarly, Khashan et al. (2011) and Fineberg et al. (2016) also found that prenatal stress was associated with greater risk for poor outcomes (increased risk for affective disorders and increased risk for schizophrenia, respectively) in males but not in females. Other research has found females to be at greater risk, suggesting that further research is necessary to understand the discrepancy.

It is possible that postpartum exposure to IPV may result in sex differences in how infants touch their mothers, with males and females exhibiting different signs of dysregulation (e.g., males engaging in more externalizing behaviors, such as negative touch, and females having more internalizing problems, such as anxiety) when stressed due to being raised in a periodically unpredictable and perhaps frightening environment. Research suggests that male children exhibit more physically aggressive behavior than female children beginning around 1 – 1.5 years of age (Alink et al., 2006; Baillargeon et al., 2007), and the magnitude of the effect increases through childhood and into adulthood (for review, see Archer, 2000; Côté, 2007), with adult males continuing to exhibit more physical aggression and females utilizing more relational aggression (Archer & Coyne, 2005). In addition, the use of more aggressive behavior in early childhood predicts a rising trajectory of aggressive behavior across time, and children who are exposed to risk factors during pregnancy and postpartum (such as demographic risk or family dysfunction) are at greater risk of this pattern of aggression (Tremblay et al., 2004). Furthermore, exposure to early adversity, such as child maltreatment, has been found to exacerbate the sex effect, such that children engage in more sex-stereotypic types of aggression when dysregulated (Cullerton-Sen et al., 2008). Therefore, postpartum IPV exposure may result in increased

physical aggression in the form of negative touch behavior among male infants when they become dysregulated. This tendency towards physically aggressive interactive behavior among risk-exposed males in infancy may be indicative of the beginning of a trajectory of increased physical aggression into childhood, adolescence and adulthood.

These touch differences may also be learned within the context of attachment relationships and may be more reflective of differences in how parents raise and socialize their male and female infants within the context of pregnancy and postpartum IPV (for review, see Tailor & Letourneau, 2012). Research suggests that from birth, parents respond to child behaviors in ways that socialize their baby girls and baby boys to engage in behaviors that conform to societal norms for gendered behavior (for girls, nurturing and deferent behavior; and for boys, dominant and aggressive behavior; Birns et al., 1994; Brody, 2000; Keenan & Shaw, 1997). This sex-role socialization may be particularly evident in homes with IPV, where parents have been found to hold more sex-role stereotypic beliefs (Burge, 1981; Morris, 2009). Therefore, male infants in homes with IPV may receive feedback from their parents that promotes increased aggressive behavior which, in the present study, may be reflected in increased negative touch.

In addition to the increased sex-role socialization, there may also be differences in how IPV-exposed mothers perceive and respond to their male infants versus their female infants. As noted above, mothers with pregnancy IPV engaged in distinctive touch behaviors that varied by infant sex. While the lab-observed differences suggested an increase in positively-valenced touch behaviors only, it is possible that these mothers engage in other parenting behaviors that promote negative touch in male infants. Research has found that IPV-exposed mothers worry that their baby boys will grow up to perpetrate IPV (Levendosky, Lynch, & Graham-Bermann, 2000),

which could result in parenting behaviors in response to this fear (e.g., mothers may attempt to combat negative behavior in their baby boys by responding with affectionate parenting, potentially reinforcing negative behavior; or mothers may respond to their male infants with more punitive behavior, resulting in increased dysregulation and more negative infant behavior). Research has also found that mothers with pregnancy IPV may interpret fetal behaviors in a distorted and negative way (such as interpreting a kick as violent and intended to hurt the mother) (Huth-Bocks et al., 2004). These pregnancy representations are significantly related to postpartum representations (Theran et al., 2005), likely continuing to result in altered interpretations of infant behavior and, therefore, differences in how mothers respond to infant cues. The effect would be expected to be strongest in mothers of male infants. However, these distortions would likely be captured in the measure of maternal representations in the present study, which did not mediate the relationship between IPV-exposure and maternal touch behavior, and therefore may be less likely to explain differences in male infant touch behavior.

Postpartum depression was also associated with differences in infant behavior, with more severe postpartum depression predicting increased instrumental touch by male infants. Given that pregnancy depression did not predict differences in infant touch behavior, this suggests that the relationship between infant touch and maternal depression is likely due to parenting differences. Depressed mothers have been found to respond with developmentally inappropriate parenting behaviors, engaging in less responsive parenting with younger, more dependent infants than nondepressed mothers, and more restrictive, hands on parenting with older infants than their nondepressed counterparts (Herrera et al., 2004). With instrumental touch, which is a touch behavior intended to communicate and meet a need, this increase may suggest that male infants of depressed mothers have learned to engage in more agentic behavior and alert their mothers to

their needs to increase the likelihood of having that need met. In addition, this increase in instrumental touch may be a learned behavior. As noted in the appendix, mothers with postpartum depression engaged in more instrumental touch with their male infants than did depressed mothers of female infants. However, research examining the relationship between maternal depression, infant sex, and maternal parenting is limited. Cornish and colleagues (2006) did not find evidence to support a role of infant sex in the effect of postpartum depression on maternal self-reported experiences of parenting.

The final aim, which postulated that IPV and depression would predict maternal and infant tactile responses to one another's touch, was partially supported. IPV and depression during pregnancy or postpartum did not predict differences in how mothers responded to infants' touch, but did predict differences in how infants responded to mothers' touch. It was posited that IPV may affect maternal psychological and physical perception of touch, leading touch to be experienced as more negative or threatening, and therefore resulting in altered touch responses. However, the results of the present study do not provide support for alterations in the maternal perception of touch behavior. Rather, mothers with pregnancy or postpartum IPV were similarly responsive to infant touch as nonexposed mothers. Depression was expected to be associated with differences in maternal touch responses given extant research on more discordant parenting in depressed mothers, but the findings did not suggest differences. Considering that maternal depression predicted differences in the touch behaviors initiated by mothers, it may be that infant touch behaviors provided mothers (depressed and nondepressed) with helpful cues to the infant's needs, and these cues were perceived in a similar way regardless of depression. Indeed, research suggests that touch perception, outside of perception of pain, is not altered in depressed individuals (Klauenberg et al., 2008). Rather, it may be that perception of other cues (e.g., facial

expression; Rubinow & Post, 1992) is impaired in depressed mothers, resulting in differences in other types of parenting behavior but no significant differences in touch responses to infant touch.

Infant touch responses, however, varied as a function of both IPV and depression. Specifically, male infants responded with more positive/neutral touch to any maternal touch if the dyad had been exposed to more pregnancy IPV. This finding is not surprising given that mothers with more pregnancy IPV used more affectionate touch with their male infants. Therefore, the increased positive/neutral touch responses observed in male infants was likely in response to the increased affectionate touch these infants received from their mothers, providing support for the role that maternal touch may play in shaping infant touch. In addition, both male and female infants who were exposed to any IPV pre- or postnatally engaged in more negative touch responses to any maternal touch. Given the increase in both positive and negative responses for male infants, these findings may indicate that male infants were more reactive to maternal touch behavior overall. The finding suggests several possible mechanisms – it may be that exposure to maternal stress hormones during pregnancy is associated with more negative touch responses postnatally, perhaps due to increased dysregulation or alterations in touch perception. It is also possible that the effects are indirect - pregnancy and postpartum IPV may result in differences in parenting or differences in the home environment that lead to increases in negative touch responding. These environmental differences may not have been evident in the present study because they may not be specific to touch or specific to maternal parenting more broadly. The findings of increased positive/neutral touch responses and increased negative touch responses are not necessarily counter to one another. IPV exposure may be associated with increased infant sensitivity to stimuli, particularly in male infants, resulting in increased negative

as well as increased positive touch responses. This increased sensitivity to maternal touch may derive from more mixed parenting behaviors by IPV-exposed mothers, particularly with infant sons, or infants being programmed by the prenatal or postnatal environment to respond more strongly to stimuli.

With respect to depression, more pregnancy depression predicted fewer positive/neutral touch responses by male and female infants to any maternal touch. Further, pregnancy depression predicted more negative touch responses in males, and less negative touch responses in females. The absence of pregnancy depression predicted more negative touch responses in females, and less negative touch responses in males. Research suggests that exposure to pregnancy depression is associated with differences in infant emotionality and behavior postpartum (e.g., Davis et al., 2004; Davis et al., 2007; Zhang et al., 2018). As the effects were specific to the pregnancy period in the present study, and maternal touch behavior did not vary as a function of pregnancy versus postpartum depression, this may suggest that the effect is due to prenatal programming. Indeed, pregnancy stress is associated with increased aggression and externalizing behaviors postpartum in males, but increased emotionality in females (Glover & Hill, 2012; Sandman, Glynn, & Davis, 2013), which may help to explain increased negative touch responses in males exposed to pregnancy depression in the present sample. However, as infant emotions were not coded in the present study, it is difficult to determine whether female infants who were exposed to pregnancy depression were more emotionally reactive and dysregulated. Research suggests that these more overt challenging behaviors by male infants of depressed mothers may make it more challenging for mothers to interact with their male infants and make repairs when infant expectations or needs aren't met, further reinforcing the infant's dysregulation and externalizing behaviors (Tronick & Reck, 2009).

Overall, while mother-infant touch was not able to be assessed dyadically and dynamically, conceptually it was examined in such a way so as to provide insight into maternal and infant touch during an interaction, how they each respond to one another's touch, and how different risk factors may affect this process. Pregnancy IPV demonstrated the greatest effect in mother-son dyads, with mothers engaging in more active, warm touch and infant sons initiating more negative touch but responding to maternal touch with more positive/neutral touch responses (in addition to more negative touch responses, although this pattern was also demonstrated in female infants). There were no sex differences in the effect of depression on maternal touch, but infant touch and responses differed by sex in the context of depression. Mothers with pregnancy or postpartum depression used more intrusive touch with their infants, whereas male infants tended to use more instrumental touch if they were exposed to postpartum depression and respond with more negative touch if they were exposed to pregnancy depression. Taken together, the results suggest that the effect of risk on maternal touch depends on the type, timing, and severity of the risk, and some types of risk may engender differences in how mothers parent their male versus their female infants. In addition, male infants may be differently susceptible to the effects of risk, leading to greater touch responsivity and reactivity by male infants. While some of the differential effects of risk on male and female touch behaviors may be attributable to observed differences in maternal parenting, the absence of sex differences in maternal touch behavior due to depression but the presence of sex differences in infant touch behavior due to depression suggest that additional factors are at play, such as other parenting differences, environmental differences, or differential susceptibility to prenatal programming.

Limitations

The present study has several limitations that provide direction for future research. Firstly, touch could not be examined as a continuous, dyadic process that occurs across time. This is partly due to the large imbalance between how often mothers initiate touch with their infants and how often infants initiate touch. There are also several measurement limitations. For example, mother-infant touch was examined in a lab setting rather than in a more typical setting for mother and infant. The setting was new to both mother and infant, and mothers were aware of being videotaped and observed, which may have resulted in different behaviors than mother and infant might engage in at home[6]. However, observing mother and infant within the home is not an option for dyads experiencing IPV as it potentially puts mother and infant at increased risk of violence. Additionally, several of the constructs of interest relied on self-report data, which may be subject to socially desirable responding. Women who experience IPV may feel ashamed or traumatized by their experiences, or may be concerned about their children being removed from the home due to IPV and therefore underreport. Furthermore, the measure of IPV relied on retrospective reporting, which may have also resulted in underreporting.

Implications

Theoretical Implications. The present research provides evidence for the role that environmental and mental health stressors play in maternal caregiving, and suggests that the effects can vary by type of stressor. While one type of stressor may inform parenting in a way that results in adaptive parenting intended to combat risk (e.g., pregnancy IPV leading to more

[6] To examine whether the observed touch was associated with maternal self-reported parenting, which may be more reflective of day-to-day interactions, maternal touch behavior was correlated with the Nurturing subscale of the Parent Behavior Checklist (Fox, 1994), which mothers had also completed at the same lab visit. However, none of the touch scales correlated with self-reported nurturing parenting behavior.

affectionate touch with infant sons), others may interfere with sensitive, attuned parenting, perhaps by impeding maternal perception of or ability to respond to infant cues, thereby potentially increasing risk (e.g., pregnancy and postpartum depression predicting more intrusive maternal touch). The findings do not, however, suggest that stressors such as IPV and maternal depression affect maternal touch by shaping developing maternal representations. This study also supports the understanding that early learning happens in the context of attachment relationships (e.g., mothers with pregnancy IPV engaged in more instrumental touch with their infant sons, and male infants who were exposed to pregnancy IPV also engaged in more instrumental touch with their mothers, suggesting that the baby boys may be modeling the care they have received). These early interactions lay the foundation for later interactive behavior and expectations of caregiving. Moreover, these results may also provide support for the intergenerational transmission of violence in male children exposed to IPV, which may already be evident in interactive touch behaviors in infancy.

Clinical Implications. The findings may have implications for interventions aimed at targeting the detrimental effects of IPV and maternal psychopathology on the mother-child relationship and child outcomes. Clinicians can support the positive parenting behaviors that mothers may develop to compensate for IPV-exposure, and provide additional support to reduce other demonstrated effects of IPV and maternal depression on mothers and mothering (e.g., physiological changes; increased emotion dysregulation; confusing, frightening, inconsistent, or intrusive parenting; blunted affect). These interventions can be provided in an individual or dyadic format, with the benefit of a dyadic format being that the clinician can comment on the infant's state and the mother-infant relationship to help mothers mentalize their infants. Postpartum interventions may also benefit from including a touch intervention to increase

nurturing maternal touch, as maternal touch of the infant has been shown to improve maternal factors (e.g., depression), infant outcomes (e.g., infant emotion regulation, attachment, physical development), and the mother-infant relationship. Nevertheless, it may also be important to consider that while touch interventions have generally been associated with improved outcomes, in the present study, male infants exposed to pregnancy IPV reacted to maternal touch with more negative touch behavior. Therefore, a touch intervention may also be activating for certain infants and increase dysregulation. Lastly, given that the early parent-child relationship lays the foundation for the child's understanding of relationships, supporting the mother-infant relationship will have implications for the child beyond infancy, into adolescence and adulthood.

Research Implications. This study represents a step towards understanding the effects of trauma and other stressors during pregnancy and the postpartum period on mother and infant. Furthermore, the results demonstrate that the type of risk and the time period of exposure have differential effects on interactive touch outcomes. The pregnancy period emerged as an important predictor, underscoring the value in examining stressors during the pregnancy period when studying the mother-infant relationship. Stressors during this time period demonstrated implications for mothering, and for infant behavior towards the mother, potentially as a result of prenatal programming, or through the effects of stressors on maternal caregiving. A finding that may benefit from further clarification is the role of severity versus general exposure to IPV and depression. For mothers, significant effects were found when IPV and depression were examined as continuous variables, suggesting that the extent to which risk predicted changes in maternal touch depended on the severity of the risk. Conversely, the majority of the findings for infants were when IPV and depression were examined as categorical variables, suggesting that the

presence of IPV or clinically significant depression was sufficient to produce an effect on infant touch and touch responses.

Future research should examine whether early differences in mother-infant touch predict later differences in child outcomes or the mother-child relationship. Understanding whether interactive differences observed at 1 year of age have implications for later functioning may provide additional information for better understanding which differences may be most important to target with interventions. In addition, further research on the role of sex differences and the relationship between risk and child outcomes may be beneficial. Indeed, research suggests a connection between early adversity (such as prenatal maternal stress exposure or postnatal exposure to IPV or maternal depression) and emotion regulation difficulties in early childhood (e.g., Fong, Hawes, & Allen, 2017; Monk, Spicer, & Champagne, 2012), which in turn predict aggressive behavior later in childhood (e.g.,Crockenberg, Leerkes, & Bárrig Jó, 2008; Holmes, Yoon, & Berg, 2017). Furthermore, research has demonstrated that the degree to which emotion regulation difficulties are associated with later aggression varies by the biological sex of the child, although the findings are mixed as to whether the effect is stronger in male or female children (e.g., Bowie, 2010; Cummings, Pepler, & Moore, 1999; Eisenberg et al., 2001). This discrepancy suggests that there may be additional factors contributing to later aggression.

Future research may also benefit from examining other interactive behaviors to provide a more nuanced understanding of touch and of the mother-infant relationship. For example, coding maternal and infant emotion and non-touch behaviors or including maternal and infant physiological arousal across an interaction may provide insight into the relationship between risk, touch, and emotion regulation. Lastly, the present study examined the effect of stressors during pregnancy and the first year postpartum, which oversimplifies and muddies the

implications of stress for mother and infant. Research has demonstrated that there are sensitive periods for the effects of stressors on fetal and infant development, suggesting that a more precise understanding of the timing of IPV and depression may be necessary for understanding how, why, and to what extent these stressors may affect infants overall and interactive behavior more specifically. Moreover, the timing of the stressors likely also has implications for how maternal parenting is affected, not only because how a mother thinks about herself and her child shifts across pregnancy, but also because of the physical, physiological, and neurocognitive changes that occur across pregnancy (e.g., Pearson et al., 2010; Pearson et al., 2009). Therefore, different aspects of mothering may be more vulnerable at some points of the pregnancy over others and further research is necessary to elucidate the role of timing in the effect of stressors on parenting more broadly, and touch specifically.

Conclusion

This study represents a contribution to the growing mother-infant touch literature. Overall, the findings demonstrated that pregnancy and postpartum IPV and depression predict differences in how mother and infant touch one another. Male infants in general were more vulnerable to the effects of IPV and depression on touch, potentially due to differences in maternal behavior, an increased sensitivity to prenatal effects of stress, or increased sensitivity to the postnatal home environment. In addition, infant touch overall varied more as a function of IPV and depression than maternal touch, suggesting that infants may be more sensitive to the stressors. Alternatively, it may be that the effects of IPV and depression on maternal touch were not strongly elicited in the lab setting or were more evident in other parenting behaviors. Ultimately, the effect of IPV and depression on mother-infant touch suggests a potential pathway

through which these stressors may exert more long-term change on interactive behavior and expectations of caregiving.

APPENDICES

APPENDIX A: Coding Manual for Mother-Infant Touch

Touch Purpose

NOTE: Only provide a touch purpose code if the primary person being coded INITIATED the touch (either in the current or prior 5-second window)

1. **Affectionate/Playful**
    a. Definition: The purpose of the touch is typically to soothe, establish a connection, communicate safety or positive feelings, or show caring. This is nurturing touch that demonstrates an effort to show affection to the other person. Affectionate touch may also arise in the context of playful behaviors.
    b. Mother examples:
        i. Mother gently rubs her child's back.
        ii. Mother picks up her crying infant to provide comfort.
        iii. Mother tickles her infant's stomach while the infant laughs.
        iv. Mother moves to rest her hands on her baby, in a way that is not accidental or instrumental.
            1. Note: If mother's hands continue to rest on her baby in the next 5 seconds, code the first 5 seconds as Affectionate, and the next 5 seconds as Passive.
        v. Mother bounces baby while holding baby
    c. Infant examples:
        i. Infant strokes his mother's face.
        ii. Infant holds onto mother when frightened.
        iii. Infant leans into mother

1. Note: If infant continues to passively lean for the next 5 seconds, code the first 5 seconds as Affectionate, and the next 5 as Passive.

2. Instrumental

a. Definition: The purpose of this touch is to take care of the needs of the other or the self. This touch is typically goal-directed. This code will be restricted to specific behaviors:

i. Lifting

ii. Diaper change

1. Note: code as being WITHOUT object

iii. Adjusting clothing

iv. Feeding

1. Including wiping baby's face

2. Note: if with bottle or juicebox (etc.), code as being WITHOUT object

3. Note: the person must make contact with the other person for this to be coded. If, for example, mother is holding a cheerio in her hand, and baby reaches out to grab it but does not touch mother, both would receive No Touch codes

v. Tapping (e.g., to get attention)

vi. Baby using mother to push him/herself up

vii. Holding (if baby is held out, away from the mother's body)

1. Note: if baby is held close to the body, code as Affectionate

viii. Wiping face/nose

b. Mother examples:
    i. Mother wipes her infant's mouth after her infant eats.
    ii. Mother changes her infant's diaper, using only the necessary contact to complete the change (additional touches during the change may necessitate additional codes).
c. Infant examples:
    i. Infant places his hands on his mother to push himself into a standing position.
    ii. Infant actively clings to mother while mother is holding infant.
    iii. Infant slides out of mother's lap and uses mother's body to get out of her lap.
        1. Note: if mother does not help infant, code her response as "Passive/Accidental"
d. Note: If the instrumental behavior includes Affectionate touch, code both behaviors

3. Accidental/Passive

a. Definition: This touch has no explicit purpose and typically occurs accidentally or during the course of another behavior. For passive touch, this require little to no active muscle engagement.
b. Mother examples:
    i. Mother's arm grazes infant's body as she reaches for a toy.
    ii. Mother's hands touch infant's hands as she gives him a toy.

iii. Mother placed infant in her lap in a prior 5-second window, and now the infant remains seated in the mother's lap.

c. Infant examples:

i. Infant hands mother a toy and his hand grazes hers in the process.

ii. Infant climbed into mother's lap in a prior 5-second window, and remains passively seated in the mother's lap in the subsequent window(s)

d. *Note:* A touch that was coded as active in a prior 5-second window can become passive if mother and infant are still in contact but no longer actively moving (e.g., a mother strokes her infant's back and then leaves her hand resting on the infant's back without movement or muscle engagement). The touch goes from actively engaging muscles to passive resting.

4. Negative

a. Definition: The purpose of the touch is to inflict harm or pain, or punish the other person. This touch may or may not be intended as negative. Negative touch may also be insensitive or cold. Negative touch may also be behavior done in frustration or with intent to restrain. Negative touch can be minor (i.e., it does not need to be a big negative touch in order to count).

b. Mother examples:

i. Mother hits, pinches, or grabs her child.

ii. Mother pushes her child.

iii. Mother restrains infant in place despite infant trying to move away.

c. Infant examples:

i. Infant pinches his mother.

ii. Infant hits his mother.

iii. Infant pushes away from his mother.

iv. Infant kicks mother in frustration while having diaper changed.

5. No touch

a. Definition: The person is not engaging in a touch he or she initiated. No touch occurs.

b. If touch is unclear, also code no touch

i. Example:

1. A toy obstructed the view, or mother and infant were angled in such a way that it is unclear whether touch occurred, or mother and infant are both off screen.

ii. Note: only code unclear if no other type of touch is coded. If part of the touch was unclear, but you saw another type of touch during the 5-second window, code only the other type of touch.

6. **Bid**

a. Definition: Reaching behavior with the intent of initiating touch with the other, but touch does not occur on the part of the person who initiated it.

b. Mother example:

i. Mother reaches towards her infant, and the infant withdraws. Consequently, the mother's attempt to touch her infant is not successful.

ii. Mother reaches towards her infant, and the infant steps towards her and completes the touch.

1. Note: in this scenario, both infant and mother would be considered to have initiated the touch – the mother with a Bid, and the infant with the Affectionate or Instrumental touch (depending).
2.

c. Infant example:
    i. Infant reaches up to the mother to indicate wanting to be held, but does not make physical contact with the mother because the mother steps back.
    ii. Infant reaches up to the mother to indicate wanting to be held, but stops short of making physical contact with the mother. The mother, however, reaches down and completes the touch.
        1. Note: in this scenario, both infant and mother would be considered to have initiated the touch – the infant with a Bid, and the mother with the Affectionate or Instrumental touch (depending).
d. Note: if someone is reaching to touch, but touch occurs in the subsequent 5-second period, do not code as bid. You may need to skip ahead and go back while coding to determine if something is a bid.
e. Note: Only code bid if it is a bid for touch, not, for example, a bid for play. If baby is reaching for mother and no touch occurs, code bid. If mother holds out a toy for the baby, <u>do not</u> code bid.

<u>Touch Purpose Notes:</u>

1. If the person being coded holds a toy/food/etc. out to the other person, and the other person takes the object, this is not automatically given a touch purpose code (or coded as

touch with an object). It is only given a touch purpose code if the person holds out the toy/food/etc. and touches the other person with the object intentionally or passively.

2. For touch bids:
    a. If the person being coded holds a toy/food/etc. out to the other person, this is not automatically a touch bid. It is only a touch bid if the person holds out the toy/food/etc. and tries to touch the other person with it.
    b. If a person just shakes an item in front of the other person, this is not a touch bid.
3. The other person may complete the touch, but the person who initiated the touch still receives the touch bid code (e.g., if an infant reaches towards his mother to initiate holding (but does not touch his mother), and his mother completes the touch by picking up the infant, then the infant would receive a touch bid code and the mother would be assigned a touch response code).
4. POTENTIALLY CONFUSING CODES:
    a. **<u>If coding the infant (for example)</u>**:
        i. Mother lifts baby into her lap and baby passively allows him/herself to be lifted: <u>baby coded No Touch for the Touch Purpose code</u>
        ii. Baby remains passively seated in mothers lap after mother lifts baby into lap: <u>baby coded No Touch for the Touch Purpose code</u>
        iii. However, if baby initiates a touch after having been seated in mother's lap, give baby a touch purpose code
    b. **<u>If coding the infant or the mother</u>**:
        i. If both mother and infant initiate a touch, both would receive Touch Purpose codes in their respective codings.

c. **Some touch behaviors may require more than 1 touch code**

   i. For example, if mother changes her baby's diaper in her lap, you may code both Instrumental (the changing) and Passive (passive contact of having baby on the lap). This is because this type of touch is different from the mother changing the baby on the floor.

d. **Special Circumstance: Baby sliding out of mother's lap**

   i. If coding the baby:

      1. Code baby's Touch Purpose as Instrumental
      2. Code mother's Touch Response as Passive/Accidental (unless mother helps or engages in an active touch behavior)

   ii. If coding the mother:

      1. Code mother's Touch Purpose as Passive/Accidental
      2. Code infant's Touch Response as Passive/Accidental

e. **If any of these are unclear, let me know! I have examples of each scenario!**

Other Touch Response

1. **Positive/Neutral**

   a. Definition: While or shortly after being touched, the person who was touched (Person B) responds by touching the person who touched them (Person A) in a positive or neutral way. Positive touch responsiveness is characterized by a warm, affectionate, playful or connective touch. Neutral touch responsiveness is characterized by being absent of an emotional valence.

   b. Mother examples:

i. When the infant touches his mother, mother responds by affectionately picking up and holding the infant.

c. Infant examples:

i. When the mother touches her infant, infant responds by playfully pushing his head into his mother.

2. Negative

a. Definition: While or shortly after being touched, the person who was touched (Person B) responds by touching the person who touched them (Person A) in a negative way. Negative touch responsiveness is characterized by a harsh, punitive, hurtful, restrictive or avoidant (e.g., pushing away) touch. Negative touch responses may also occur when a member of the dyad is frustrated or upset and may not be intended to be hurtful.

b. Mother examples:

i. When the infant touches his mother, mother responds by pushing her infant.

ii. When the infant tries to push away, mother restrains the infant to keep him in place.

c. Infant examples:

i. When the mother touches her infant, the infant responds by pushing his mother away.

ii. While mother is changing the infant's diaper, the infant is upset and kicks her.

d. NOTE: this can include withdrawal behavior (i.e., an intentional absence of touch being coded as a touch behavior) **<u>if</u>** the withdrawal is negative

e. NOTE: negative responses can also include restraint (e.g., baby is trying to move away and mom continues to hold onto the baby – even if the mom's touch purpose is instrumental. To the baby, this feels like a negative response)

3. **Accidental/Passive**

   a. Definition: While or after being touched, the person who was touched (Person B) maintains a tactile response by continuing to remain in contact with the person who touched them (Person A) in a passive way. Passive touch means that muscles are not straining to complete the touch.

      i. *Note:* This code can also be given after an initial touch response code was assigned in a prior 5-second interval. That is, an active touch response occurred in a prior 5-second interval and now passively continues.

   b. Mother example:

      i. When the infant touches his mother, the mother responds by resting her hand on the infant's face (positive/neutral touch response) and continues to rest her hand on the infant's face for the subsequent 5-second interval (passive touch response) as the infant continues to touch her in the same way.

   c. Infant examples:

      i. Mother picks up her infant and sets the infant in her lap. The infant passively accepts the movement, but otherwise does not respond with a tactile behavior.

ii. When the mother tickles her infant, who is lying prone on the ground between her legs the infant responds by placing his feet on her legs (positive/neutral touch response) and continues to rest his feet on his mother's legs as she is tickling him in the subsequent 5-second interval (passive touch response).

4. No touch

a. Definition: No tactile response occurs in response to the other's touch. This code can be given for a neutral withdrawal.

b. Examples:

i. Mother reaches for her infant (bid), her infant does not respond. No tactile contact occurs between mother and infant.

ii. Infant is resting his legs on his mother as she changes him. When she's done, she pats the infant to let him know. He moves his legs up in response, but does not appear upset or as if he wants to get away from his mother. His response is coded as No Touch because it is a neutral withdrawal.

iii. Mom rests a book on the baby as she reads to him. The baby touches the book in response. Baby's response is coded as No Touch because he touched the book and not his mother.

c. If touch response is unclear, also code no touch

i. Note: only code unclear if no other type of touch response is coded.

Other Touch Response Notes:

1. To determine valence of touch response (positive/neutral, negative), coders may use other communicative cues, such as vocalizations, facial expressions, gaze, and body movements.
    a. However, only code a positive/neutral, or negative response to touch if the person being touched responds with tactile behavior. If the person being touched cries when touched but does not respond with tactile behavior (e.g., pushing the toucher away), code passive touch if the person being touched does not move and remains in physical contact, no touch if the person being touched withdraws in a neutral way (i.e., an absence of touch), or negative touch if the person withdraws in a negative way (e.g., pushing the toucher).
2. If person B is already touching person A when person A initiates touch, code the valence of person B's touch behavior as the "other touch response" (even if person B's touch behavior did not noticeably change in response to person A's touch).

Qualifiers

1. Intrusive
    a. Note: Only give mothers intrusive codes
        i. If a baby's code seems intrusive, note the time and the dyad, and send the information to Nicola
    b. Note: Negative touch is not necessarily intrusive, but it can be. Positive touch and instrumental touch also have the potential to be intrusive.

c. To determine whether a touch is intrusive, coders may use other communicative cues, such as vocalizations, facial expressions, gaze, and body movements from both members of the dyad.

2. Touch with object
    a. Do not include feeding unless mother makes no other physical contact with infant while feeding the infant
    b. If mom is changing the baby's diaper and touches the baby through the diaper, do <u>not</u> code as touch with object
3. Note: For coding, you can select more than one qualifier for a touch purpose code
    a. e.g., if affectionate/playful touch occurs twice during the 5-second period, once with an object and once without, code both qualifiers

<u>Interaction Quality</u>

1. At the end of each video, please select one or more of the following to describe the video:
    a. Mother Mostly Attuned/Sometimes Attuned/Occasionally Attuned/Not Attuned
        i. Attuned: mother is responsive to baby and often correctly anticipates baby's needs.
    b. Infant was in mother's lap
        i. This should occur for at least several minutes of the video
    c. Mother and infant were next to each other without touching or interacting with each other
        i. This should occur for at least several minutes of the video
    d. Mother and infant were engaged with each other, but typically not with using touch

i. E.g., using play, verbally

ii. This should occur for significant portions of the video

e. Mother was intrusive

i. This should be used if the intrusive behavior was not tactile. This can include shaking objects in the baby's face, cornering the baby, etc.

f. Examples of possible things to fill in for the "Other" response:

i. If mother said something unusual or mean to the baby ("You're a bad baby")

ii. If mother or infant engage in an unusual behavior (e.g., mother mocks baby, mother claps in baby's face, baby runs away from mother in a way that is fearful)

iii. Providing context (e.g., if infant was asleep, or mother was changing the baby's diaper for most of the video)

Differentials

- Sometimes the same touch activity will be coded differently depending on the quality of the touch.
    - E.g., maternal caregiving behaviors may be coded as instrumental, affectionate or even negative depending on how the behavior is done

Procedures

1. Check the assignment spreadsheet to see which video you will be coding and who in the dyad you will be coding. The start time for each tape will begin at 2:01, which is 2 minutes and 1 second from the start of the free play. Set the bin to 4.98 seconds.

2. Mark each observed touch purpose code(s) as present during the 4.98-second period.
3. If touch occurred, indicate whether touch was made with an object (e.g., mother touches infant with a toy). Do not assign a code if no touch occurred or if touch was unclear.
4. If touch occurred, indicate whether touch was intrusive. Do not assign a code if no touch occurred or if touch was unclear.
5. If touch or a touch bid occurred during the 4.98-second interval, indicate how the other person responded to the touch during the same 4.98-second interval. Choose the predominant response.

General Notes:

1. If the same touch behavior is continued over several intervals, code the touch purpose for all of the intervals that the touch actively spans. If the touch becomes passive contact, code passive.

APPENDIX B: IPV, Depression, and Maternal Touch

To examine the effects of IPV and depression on maternal instrumental and passive touch, multilevel modeling was run in SPSS. For additional information about the analysis, please see the "Data Analytic Approach" section.

IPV and Maternal Touch

Instrumental Touch. Table 32a presents the MLM results predicting instrumental touch as a function of role, continuous pregnancy IPV, continuous pregnancy depression, and infant sex. As can be seen in the Table, there was a role main effect indicating that mothers engaged in more instrumental touch than babies. There was also a main effect of IPV which was qualified by a role by IPV interaction as well as a role by IPV by infant sex interaction. Table 32b presents the simple slopes for IPV and depression separately for mothers and babies, and indicates that the effects of IPV on instrumental touch are specific to mothers. The role by IPV by infant sex interaction suggests that the effect of IPV on instrumental touch by mothers differs for male and female infants. Specifically, as shown in Table 32c, for mothers of boys, greater pregnancy IPV is associated with more instrumental touch. No such effects emerged for mothers of female infants.

Table 33a presents the results predicting instrumental touch as a function of continuous postpartum IPV, continuous postpartum depression, and infant sex. There was again a role main effect indicating that mothers engaged in more instrumental touch than infants. There were no main effects of postpartum IPV or infant sex on maternal instrumental touch.

The categorical pregnancy IPV results are presented in Table 34a. There was a main effect of IPV and a role by IPV interaction. As shown in table 34b, mothers with pregnancy IPV engaged in more instrumental touch than mothers without pregnancy IPV.

The categorical results for postpartum IPV are presented in Table 35a. The results again demonstrate a role main effect indicating that mothers engaged in more instrumental touch than infants. As can be seen in the table, IPV and infant sex did not show evidence of main effects or interactions predicting maternal instrumental touch.

Passive Touch. Tables 36a-39a present the MLM results predicting passive touch as a function of IPV, maternal depression, and infant sex. As can be seen in the tables, IPV (pregnancy and postpartum; continuous and categorical) and infant sex did not show evidence of main effects predicting maternal passive touch. Role demonstrated a main effect, suggesting that mothers engaged in more passive touch than infants.

Depression and Maternal Touch

Affectionate Touch. Tables 6a-9a present the MLM results predicting affectionate touch as a function of IPV, maternal depression, and infant sex. As can be seen in the tables, maternal depression (pregnancy and postpartum; continuous and categorical) and infant sex did not show evidence of main effects predicting maternal affectionate touch. Role demonstrated a main effect, suggesting that mothers engaged in more affectionate touch than infants.

Negative. Tables 10a-13a present the MLM results predicting negative touch as a function of IPV, maternal depression, and infant sex. As can be seen in the tables, maternal depression (pregnancy and postpartum; continuous and categorical) and infant sex did not show evidence of main effects predicting maternal negative touch. Role demonstrated a main effect, suggesting that mothers engaged in less negative touch than infants.

Instrumental. Table 32a presents the MLM results predicting instrumental touch as a function of role, continuous pregnancy IPV, continuous pregnancy depression, and infant sex. As

can be seen in the Table, there was a role main effect indicating that mothers engaged in more instrumental touch than babies. There was also a role by depression interaction, suggesting that the effect of depression on instrumental touch varied for mothers and infants. However, follow-up analyses indicated that the effect was not significant for mothers or infants.

Table 33a presents the results predicting instrumental touch as a function of continuous postpartum IPV, continuous postpartum depression, and infant sex. As can be seen in the table, there was a role by depression by infant sex interaction. Specifically, as shown in Table 33c, for mothers of girls, greater postpartum depression was associated with less instrumental touch. No effects emerged for mothers of male infants.

Table 34a presents the results predicting instrumental touch as a function of categorical pregnancy IPV, categorical pregnancy depression, and infant sex. The main effect of role was qualified by a role by depression and a role by depression by infant sex interaction. The role by depression interaction suggests that the effects of depression on instrumental touch are limited to mothers. The role by depression by infant sex interaction suggests that the effect of depression on instrumental touch by mothers differs for male and female infants. Specifically, as shown in Table 34b, for mothers of girls, greater pregnancy depression is associated with less instrumental touch. There were no such effects for mothers of male infants.

Table 35a presents the results predicting instrumental touch as a function of categorical postpartum IPV, categorical postpartum depression, and infant sex. Aside from a role main effect, there were no main or interactive effects of postpartum depression on maternal instrumental touch.

Passive Touch. Tables 36a-39a present the MLM results predicting passive touch as a function of IPV, maternal depression, and infant sex. As can be seen in the tables, maternal depression (pregnancy and postpartum; continuous and categorical) and infant sex did not exert main effects on maternal passive touch. Role demonstrated a main effect, suggesting that mothers engaged in more passive touch than infants.

APPENDIX C: Pregnancy Representations

To determine whether maternal pregnancy representations mediated the relationship between pregnancy IPV/pregnancy depression and maternal touch, additional SEM analyses were run with a pregnancy representation latent factor. The latent factor is presented in Figure 5 For additional information about the analysis, please see the "Data Analytic Approach" section. Tables 52-61 present the SEM results for the continuous and categorical models. As with the postpartum representations, pregnancy representations also did not mediate the relationship between pregnancy IPV/pregnancy depression and maternal touch behavior.

APPENDIX D: Specific Touch Predicting Specific Touch Responses

Multilevel modeling was used to assess whether there were patterns of specific touch types and specific touch responses that varied as a function of pregnancy IPV, postpartum IPV, pregnancy depression, and postpartum depression. In these analyses, the dyad was treated as the upper-level unit, and the individual was treated as the lower level unit. Four types of fixed effects models were run. The first type of model tested for differences in touch behavior as a function of role. These models included an IPV variable from either the pregnancy or postpartum period which was measured either continuously or categorically, a depression variable likewise measured in either pregnancy or postpartum and either continuously or categorically, a categorical touch variable (1 = affectionate touch, 2 = instrumental touch, 3 = passive touch, 4 = negative touch), and a categorical touch response variable (1 = no touch response, 2 = positive/neutral touch response, 3 = negative touch response). Continuous measures of IPV and depression were grand-mean centered. The fixed effect model also included interactions between role and IPV to test whether the effect of IPV on touch differed for mothers and infants. Similarly the models included interactions between role and depression. Four-way interactions between role, IPV (or depression), touch, and touch response were also included to test for differences in effects as a function of touch and touch responses.

If a role by IPV (or depression) by touch by touch response interaction emerged, simple slope multilevel analyses were used to estimate effects of IPV (or depression) separately for each individual touch type by response by role. If there was evidence for interactive effects for specific touch types, a follow up analysis was run using the significant touch type(s). The follow-up examined the interaction between IPV (or depression), the significant touch type(s), specific

touch responses, and role. Finally, if there was evidence that the results differed by role, the final analysis estimated separate results for mothers and infants.

In the following results sections, for the continuous analyses, “A” tables will present the interaction model, “B” tables will present simple slopes for role, “C” tables will present the simple slopes for specific touch types, and “D” tables will present the simple slopes for specific touch responses. The categorical analyses were not significant and will therefore be presented in one table for the pregnancy period and one table for the postpartum period.

Table 62a presents the MLM results predicting total touch/touch responses as a function of role, continuous pregnancy IPV, continuous pregnancy depression, touch, and touch responses. As can be seen in the table, there was a role by IPV by touch by touch response interaction. There was no interaction for depression. Table 62b presents the simple slopes for IPV separately for each touch type, and indicates that the effect of IPV on touch/touch responses is specific to instrumental touch. Table 62c presents the simple slopes for the role by IPV by instrumental touch by touch response interaction. There was a role by IPV by instrumental touch by positive/neutral touch response interaction. Specifically, as can be seen in Table 62d, for mothers, pregnancy IPV was associated with infants responding to maternal instrumental touch with positive/neutral touch responses. No other touch and touch response patterns emerged as a function of pregnancy IPV.

APPENDIX E: Tables

Table 1:

Correlations and Means for Mother Touch

	1	2	3	4	5	6	7	8	9	10	11	12	Mean (SD)
1. Pregnancy IPV	-												3.59 (8.73)
2. Postpartum IPV	.24**	-											2.87 (8.53)
3. Pregnancy Depression	.33**	.06	-										10.22 (6.94)
4. Postpartum Depression	.16*	.12	.46**	-									5.70 (5.54)
5. Dem Risk	.32**	.08	.16*	.07	-								1.53 (1.20)
6. Baby Biological Sex	-.15*	-.17*	-.13	-.03	-.02	-							-
7. Affectionate Touch	.09	-.08	-.08	-.09	.00	.02	-						6.86 (9.24)
8. Instrumental Touch	.13	-.07	-.11	-.06	.04	-.01	.41**	-					11.32 (12.47)
9. Passive Touch	-.03	-.06	-.10	-.12	.00	.00	.31**	.39**	-				12.49 (19.50)
10. Negative Touch	.08	.00	-.05	.03	.18*	-.08	.00	.12	.06	-			.11 (.44)
11. No Touch	-.05	.09	.12	.11	.00	-.06	-.58**	-.72	-.86**	-.10	-		70.62 (22.67)
12. Intrusive Touch	.08	-.03	.08	.18*	.02	.05	.18*	.15*	-.05	.19*	-.10	-	.09 (.54)

Note. * indicates p is significant at < 0.05, ** indicates p is significant at < .001

Table 2:

Correlations and Means for Infant Touch

	1	2	3	4	5	6	7	8	9	10	11	Mean (SD)
1. Pregnancy IPV	-											3.59 (8.73)
2. Postpartum IPV	.24**	-										2.87 (8.53
3. Pregnancy Depression	.33**	.06	-									10.22 (6.94)
4. Postpartum Depression	.16*	.12	.46**	-								5.70 (5.54)
5. Dem Risk	.32**	.08	.16*	.07	-							1.53 (1.20)
6. Baby Biological Sex	-.15*	-.17*	-.13	-.03	-.02	-						-
7. Affectionate Touch	.02	.00	-.04	-.08	.03	-.08	-					2.29 (5.54)
8. Instrumental Touch	-.07	.08	.05	.17*	-.01	.04	.40**	-				2.33 (4.00)
9. Passive Touch	.04	-.11	.00	-.09	.00	.01	.32**	.28**	-			9.10 (13.18)
10. Negative Touch	.08	.02	.07	.09	.06	.09	.05	.07	.11	-		.37 (1.45)
11. No Touch	-.02	.06	-.01	.05	.00	.00	-.64**	-.55**	-.90**	-.19*	-	82.53 (16.60)

Note. * indicates *p* is significant at < 0.05, ** indicates *p* is significant at < .001

Table 3:

Correlations and Means for Maternal Touch Response to Infant Touch

	1	2	3	4	5	6	7	8	9	Mean (SD)
1. Pregnancy IPV	-									3.59 (8.73)
2. Postpartum IPV	.24**	-								2.87 (8.53
3. Pregnancy Depression	.33**	.06	-							10.22 (6.94)
4. Postpartum Depression	.16*	.12	.46**	-						5.70 (5.54)
5. Dem Risk	.32**	.08	.16*	.07	-					1.53 (1.20)
6. Baby Biological Sex	-.15*	-.17*	-.13	-.03	-.02	-				-
7. Positive/Neutral Touch Response	.03	-.06	-.01	-.05	-.01	-.02	-			12.09 (17.60)
9. Negative Touch Response	-.03	-.06	.02	-.07	.07	-.09	.23**	-		.05 (.26)
10. No Touch Response	-.06	-.02	.08	.09	.16*	.19*	.11	.08	-	1.98 (2.04)

Note. * indicates *p* is significant at < 0.05, ** indicates *p* is significant at < .001

Table 4:

Correlations and Means for Infant Touch Response to Maternal Touch

	1	2	3	4	5	6	7	8	9	Mean (SD)
1. Pregnancy IPV	-									3.59 (8.73)
2. Postpartum IPV	.24**	-								2.87 (8.53
3. Pregnancy Depression	.33**	.06	-							10.22 (6.94)
4. Postpartum Depression	.16*	.12	.46**	-						5.70 (5.54)
5. Dem Risk	.32**	.08	.16*	.07	-					1.53 (1.20)
6. Baby Biological Sex	-.15*	-.17*	-.13	-.03	-.02	-				-
7. Positive/Neutral Touch Response	.05	-.09	-.15*	-.14	.03	-.01	-			25.87 (30.01)
8. Negative Touch Response	.04	.03	.03	.07	.02	.03	.28**	-		.86 (2.70)
9. No Touch Response	.06	-.05	.08	.00	-.06	.04	.23**	.19**	-	4.10 (3.74)

Note. * indicates *p* is significant at < 0.05, ** indicates *p* is significant at < .001

Table 5:

Correlations between Mother and Infant Touch

	Aff Touch Baby	**Ins Touch Baby**	**Pas Touch Baby**	**Neg Touch Baby**	**No Touch Baby**
Aff Touch Mom	.47**	.37**	.35**	.17*	-.49**
Ins Touch Mom	.40**	.19*	.31**	.32**	-.42**
Pas Touch Mom	.38**	.21**	.54**	-.01	-.56**
Neg Touch Mom	.04	.03	.15*	.10	-.14
No Touch Mom	-.41**	-.29**	-.55**	-.19*	.61**

Note. * indicates p is significant at < 0.05, ** indicates p is significant at < .001

Table 6:

Correlations between IPV, Depression, and WMCI Subscales

	1	2	3	4	5	6	7	8	9	10	11
1. Pregnancy IPV	-										
2. Postpartum IPV	.24**	-									
3. Pregnancy Depression	.33**	.06	-								
4. Postpartum Depression	.16*	.12	.46**	-							
5. Dem Risk	.32**	.08	.16*	.07	-						
6. Baby Biological Sex	-.15*	-.17*	-.13	-.03	-.02	-					
7. Richness of Perceptions	-.18*	-.07	-.17*	-.02	-.32**	.05	-				
8. Intensity of Involvement	-.18*	-.04	-.19*	-.02	-.33**	-.01	.70**	-			
9. Coherence	-.12	.06	-.17*	-.03	-.34**	.00	.39**	.47**	-		
10. Caregiving Sensitivity	-.23**	-.13	-.34**	-.14	-.42**	.08	.51**	.57**	.57**	-	
11. Acceptance	-.24**	-.02	-.36**	-.06	-.44**	.07	.52**	.63**	.61*	.74**	-

Note. * indicates *p* is significant at < 0.05, ** indicates *p* is significant at < .001

Table 7:

Correlations between WMCI Subscales and Maternal Touch

	1	2	3	4	5	6	7	8	9	10
1. Richness of Perceptions	-									
2. Intensity of Involvement	.70**	-								
3. Coherence	.39**	.47**	-							
4. Caregiving Sensitivity	.51**	.57**	.57**	-						
5. Acceptance	.52**	.63**	.61**	.74**	-					
6. Affectionate Touch	.18*	.13	.03	.10	.15*	-				
7. Instrumental Touch	.17*	.06	-.03	.10	.12	.41**	-			
8. Passive Touch	.10	.06	.07	.16*	.08	.31**	.39**	-		
9. Negative Touch	-.12	-.11	-.04	-.04	-.03	.01	.12	.06	-	
10. No Touch	-.15*	-.07	-.01	-.14	-.12	-.58**	-.72**	-.86**	-.10	-

Note. * indicates *p* is significant at < 0.05, ** indicates *p* is significant at < .001

Table 8:

Percentage of Initiated Touch Behavior that Received a Touch Response

Initiated Touch	**Percentage Receiving Other Touch Response**
Maternal Affectionate Touch	79.15%
Maternal Instrumental Touch	85.89%
Maternal Passive Touch	91.72%
Maternal Negative Touch	65.00%
Infant Affectionate Touch	93.48%
Infant Instrumental Touch	94.57%
Infant Passive Touch	82.45%
Infant Negative Touch	70.77%

Table 9a:

Multilevel regression coefficients estimating the effects of role, infant sex, and continuous pregnancy IPV and depression on affectionate touch

	Estimate	**Standard Error**	***df***	***t***	***p***
Intercept	4.833	.483	167	10.00	.000
Role	2.407	.310	168	7.75	.000
IPV	.144	.064	171	2.26	.025
Depression	-.105	.075	167	-1.40	.164
Infant Sex	-.025	.483	167	-.05	.959
Role x IPV	.099	.040	168	2.50	.013
Role x Depression	-.056	.048	168	-1.16	.248
Role x Infant Sex	.391	.310	168	1.26	.209
IPV x Infant Sex	.194	.062	167	3.13	.002
Depression x Infant Sex	.007	.076	168	.09	.931
Role x IPV x Infant Sex	.111	.040	168	2.79	.006
Role x Depression x Infant Sex	-.011	.048	168	-.23	.815
Demographic Risk	.094	.373	167	.25	.801

Table 9b:

Estimating separate role effects for mother and infants testing the effects of infant sex and continuous pregnancy IPV and depression on affectionate touch

	Role: Mother			**Role: Baby**		
	Estimate (SE)	***t(df)***	***p***	**Estimate (SE)**	***t(df)***	***p***
Role	7.241 (.690)	10.50(167)	.000	2.426 (.429)	5.66 (167)	.000
Role x IPV	.243 (.090)	2.72 (173)	.001	.04 (.06)	.78 (167)	.435
Role x Dep	-.161 (.107)	-1.5 (168)	.135	-.049 (.067)	-.74 (167)	.462
Role x Infant Sex	.366 (.690)	.53 (167)	.596	-.416 (.429)	-.97 (167)	.334
Role x IPV x Infant Sex	.305 (.088)	3.45 (167)	.001	.083 (.055)	1.51 (167)	.132
Role x Dep x Infant Sex	-.005 (.107)	-.04 (169)	.965	.018 (.067)	.27 (167)	.791

Table 9c:

Estimating separate effect estimates for mothers with male versus female infants for continuous pregnancy IPV and depression on affectionate touch

	Role: Mother						**Role: Baby**					
	Sex: Boy			**Sex: Girl**			**Sex: Boy**			**Sex: Girl**		
	Est (SE)	***t(df)***	***p***	**Est (SE)**	***t(df)***	***p***	**Est (SE)**	***t(df)***	***p***	**Est (SE)**	***t(df)***	***p***
Sex	7.607 (.969)	7.85 (167)	.000	6.875 (.982)	7.00 (167)	.000	2.010 (.603)	3.33 (167)	.001	2.842 (.611)	4.65 (167)	.000
IPV x Role x Sex	.549 (.146)	3.77 (169)	.000	-.062 (.103)	-.60 (173)	.549	.128 (.091)	1.41 (167)	.162	-.039 (.065)	-.59 (167)	.555
Dep x Role x Sex	-.165 (.168)	-.98 (169)	.326	-.156 (.133)	-1.17 (167)	.243	-.031 (.105)	-.30 (167)	.766	-.067 (.083)	-.81 (167)	.419

Table 10a:

Multilevel regression coefficients estimating the effects of role, infant sex, and continuous postpartum IPV and depression on affectionate touch

	Estimate	**Standard Error**	***df***	***t***	***p***
Intercept	4.561	.504	167	9.06	.000
Role	2.300	.322	168	7.13	.000
IPV	-.054	.078	168	-.69	.491
Depression	-.113	.090	167	-1.26	.208
Infant Sex	-.200	.504	167	-.40	.692
Role x IPV	-.028	.049	168	-.56	.575
Role x Depression	-.030	.057	168	-.52	.607
Role x Infant Sex	.272	.322	168	.84	.400
IPV x Infant Sex	-.012	.077	167	-.15	.878
Depression x Infant Sex	-.032	.090	168	-.35	.726
Role x IPV x Infant Sex	.013	.049	168	.26	.793
Role x Depression x Infant Sex	-.005	.057	168	-.09	.926
Demographic Risk	.177	.358	167	.50	.621

Table 11a:

Multilevel regression coefficients estimating the effects of role, infant sex, and categorical pregnancy IPV and depression on affectionate touch

	F	***df***	***p***
Intercept	54.556	181	.000
Role	45.475	168	.000
IPV	.130	172	.719
Depression	.238	168	.627
Infant Sex	.029	166	.864
Role x IPV	.058	168	.810
Role x Depression	.017	168	.897
Role x Infant Sex	1.820	168	.179
IPV x Infant Sex	.242	166	.624
Depression x Infant Sex	2.353	167	.127
Role x IPV x Infant Sex	1.317	168	.253
Role x Depression x Infant Sex	.019	168	.890
Demographic Risk	.239	164	.916

Table 12a:

Multilevel regression coefficients estimating the effects of role, infant sex, and categorical postpartum IPV and depression on affectionate touch

	F	***df***	***p***
Intercept	24.976	181	.000
Role	22.326	168	.000
IPV	.004	169	.952
Depression	2.322	169	.137
Infant Sex	.183	165	.669
Role x IPV	1.386	168	.241
Role x Depression	.144	168	.705
Role x Infant Sex	.667	168	.415
IPV x Infant Sex	.164	167	.686
Depression x Infant Sex	.123	166	.726
Role x IPV x Infant Sex	1.314	168	.253
Role x Depression x Infant Sex	.200	168	.655
Demographic Risk	.349	164	.844

Table 13a:

Multilevel regression coefficients estimating the effects of role, infant sex, and continuous pregnancy IPV and depression on negative touch

	Estimate	**Standard Error**	***df***	***t***	***p***
Intercept	.264	.059	167	4.46	.000
Role	-.147	.056	168	-2.62	.010
IPV	.009	.008	173	1.19	.237
Depression	.006	.009	168	.64	.526
Infant Sex	.067	.059	167	1.13	.259
Role x IPV	-.007	.007	168	-.93	.354
Role x Depression	-.012	.009	168	-1.36	.176
Role x Infant Sex	-.105	.056	168	-1.88	.062
IPV x Infant Sex	.007	.008	167	.87	.386
Depression x Infant Sex	.014	.009	169	1.51	.134
Role x IPV x Infant Sex	-.007	.007	168	-1.03	.305
Role x Depression x Infant Sex	-.011	.009	168	-1.28	.203
Demographic Risk	.061	.029	167	2.09	.038

Table 14a:

Multilevel regression coefficients estimating the effects of role, infant sex, and continuous postpartum IPV and depression on negative touch

	Estimate	**Standard Error**	***df***	***t***	***p***
Intercept	.269	.059	167	4.53	.000
Role	-.145	.057	168	-2.55	.012
IPV	.013	.009	168	1.41	.160
Depression	.014	.011	168	1.33	.185
Infant Sex	.071	.059	167	1.19	.235
Role x IPV	-.010	.009	168	-1.19	.237
Role x Depression	-.012	.010	168	-1.21	.228
Role x Infant Sex	-.103	.057	168	-1.81	.072
IPV x Infant Sex	.017	.009	168	1.88	.062
Depression x Infant Sex	.011	.011	168	1.02	.310
Role x IPV x Infant Sex	-.011	.009	168	-1.30	.197
Role x Depression x Infant Sex	-.008	.010	168	-.82	.413
Demographic Risk	.061	.028	167	2.22	.028

Table 15a:

Multilevel regression coefficients estimating the effects of role, infant sex, and categorical pregnancy IPV and depression on negative touch

	F	***df***	***p***
Intercept	18.186	191	.000
Role	8.900	168	.003
IPV	1.763	175	.186
Depression	.401	170	.528
Infant Sex	2.672	168	.104
Role x IPV	1.540	168	.216
Role x Depression	1.506	168	.222
Role x Infant Sex	6.365	168	.013
IPV x Infant Sex	1.581	168	.210
Depression x Infant Sex	1.304	169	.255
Role x Infant Sex x IPV	4.314	168	.039
Role x Infant Sex x Depression	.066	168	.798
Demographic Risk	2.813	164	.027

Table 15b:

Estimated marginal means for the effects of role, infant sex, and categorical pregnancy IPV and depression on negative touch

		Mean	Standard Error	*df*	*95% CI*
Role	Baby	.460	.119	177	[.225, .694]
	Mother	.106	.042	166	[.024, .188]
Role x Infant Sex	Infant - Female	.207	.160	175	[-.109, .523]
	Infant - Male	.712	.173	171	[.371, 1.054]
	Mother - Female	.153	.054	166	[.046, .259]
	Mother - Male	.060	.056	165	[-.051, .170]
Role x Infant Sex x IPV	Infant - Female - No	.254	.202	175	[-.145, .653]
	Infant - Female - Yes	.160	.258	170	[-.349, .669]
	Infant - Male - No	.325	.185	172	[-.041, .691]
	Infant - Male - Yes	1.100	.310	169	[.488, 1.712]
	Mother - Female - No	.093	.069	166	[-.043, .229]
	Mother - Female - Yes	.212	.081	165	[.051, .373]
	Mother - Male - No	.095	.061	165	[-.025, .214]
	Mother - Male - Yes	.025	.097	164	[-.168, .217]

Table 16a:

Multilevel regression coefficients estimating the effects of role, infant sex, and categorical postpartum IPV and depression on negative touch

	F	***df***	***p***
Intercept	20.999	190	.000
Role	9.633	168	.002
IPV	6.899	172	.009
Depression	.283	171	.596
Infant Sex	5.219	167	.024
Role x IPV	3.162	168	.077
Role x Depression	.401	168	.527
Role x Infant Sex	6.858	168	.010
IPV x Infant Sex	6.823	169	.010
Depression x Infant Sex	.062	168	.804
Role x IPV x Infant Sex	5.131	168	.025
Role x Depression x Infant Sex	.222	168	.638
Demographic Risk	2.756	164	.030

Table 16b:

Estimated marginal means for the effects of role, infant sex, and categorical postpartum IPV and depression on negative touch

		Mean	Standard Error	*df*	*95% CI*
Role	Baby	.612	.149	177	[.318, .907]
	Mother	.145	.052	167	[.042, .248]
IPV	No	.198	.084	184	[.033, .364]
	Yes	.559	.127	182	[.309, .808]
Infant Sex	Female	.199	.104	181	[-.006, .404]
	Male	.558	.123	178	[.315, .801]
Role x Infant Sex	Infant - Female	.236	.190	173	[-.140, .612]
	Infant - Male	.989	.227	172	[.541, 1.436]
	Mother - Female	.163	.063	166	[.038, .288]
	Mother - Male	.127	.074	166	[-.019, .273]
IPV x Infant Sex	Male - No	.197	.120	180	[-.039, .433]
	Male - Yes	.202	.150	174	[-.095, .498]
	Female - No	.200	.114	173	[-.025, .424]
	Female - Yes	.916	.199	176	[.524, 1.308]
Role x Infant Sex x IPV	Infant - Female - No	.265	.220	172	[-.169, .699]
	Infant - Female - Yes	.206	.279	170	[-.344, .757]

Table 16b (cont'd)

	Infant - Male - No	.367	.211	170	[-.050, .784]
	Infant - Male - Yes	1.610	.367	171	[.885, 2.335]
	Mother - Female - No	.129	.073	166	[-.015, .272]
	Mother - Female - Yes	.197	.089	165	[.021, .373]
	Mother - Male - No	.032	.067	165	[-.100 .165]
	Mother - Male - Yes	.119	.119	165	[-.013, .456]

Table 17a:

Multilevel regression coefficients estimating the effects of role, infant sex, and continuous pregnancy IPV and depression on intrusive touch

	Estimate	**Standard Error**	***df***	***t***	***p***
Intercept	.269	.075	167	3.62	.000
IPV	.006	.010	167	.61	.541
Depression	.023	.011	167	1.98	.049
Infant Sex	.079	.075	167	1.06	.292
IPV x Infant Sex	.000	.010	167	-.04	.965
Depression x Infant Sex	-.004	.012	167	-.37	.712
Demographic Risk	-.066	.066	167	-1.01	.316

Table 18a:

Multilevel regression coefficients estimating the effects of role, infant sex, and continuous postpartum IPV and depression on intrusive touch

	Estimate	**Standard Error**	***df***	***t***	***p***
Intercept	.293	.074	167	3.94	.000
IPV	.002	.011	167	.16	.877
Depression	.039	.013	167	2.96	.004
Infant Sex	.058	.074	167	.78	.435
IPV x Infant Sex	.013	.011	167	1.15	.250
Depression x Infant Sex	-.007	.013	167	-.51	.610
Demographic Risk	-.044	.062	167	-.71	.476

Table 19a:

Multilevel regression coefficients estimating the effects of role, infant sex, and categorical pregnancy IPV and depression on intrusive touch

	F	***df***	***p***
Intercept	7.884	164	.000
IPV	3.336	164	.070
Depression	.164	164	.686
Infant Sex	2.010	164	.158
IPV x Infant Sex	.279	164	.598
Depression x Infant Sex	.160	164	.690
Demographic Risk	1.322	164	.264

Table 20a:

Multilevel regression coefficients estimating the effects of role, infant sex, and categorical postpartum IPV and depression on intrusive touch

	F	***df***	***p***
Intercept	7.525	164	.007
IPV	.112	164	.739
Depression	1.873	164	.173
Infant Sex	.656	164	.419
IPV x Infant Sex	1.094	164	.297
Depression x Infant Sex	.809	164	.370
Demographic Risk	.949	164	.437

Table 21a:

Multilevel regression coefficients estimating the effects of role, infant sex, and continuous pregnancy IPV and depression on no touch

	Estimate	Standard Error	*df*	*t*	*p*
Intercept	75.902	1.345	167	56.43	.000
Role	-6.093	.690	168	-8.83	.000
IPV	-.316	.178	169	-1.78	.077
Depression	.195	.209	167	.93	.353
Infant Sex	-.845	1.346	167	-.63	.531
Role x IPV	-.179	.088	168	-2.03	.044
Role x Depression	.261	.107	168	2.45	.015
Role x Infant Sex	-.599	.690	168	-.87	0386
IPV x Infant Sex	-.385	.173	167	-2.23	.027
Depression x Infant Sex	-.219	.211	168	-1.04	.300
Role x IPV x Infant Sex	-.161	.088	168	-1.82	.071
Role x Depression x Infant Sex	.060	.107	168	.56	.577
Demographic Risk	.264	1.116	167	.24	.813

Table 21b:

Estimating separate effects for mothers and infants testing the effects of infant sex and continuous pregnancy IPV and depression on no touch

	Role: Mother			Role: Baby		
	Estimate (SE)	***t(df)***	***p***	**Estimate (SE)**	***t(df)***	***p***
Role	69.808 (1.711)	40.79(167)	.000	81.995 (1.281)	63.99 (167)	.000
Role x IPV	-.496 (.224)	-2.21 (173)	.028	-.137 (.170)	-.81 (167)	.422
Role x Dep	.456 (.266)	1.72 (168)	.088	-.067 (.199)	-.33 (167)	.738
Role x Infant Sex	-1.445 (1.712)	-.84 (167)	.400	-.246 (1.282)	-.19 (167)	.848
Role x IPV x Infant Sex	-.546 (.219)	-2.49 (167)	.014	-.224 (.164)	-1.36 (167)	.174
Role x Dep x Infant Sex	-.159 (.267)	-.60 (169)	.551	-.279 (.201)	-1.39 (167)	.167

Table 22a:

Multilevel regression coefficients estimating the effects of role, infant sex, and continuous postpartum IPV and depression on no touch

	Estimate	Standard Error	*df*	*t*	*p*
Intercept	76.625	1.381	167	55.49	.000
Role	-5.904	.708	168	-8.34	.000
IPV	.170	.213	167	.80	.427
Depression	.259	.247	167	1.05	.295
Infant Sex	-.357	1.381	167	-.26	.797
Role x IPV	.059	.109	168	.54	.590
Role x Depression	.138	.126	168	1.10	.275
Role x Infant Sex	-.507	.708	168	-.72	.475
IPV x Infant Sex	.059	.212	167	.28	.780
Depression x Infant Sex	-.398	.248	167	-1.20	.230
Role x IPV x Infant Sex	.047	.109	168	.43	.666
Role x Depression x Infant Sex	-.173	.126	168	-1.38	.171
Demographic Risk	-.115	1.071	167	-.11	.915

Table 23a:

Multilevel regression coefficients estimating the effects of role, infant sex, and categorical pregnancy IPV and depression on no touch

	F	***df***	***p***
Intercept	2093.338	173	.000
Role	62.988	168	.000
IPV	.159	168	.690
Depression	.102	166	.750
Infant Sex	.234	165	.629
Role x IPV	.128	168	.721
Role x Depression	3.109	168	.080
Role x Infant Sex	.221	168	.639
IPV x Infant Sex	.626	165	.430
Depression x Infant Sex	3.598	166	.060
Role x IPV x Infant Sex	.618	168	.433
Role x Depression x Infant Sex	.837	168	.362
Demographic Risk	.653	164	.625

Table 24a:

Multilevel regression coefficients estimating the effects of role, infant sex, and categorical postpartum IPV and depression on no touch

	F	***df***	***p***
Intercept	1354.963	173	.000
Role	32.693	168	.000
IPV	.014	167	.907
Depression	.409	166	.523
Infant Sex	.405	164	.526
Role x IPV	.034	168	.854
Role x Depression	1.809	168	.180
Role x Infant Sex	2.525	168	.114
IPV x Infant Sex	.879	165	.350
Depression x Infant Sex	.783	165	.378
Role x IPV x Infant Sex	.070	168	.792
Role x Depression x Infant Sex	2.488	168	.117
Demographic Risk	.895	164	.468

Table 25:

Maternal representations mediating the relationship between continuous IPV/depression and affectionate touch

	b	*SE of b*	*β*	*p*
Path: Predictor ⟶ Mediator				
Pregnancy IPV -> Maternal Reps	-.001	.005	-.021	.785
Postpartum IPV -> Maternal Reps	.000	.004	-.002	.972
Pregnancy Depression -> Maternal Reps	-.026	.007	-.346	.000
Postpartum Depression -> Maternal Reps	.010	.007	.110	.154
Path: Mediator ⟶ Outcome				
Maternal Reps -> Affectionate Touch	3.613	1.780	.206	.042
Path: Predictor ⟶ Outcome (Direct)				
Pregnancy IPV -> Affectionate Touch	.176	.088	.166	.047
Postpartum IPV -> Affectionate Touch	-.112	.083	-.103	.181
Pregnancy Depression -> Affectionate Touch	-.026	.125	-.019	.837
Postpartum Depression -> Affectionate Touch	-.141	.141	-.085	.315
Path: Predictor ⟶ Outcome (Indirect)				
Pregnancy IPV -> Affectionate Touch	-.005	.017	-.004	.786
Postpartum IPV -> Affectionate Touch	-.001	.016	-.001	.972
Pregnancy Depression -> Affectionate Touch	-.095	.051	-.071	.062
Postpartum Depression -> Affectionate Touch	.038	.032	.023	.238

Table 25 (cont'd)

Control Variables				
Demographic Risk -> Maternal Reps	-.194	.038	-.441	.000
Infant Sex -> Maternal Reps	.014	.072	.014	.843
Demographic Risk -> Affectionate Touch	.529	.690	.068	.443
Infant Sex -> Affectionate Touch	.221	1.395	.012	.874

Model fit: Free parameters = 31; X^2 = 27.5777, DF = 32, p = .690; RMSEA = .000; CFI = 1.000; R^2 = .064, p = .088

Table 26:

Maternal representations mediating the relationship between categorical IPV/depression and affectionate touch

	b	*SE of b*	*β*	*p*
Path: Predictor ⟶ Mediator				
Pregnancy IPV -> Maternal Reps	-.010	.094	-.009	.911
Postpartum IPV -> Maternal Reps	.020	.093	.016	.833
Pregnancy Depression -> Maternal Reps	-.306	.088	-.292	.000
Postpartum Depression -> Maternal Reps	.099	.096	.076	.301
Path: Mediator ⟶ Outcome				
Maternal Reps -> Affectionate Touch	3.942	1.770	.224	.026
Path: Predictor ⟶ Outcome (Direct)				
Pregnancy IPV -> Affectionate Touch	.897	1.795	.046	.617
Postpartum IPV -> Affectionate Touch	-1.168	1.788	-.055	.513
Pregnancy Depression -> Affectionate Touch	1.552	1.662	.084	.350
Postpartum Depression -> Affectionate Touch	-2.618	1.837	-.114	.154
Path: Predictor ⟶ Outcome (Indirect)				
Pregnancy IPV -> Affectionate Touch	-.041	.369	-.002	.911
Postpartum IPV -> Affectionate Touch	.078	.369	.004	.833
Pregnancy Depression -> Affectionate Touch	1.208	.621	-.066	.052
Postpartum Depression -> Affectionate Touch	.391	.414	.017	.344

Table 26 (cont'd)

Control Variables				
Demographic Risk -> Maternal Reps	-.193	.038	-.439	.000
Infant Sex -> Maternal Reps	.043	.073	.041	.558
Demographic Risk -> Affectionate Touch	.750	.698	.097	.283
Infant Sex -> Affectionate Touch	.129	1.397	.007	.926

Model fit: Free parameters = 31; X^2 = 27.611, DF = 32, p = .689; RMSEA = .000; CFI = 1.000; R^2 = .045, p = .170

Table 27:

Maternal representations mediating the relationship between continuous IPV/depression and instrumental touch

	b	*SE of b*	*β*	*p*
Path: Predictor ⟶ Mediator				
Pregnancy IPV -> Maternal Reps	-.001	.005	-.021	.787
Postpartum IPV -> Maternal Reps	.000	.004	-.003	.964
Pregnancy Depression -> Maternal Reps	-.026	.007	-.346	.000
Postpartum Depression -> Maternal Reps	.010	.007	.109	.157
Path: Mediator ⟶ Outcome				
Maternal Reps -> Instrumental Touch	3.582	2.366	.151	.130
Path: Predictor ⟶ Outcome (Direct)				
Pregnancy IPV -> Instrumental Touch	.303	.119	.212	.011
Postpartum IPV -> Instrumental Touch	-.167	.112	-.114	.136
Pregnancy Depression -> Instrumental Touch	-.222	.168	-.123	.187
Postpartum Depression -> Instrumental Touch	-.036	.189	-.016	.849
Path: Predictor ⟶ Outcome (Indirect)				
Pregnancy IPV -> Instrumental Touch	-.004	.017	-.003	.790
Postpartum IPV -> Instrumental Touch	-.001	.016	.000	.964
Pregnancy Depression -> Instrumental Touch	-.094	.065	-.052	.150
Postpartum Depression -> Instrumental Touch	-.037	.036	.016	.297

Table 27 (cont'd)

Control Variables				
Demographic Risk -> Maternal Reps	-.194	.038	-.441	.000
Infant Sex -> Maternal Reps	.014	.072	.013	.848
Demographic Risk -> Instrumental Touch	.791	.927	.076	.394
Infant Sex -> Instrumental Touch	-.590	1.874	-.024	.753

Model fit: Free parameters = 31; X^2 = 31.559, DF = 32, p = .489; RMSEA = .000; CFI = 1.000; R^2 = .070, p = .065

Table 28:

Maternal representations mediating the relationship between categorical IPV/depression and instrumental touch

	b	*SE of b*	*β*	*p*
Path: Predictor ⟶ Mediator				
Pregnancy IPV -> Maternal Reps	-.012	.094	-.011	.900
Postpartum IPV -> Maternal Reps	.018	.093	.015	.845
Pregnancy Depression -> Maternal Reps	-.307	.088	-.292	.000
Postpartum Depression -> Maternal Reps	.099	.096	.076	.300
Path: Mediator ⟶ Outcome				
Maternal Reps -> Instrumental Touch	3.769	2.326	.159	.105
Path: Predictor ⟶ Outcome (Direct)				
Pregnancy IPV -> Instrumental Touch	6.121	2.386	.230	.010
Postpartum IPV -> Instrumental Touch	.795	2.376	.028	.738
Pregnancy Depression -> Instrumental Touch	-3.120	2.209	-.125	.158
Postpartum Depression -> Instrumental Touch	-.272	2.441	-.009	.911
Path: Predictor ⟶ Outcome (Indirect)				
Pregnancy IPV -> Instrumental Touch	-.045	.354	-.002	.900
Postpartum IPV -> Instrumental Touch	.069	.354	.002	.846
Pregnancy Depression -> Instrumental Touch	-1.155	.771	-.046	.134
Postpartum Depression -> Instrumental Touch	.375	.427	.012	.381

Table 28 (cont'd)

Control Variables				
Demographic Risk -> Maternal Reps	-.192	.038	-.438	.000
Infant Sex -> Maternal Reps	.042	.073	.040	.567
Demographic Risk -> Instrumental Touch	.640	.928	.061	.490
Infant Sex -> Instrumental Touch	.177	1.856	.007	.924

Model fit: Free parameters = 31; X^2 = 32.504, DF = 32, p = .442; RMSEA = .010; CFI = .999; R^2 = .072, p = .062

Table 29:

Maternal representations mediating the relationship between continuous IPV/depression and passive touch

	b	*SE of b*	*β*	*p*
Path: Predictor ⟶ Mediator				
Pregnancy IPV -> Maternal Reps	-.001	.005	-.020	.790
Postpartum IPV -> Maternal Reps	.000	.004	-.004	.950
Pregnancy Depression -> Maternal Reps	-.026	.007	-.345	.000
Postpartum Depression -> Maternal Reps	.010	.007	.108	.162
Path: Mediator ⟶ Outcome				
Maternal Reps -> Passive Touch	5.568	3.793	.150	.142
Path: Predictor ⟶ Outcome (Direct)				
Pregnancy IPV -> Passive Touch	.034	.189	.015	.856
Postpartum IPV -> Passive Touch	-.126	.178	-.055	.479
Pregnancy Depression -> Passive Touch	-.052	.268	-.018	.846
Postpartum Depression -> Passive Touch	-.346	.301	-.098	.250
Path: Predictor ⟶ Outcome (Indirect)				
Pregnancy IPV -> Passive Touch	-.007	.026	-.003	.793
Postpartum IPV -> Passive Touch	-.001	.024	-.001	.951
Pregnancy Depression -> Passive Touch	-.145	.104	-.052	.160
Postpartum Depression -> Passive Touch	.057	.055	.016	.304

Table 29 (cont'd)

Control Variables				
Demographic Risk -> Maternal Reps	-.194	.038	-.441	.000
Infant Sex -> Maternal Reps	.014	.072	.013	.849
Demographic Risk -> Passive Touch	1.377	1.479	.084	.352
Infant Sex -> Passive Touch	-.810	2.986	-.021	.786

Model fit: Free parameters = 31; X^2 = 24.619, DF = 32, p = .821; RMSEA = .000; CFI = 1.000; R^2 = .035, p = .222

Table 30:

Maternal representations mediating the relationship between categorical IPV/depression and passive touch

	b	*SE of b*	*β*	*p*
Path: Predictor ⟶ Mediator				
Pregnancy IPV -> Maternal Reps	-.012	.094	-.011	.898
Postpartum IPV -> Maternal Reps	.018	.093	.015	.845
Pregnancy Depression -> Maternal Reps	-.305	.088	-.291	.001
Postpartum Depression -> Maternal Reps	.098	.096	.075	.307
Path: Mediator ⟶ Outcome				
Maternal Reps -> Passive Touch	6.277	3.753	.169	.094
Path: Predictor ⟶ Outcome (Direct)				
Pregnancy IPV -> Passive Touch	-1.709	3.822	-.041	.655
Postpartum IPV -> Passive Touch	.959	3.806	.021	.801
Pregnancy Depression -> Passive Touch	1.157	3.538	.030	.744
Postpartum Depression -> Passive Touch	-3.446	3.910	-.071	.378
Path: Predictor ⟶ Outcome (Indirect)				
Pregnancy IPV -> Passive Touch	-.075	.590	-.002	.899
Postpartum IPV -> Passive Touch	.115	.589	.003	.846
Pregnancy Depression -> Passive Touch	-1.914	1.239	-.049	.122
Postpartum Depression -> Passive Touch	.615	.699	.013	.379

Table 30 (cont'd)

Control Variables				
Demographic Risk -> Maternal Reps	-.192	.038	-.439	.000
Infant Sex -> Maternal Reps	.042	.073	.040	.567
Demographic Risk -> Passive Touch	1.535	1.489	.094	.303
Infant Sex -> Passive Touch	-.490	2.974	-.013	.869

Model fit: Free parameters = 31; X^2 = 25.361, DF = 32, p = .791; RMSEA = .000; CFI = 1.000; R^2 = .026, p = .309

Table 31:

Maternal representations mediating the relationship between continuous IPV/depression and negative touch

	b	*SE of b*	*β*	*p*
Path: Predictor ⟶ Mediator				
Pregnancy IPV -> Maternal Reps	-.001	.005	-.020	.788
Postpartum IPV -> Maternal Reps	.000	.004	-.003	.962
Pregnancy Depression -> Maternal Reps	-.026	.007	-.346	.000
Postpartum Depression -> Maternal Reps	.010	.007	.109	.159
Path: Mediator ⟶ Outcome				
Maternal Reps -> Negative Touch	.009	.084	.011	.911
Path: Predictor ⟶ Outcome (Direct)				
Pregnancy IPV -> Negative Touch	.003	.004	.056	.508
Postpartum IPV -> Negative Touch	-.002	.004	-.040	.600
Pregnancy Depression -> Negative Touch	-.009	.006	-.135	.151
Postpartum Depression -> Negative Touch	.006	.007	.072	.395
Path: Predictor ⟶ Outcome (Indirect)				
Pregnancy IPV -> Negative Touch	.000	.000	.000	.918
Postpartum IPV -> Negative Touch	.000	.000	.000	.965
Pregnancy Depression -> Negative Touch	.000	.002	-.004	.911
Postpartum Depression -> Negative Touch	.000	.001	.001	.911

Table 31 (cont'd)

Control Variables				
Demographic Risk -> Maternal Reps	-.193	.038	-.441	.000
Infant Sex -> Maternal Reps	.014	.072	.013	.845
Demographic Risk -> Passive Touch	.068	.033	.185	.039
Infant Sex -> Passive Touch	-.085	.067	-.096	.205

Model fit: Free parameters = 31; X^2 = 24.613, DF = 32, p = .821; RMSEA = .000; CFI = 1.000; R^2 = .054, p = .105

Table 32:

Maternal representations mediating the relationship between categorical IPV/depression and negative touch

	b	*SE of b*	*β*	*p*
Path: Predictor ⟶ Mediator				
Pregnancy IPV -> Maternal Reps	-.011	.093	-.010	.908
Postpartum IPV -> Maternal Reps	.019	.093	.016	.837
Pregnancy Depression -> Maternal Reps	-.305	.088	-.292	.001
Postpartum Depression -> Maternal Reps	.098	.096	.075	.305
Path: Mediator ⟶ Outcome				
Maternal Reps -> Negative Touch	.018	.082	.021	.830
Path: Predictor ⟶ Outcome (Direct)				
Pregnancy IPV -> Negative Touch	-.026	.085	-.028	.756
Postpartum IPV -> Negative Touch	.152	.084	.150	.071
Pregnancy Depression -> Negative Touch	-.099	.078	-.112	.206
Postpartum Depression -> Negative Touch	.014	.087	.013	.872
Path: Predictor ⟶ Outcome (Indirect)				
Pregnancy IPV -> Negative Touch	.000	.002	.000	.919
Postpartum IPV -> Negative Touch	.000	.002	.000	.882
Pregnancy Depression -> Negative Touch	-.005	.025	-.006	.830
Postpartum Depression -> Negative Touch	.002	.008	.002	.833

Table 32 (cont'd)

Control Variables				
Demographic Risk -> Maternal Reps	-.192	.038	-.439	.000
Infant Sex -> Maternal Reps	.042	.073	.041	.561
Demographic Risk -> Negative Touch	.073	.033	.198	.027
Infant Sex -> Negative Touch	-.060	.066	-.068	.362

Model fit: Free parameters = 31; X^2 = 25.384, DF = 32, p = .790; RMSEA = .000; CFI = 1.000; R^2 = .065, p = .072

Table 33:

Maternal representations mediating the relationship between continuous IPV/depression and no touch

	b	*SE of b*	*β*	*p*
Path: Predictor ⟶ Mediator				
Pregnancy IPV -> Maternal Reps	-.001	.005	-.020	.788
Postpartum IPV -> Maternal Reps	.000	.004	-.004	.958
Pregnancy Depression -> Maternal Reps	-.026	.007	-.346	.000
Postpartum Depression -> Maternal Reps	.010	.007	.109	.159
Path: Mediator ⟶ Outcome				
Maternal Reps -> No Touch	-6.639	4.341	-.154	.126
Path: Predictor ⟶ Outcome (Direct)				
Pregnancy IPV -> No Touch	-.359	.218	-.138	.099
Postpartum IPV -> No Touch	.270	.205	.101	.189
Pregnancy Depression -> No Touch	.239	.308	.073	.437
Postpartum Depression -> No Touch	.303	.346	.074	.380
Path: Predictor ⟶ Outcome (Indirect)				
Pregnancy IPV -> No Touch	.008	.031	.003	.791
Postpartum IPV -> No Touch	.002	.029	.001	.958
Pregnancy Depression -> No Touch	.174	.119	.053	.146
Postpartum Depression -> No Touch	-.068	.065	-.017	.295

Table 33 (cont'd)

Control Variables				
Demographic Risk -> Maternal Reps	-.194	.038	-.441	.000
Infant Sex -> Maternal Reps	.014	.072	.013	.849
Demographic Risk -> No Touch	-1.204	1.699	-.064	.478
Infant Sex -> No Touch	-1.694	3.433	-.037	.622

Model fit: Free parameters = 31; X^2 = 26.588, DF = 32, p = .737; RMSEA = .000; CFI = 1.000; R^2 = .056, p = .108

Table 34:

Maternal representations mediating the relationship between categorical IPV/depression and no touch

	b	*SE of b*	*β*	*p*
Path: Predictor ⟶ Mediator				
Pregnancy IPV -> Maternal Reps	-.012	.094	-.011	.899
Postpartum IPV -> Maternal Reps	.018	.093	.015	.845
Pregnancy Depression -> Maternal Reps	-.306	.088	-.292	.000
Postpartum Depression -> Maternal Reps	.099	.096	.076	.302
Path: Mediator ⟶ Outcome				
Maternal Reps -> No Touch	-7.463	4.329	-.173	.085
Path: Predictor ⟶ Outcome (Direct)				
Pregnancy IPV -> No Touch	-2.430	4.429	-.050	.583
Postpartum IPV -> No Touch	-.809	4.410	-.016	.854
Pregnancy Depression -> No Touch	.478	4.100	.011	.907
Postpartum Depression -> No Touch	4.036	4.531	.072	.373
Path: Predictor ⟶ Outcome (Indirect)				
Pregnancy IPV -> No Touch	.089	.701	.002	.899
Postpartum IPV -> No Touch	-.136	.700	-.003	.846
Pregnancy Depression -> No Touch	2.284	1.445	.050	.114
Postpartum Depression -> No Touch	-.739	.829	-.013	.373

Table 34 (cont'd)

Control Variables				
Demographic Risk -> Maternal Reps	-.192	.038	-.438	.000
Infant Sex -> Maternal Reps	.042	.073	.040	.567
Demographic Risk -> No Touch	-1.516	1.723	-.080	.379
Infant Sex -> No Touch	-2.286	3.446	-.051	.507

Model fit: Free parameters = 31; X^2 = 27.500, DF = 32, p = .694; RMSEA = .000; CFI = 1.000; R^2 = .033, p = .246

Table 35a:

Multilevel regression coefficients estimating the effects of role, infant sex, and continuous pregnancy IPV and depression on instrumental touch

	Estimate	**Standard Error**	***df***	***t***	***p***
Intercept	7.141	.516	167	13.83	.000
Role	4.824	.447	168	10.79	.000
IPV	.170	.067	173	2.53	.012
Depression	-.097	.080	168	-1.21	.227
Infant Sex	.133	.516	167	.26	.798
Role x IPV	.226	.057	168	3.95	.000
Role x Depression	-.162	.069	168	-2.34	.021
Role x Infant Sex	-.001	.447	168	.00	.999
IPV x Infant Sex	.148	.066	168	2.24	.026
Depression x Infant Sex	.141	.080	169	1.76	.080
Role x IPV x Infant Sex	.194	.057	168	3.39	.001
Role x Depression x Infant Sex	.086	.069	168	1.24	.216
Demographic Risk	-.040	.275	167	-.15	.884

Table 35b:

Estimating separate effects for mothers and infants testing the effects of infant sex and continuous pregnancy IPV and depression on instrumental touch

	Role: Mother			Role: Baby		
	Estimate (SE)	***t(df)***	***p***	**Estimate (SE)**	***t(df)***	***p***
Role	11.965 (.914)	13.09 (167)	.000	2.317 (.313)	7.41 (167)	.000
Role x IPV	.396 (.118)	3.37 (170)	.001	-.057 (.042)	-1.37 (167)	.173
Role x Dep	-.259 (.142)	-1.83 (168)	.069	.065 (.049)	1.33 (167)	.186
Role x Infant Sex	.132 (.914)	.14 (168)	.886	.133 (.313)	.43 (167)	.670
Role x IPV x Infant Sex	.343 (.117)	2.93 (168)	.004	-.046 (.040)	-1.15 (167)	.251
Role x Dep x Infant Sex	.227 (.142)	1.60 (168)	.111	.056 (.049)	1.13 (167)	.259

Table 35c:

Estimating separate effect estimates for mothers with male versus female infants for continuous pregnancy IPV and depression on instrumental touch

	Role: Mother						**Role: Baby**					
	Sex: Boy			**Sex: Girl**			**Sex: Boy**			**Sex: Girl**		
	Est (SE)	***t(df)***	***p***	**Est (SE)**	***t(df)***	***p***	**Est (SE)**	***t(df)***	***p***	**Est (SE)**	***t(df)***	***p***
Sex	12.097 (1.284)	9.42 (168)	.000	11.834 (1.302)	9.09 (168)	.000	2.450 (.439)	5.58 (167)	.000	2.183 (.445)	4.90 (167)	.000
IPV x Role x Sex	.739 (.192)	3.84 (168)	.000	.053 (.135)	.40 (170)	.693	-.103 (.066)	-1.55 (167)	.123	-.011 (.048)	-.22 (167)	.824
Dep x Role x Sex	-.032 (.222)	-.14 (168)	.887	-.487 (.176)	-2.76 (168)	.006	.120 (.077)	1.56 (167)	.120	.009 (.060)	.15 (167)	.880

Table 36a:

Multilevel regression coefficients estimating the effects of role, infant sex, and continuous postpartum IPV and depression on instrumental touch

	Estimate	**Standard Error**	***df***	***t***	***p***
Intercept	6.847	.535	167	12.80	.000
Role	4.573	.476	168	9.61	.000
IPV	-.023	.082	168	-.28	.782
Depression	.010	.095	168	.10	.917
Infant Sex	-.022	.535	167	-.04	.967
Role x IPV	-.033	.073	168	-.46	.650
Role x Depression	-.112	.085	168	-1.32	.190
Role x Infant Sex	-.204	.476	168	-.43	.669
IPV x Infant Sex	-.010	.082	168	-.13	.899
Depression x Infant Sex	.240	.096	168	2.51	.013
Role x IPV x Infant Sex	.029	.073	168	.39	.696
Role x Depression x Infant Sex	.187	.085	168	2.20	.029
Demographic Risk	-.098	.257	167	-.38	.704

Table 36b:

Estimating separate effects for mothers and infants testing the effects of infant sex and continuous postpartum IPV and depression on instrumental touch

	Role: Mother			Role: Baby		
	Estimate (SE)	***t(df)***	***p***	**Estimate (SE)**	***t(df)***	***p***
Role	11.420 (.964)	11.85 (167)	.000	2.274 (.312)	7.29 (167)	.000
Role x IPV	-.056 (.148)	-.38 (168)	.705	.010 (.048)	.22 (167)	.829
Role x Dep	-.102 (.172)	-.59 (168)	.554	.122 (.056)	2.18 (167)	.031
Role x Infant Sex	-.226 (.964)	-.23 (167)	.815	.181 (.312)	.58 (167)	.562
Role x IPV x Infant Sex	.018 (.148)	.12 (168)	.902	-.039 (.048)	-.81 (167)	.417
Role x Dep x Infant Sex	.426 (.172)	2.48 (168)	.014	.053 (.056)	.95 (167)	.345

Table 36c:

Estimating separate effect estimates for mothers with male versus female infants for continuous postpartum IPV and depression on instrumental touch

	Role: Mother						**Role: Baby**					
	Sex: Boy			**Sex: Girl**			**Sex: Boy**			**Sex: Girl**		
	Est (SE)	***t(df)***	***p***	**Est (SE)**	***t(df)***	***p***	**Est (SE)**	***t(df)***	***p***	**Est (SE)**	***t(df)***	***p***
Sex	11.195 (1.368)	8.18 (167)	.000	11.656 (1.357)	8.58 (167)	.000	2.455 (.443)	5.54 (167)	.000	2.092 (.439)	4.76 (167)	.000
IPV x Role x Sex	-.038 (.268)	-.14 (168)	.888	-.074 (.126)	-.59 (168)	.556	-.029 (.087)	-.33 (167)	.743	.049 (.041)	1.22 (167)	.226
Dep x Role x Sex	.324 (.246)	1.32 (168)	.190	-.528 (.239)	-2.21 (167)	.029	.175 (.080)	2.17 (167)	.031	.069 (.078)	.88 (167)	.378

Table 37a:

Multilevel regression coefficients estimating the effects of role, infant sex, and categorical pregnancy IPV and depression on instrumental touch

	F	***df***	***p***
Intercept	146.713	192	.000
Role	107.408	168	.000
IPV	6.804	175	.010
Depression	2.531	170	.113
Infant Sex	.069	168	.793
Role x IPV	8.138	168	.005
Role x Depression	6.442	168	.012
Role x Infant Sex	.019	168	.891
IPV x Infant Sex	.626	168	.430
Depression x Infant Sex	11.156	170	.001
Role x IPV x Infant Sex	.070	168	.792
Role x Depression x Infant Sex	6.722	168	.010
Demographic Risk	.822	164	.513

Table 37b:

Estimated marginal means for the effects of role, infant sex, and categorical pregnancy IPV and depression on instrumental touch

		Mean	Standard Error	*df*	*95% CI*
Role	Baby	1.980	.389	165	[1.211, 2.749]
	Mother	12.174	1.007	180	[10.186, 14.161]
IPV	No	5.508	.685	195	[4.158, 6.858]
	Yes	8.646	.968	178	[6.735, 10.556]
Role x IPV	Infant - No	1.918	.461	165	[1.008, 2.828]
	Infant - Yes	2.042	.613	165	[.831, 3.253]
	Mother - No	9.098	1.174	181	[6.782, 11.413]
	Mother - Yes	15.249	1.712	172	[11.871, 18.628]
Role x Depression	Infant - No	1.613	.540	165	[.548, 2.679]
	Infant - Yes	2.347	.490	165	[1.380, 3.313]
	Mother - No	14.286	1.479	174	[11.367, 17.205]
	Mother - Yes	10.061	1.332	175	[7.432, 12.689]
Depression x Infant Sex	Infant - No	9.637	1.149	175	[7.369, 11.904]
	Infant - Yes	4.228	1.031	178	[2.193, 6.262]
	Mother - No	6.263	1.199	176	[3.897, 8.629]
	Mother - Yes	8.180	1.079	173	[6.050, 10.310]

Table 37b (cont'd)

Role x Depression x Infant Sex	Infant - Female - No	2.101	.722	164	[.676, 3.527]
	Infant - Female - Yes	1.704	.655	165	[.412, 2.997]
	Infant - Male - No	1.125	.754	164	[-.364, 2.615]
	Infant - Male - Yes	2.989	.671	164	[1.664, 4.314]
	Mother - Female - No	17.172	2.038	171	[13.148, 21.196]
	Mother - Female - Yes	6.751	1.820	173	[3.158, 10.344]
	Mother - Male - No	11.400	2.126	171	[7.205, 15.596]
	Mother - Male - Yes	13.371	1.924	170	[9.573, 17.168]

Table 38a:

Multilevel regression coefficients estimating the effects of role, infant sex, and categorical postpartum IPV and depression on instrumental touch

	F	***df***	***p***
Intercept	81.552	191	.000
Role	51.250	168	.000
IPV	1.112	172	.293
Depression	.005	171	.944
Infant Sex	1.376	167	.242
Role x IPV	.872	168	.352
Role x Depression	.360	168	.549
Role x Infant Sex	1.081	168	.300
IPV x Infant Sex	.289	169	.591
Depression x Infant Sex	4.181	168	.042
Role x IPV x Infant Sex	.257	168	.613
Role x Depression x Infant Sex	2.954	168	.088
Demographic Risk	.742	164	.565

Table 38b:

Estimated marginal means for the effects of role, infant sex, and categorical postpartum IPV and depression on instrumental touch

		Mean	**Standard Error**	***df***	***95% CI***
Role	Baby	2.247	.489	165	[1.282, 3.213]
	Mother	11.512	1.326	178	[8.895, 14.129]
Infant Sex x Depression	Female - No	7.334	.936	181	[5.488, 9.181]
	Female - Yes	4.734	1.611	173	[1.555, 7.913]
	Male - No	6.331	1.055	177	[4.250, 8.413]
	Male - Yes	9.120	1.821	174	[5.526, 12.714]

Table 39a:

Multilevel regression coefficients estimating the effects of role, infant sex, and continuous pregnancy IPV and depression on passive touch

	Estimate	**Standard Error**	***df***	***t***	***p***
Intercept	11.140	1.117	167	9.98	.000
Role	1.604	.644	168	2.49	.014
IPV	.130	.147	170	.88	.378
Depression	-.144	.174	167	-.83	.407
Infant Sex	.083	1.117	167	.08	.941
Role x IPV	-.028	.083	168	-.34	.733
Role x Depression	-.163	.100	168	-1.64	.103
Role x Infant Sex	-.244	.644	168	-.40	.705
IPV x Infant Sex	.223	.143	167	1.56	.122
Depression x Infant Sex	.064	.175	168	.37	.714
Role x IPV x Infant Sex	.012	.083	168	.14	.889
Role x Depression x Infant Sex	-.120	.100	168	-1.20	.231
Demographic Risk	-.264	.888	167	-.30	.767

Table 40a:

Multilevel regression coefficients estimating the effects of role, infant sex, and continuous postpartum IPV and depression on passive touch

	Estimate	**Standard Error**	***df***	***t***	***p***
Intercept	10.741	1.127	167	9.53	.000
Role	1.590	.655	168	2.43	.016
IPV	-.162	.174	167	-.93	.354
Depression	-.289	.201	167	-1.44	.152
Infant Sex	-.214	1.127	167	-.19	.849
Role x IPV	-.028	.100	168	-.28	.781
Role x Depression	-.111	.117	168	-.95	.342
Role x Infant Sex	-.114	.655	168	-.17	.862
IPV x Infant Sex	-.053	.173	167	-.30	.761
Depression x Infant Sex	.101	.202	168	.50	.619
Role x IPV x Infant Sex	-.075	.100	168	-.75	.457
Role x Depression x Infant Sex	.036	.117	168	.31	.756
Demographic Risk	.081	.845	167	.10	.924

Table 41a:

Multilevel regression coefficients estimating the effects of role, infant sex, and categorical pregnancy IPV and depression on passive touch

	F	***df***	***p***
Intercept	51.053	176	.000
Role	4.187	168	.042
IPV	.214	169	.644
Depression	.001	166	.978
Infant Sex	.000	165	.991
Role x IPV	.180	168	.672
Role x Depression	.908	168	.342
Role x Infant Sex	.605	168	.438
IPV x Infant Sex	.273	165	.602
Depression x Infant Sex	.531	166	.467
Role x IPV x Infant Sex	2.167	168	.143
Role x Depression x Infant Sex	.000	168	.982
Demographic Risk	.397	164	.811

Table 42a:

Multilevel regression coefficients estimating the effects of role, infant sex, and categorical postpartum IPV and depression on passive touch

	F	***df***	***p***
Intercept	26.303	176	.000
Role	1.896	168	.170
IPV	.532	167	.467
Depression	.339	167	.561
Infant Sex	.010	165	.919
Role x IPV	.302	168	.584
Role x Depression	1.936	168	.166
Role x Infant Sex	.053	168	.819
IPV x Infant Sex	.939	165	.334
Depression x Infant Sex	.100	165	.752
Role x IPV x Infant Sex	.355	168	.552
Role x Depression x Infant Sex	.963	168	.328
Demographic Risk	.681	164	.606

Table 43a:

Multilevel regression coefficients estimating the effects of role, infant sex, and continuous pregnancy IPV and depression on positive/neutral touch response

	Estimate	**Standard Error**	***df***	***t***	***p***
Intercept	19.860	1.648	167	12.05	.000
Role	-7.230	.848	168	-8.52	.000
IPV	.456	.217	172	2.11	.037
Depression	-.400	.256	168	-1.55	.124
Infant Sex	-.105	1.649	167	-.06	.949
Role x IPV	-.262	.109	168	-2.41	.017
Role x Depression	.397	.131	168	3.02	.003
Role x Infant Sex	-.060	.848	168	-.07	.944
IPV x Infant Sex	.560	.211	167	2.65	.009
Depression x Infant Sex	.173	.258	169	.67	.502
Role x IPV x Infant Sex	-.297	.109	168	-2.73	.007
Role x Depression x Infant Sex	.047	.131	168	.36	.723
Demographic Risk	-.540	1.201	167	-.45	.654

Table 43b:

Estimating separate effects for mothers and infants testing the effects of infant sex and continuous pregnancy IPV and depression on positive/neutral touch response

	Role: Mother			Role: Baby		
	Estimate (SE)	***t(df)***	***p***	**Estimate (SE)**	***t(df)***	***p***
Role	12.630 (1.361)	9.28 (167)	.000	27.090 (2.241)	12.09 (167)	.000
Role x IPV	.194 (.181)	1.07 (167)	.285	.719 (.291)	2.469 (173)	.015
Role x Dep	.001 (.212)	.01 (167)	.996	-.793 (.348)	-2.28 (168)	.024
Role x Infant Sex	-.165 (1.362)	-.12 (167)	.904	-.045 (2.241)	-.02 (167)	.984
Role x IPV x Infant Sex	.263 (.175)	1.50 (167)	.135	.857 (.287)	2.98 (167)	.003
Role x Dep x Infant Sex	.220 (.214)	1.03 (167)	.304	.126 (.349)	.36 (169)	.717

Table 43c:

Estimating separate effect estimates for mothers with male versus female infants for continuous pregnancy IPV and depression on positive/neutral touch response

	Role: Mother						**Role: Baby**					
	Sex: Boy			**Sex: Girl**			**Sex: Boy**			**Sex: Girl**		
	Est (SE)	***t(df)***	***p***	**Est (SE)**	***t(df)***	***p***	**Est (SE)**	***t(df)***	***p***	**Est (SE)**	***t(df)***	***p***
Sex	12.465 (1.913)	6.52 (167)	.000	12.794 (1.938)	6.60 (167)	.000	27.045 (3.148)	8.59 (167)	.000	27.135 (3.190)	8.51 (167)	.000
IPV x Role x Sex	.456 (.289)	1.58 (167)	.116	-.069 (.208)	-.33 (167)	.741	1.576 (.473)	3.33 (169)	.001	-.138 (.333)	-.41 (173)	.680
Dep x Role x Sex	.221 (.334)	.66 (167)	.510	-.219 (.263)	-.83 (167)	.406	-.667 (.546)	-1.22 (169)	.224	-.920 (.432)	-2.13 (167)	.035

Table 44a:

Multilevel regression coefficients estimating the effects of role, infant sex, and continuous postpartum IPV and depression on positive/neutral touch response

	Estimate	**Standard Error**	***df***	***t***	***p***
Intercept	18.862	1.704	167	11.07	.000
Role	-6.831	.884	168	-7.73	.000
IPV	-.262	.262	168	-1.00	.320
Depression	-.417	.304	167	-1.37	.172
Infant Sex	-.739	1.704	167	-.43	.665
Role x IPV	.110	.136	168	.82	.416
Role x Depression	.270	.157	168	1.72	.088
Role x Infant Sex	.105	.884	168	.12	.905
IPV x Infant Sex	-.119	.262	167	-.45	.650
Depression x Infant Sex	.239	.305	168	.78	.434
Role x IPV x Infant Sex	.066	.136	168	.49	.628
Role x Depression x Infant Sex	-.195	.157	168	-1.24	.218
Demographic Risk	-.095	1.148	167	-.08	.934

Table 45a:

Multilevel regression coefficients estimating the effects of role, infant sex, and categorical pregnancy IPV and depression on positive/neutral touch response

	F	***df***	***p***
Intercept	78.010	185	.000
Role	55.901	168	.000
IPV	.202	173	.654
Depression	.521	168	.471
Infant Sex	.009	166	.923
Role x IPV	.271	168	.603
Role x Depression	3.383	168	.068
Role x Infant Sex	.003	168	.960
IPV x Infant Sex	.432	166	.512
Depression x Infant Sex	2.899	168	.090
Role x IPV x Infant Sex	.120	168	.729
Role x Depression x Infant Sex	1.317	168	.253
Demographic Risk	.834	164	.505

Table 46a:

Multilevel regression coefficients estimating the effects of role, infant sex, and categorical postpartum IPV and depression on positive/neutral touch response

	F	***df***	***p***
Intercept	37.970	185	.000
Role	24.542	168	.000
IPV	.052	170	.820
Depression	1.002	169	.318
Infant Sex	.024	166	.876
Role x IPV	.053	168	.819
Role x Depression	2.095	168	.150
Role x Infant Sex	.540	168	.463
IPV x Infant Sex	1.062	167	.304
Depression x Infant Sex	.200	166	.655
Role x IPV x Infant Sex	.001	168	.972
Role x Depression x Infant Sex	1.926	168	.167
Demographic Risk	1.129	164	.345

Table 47a:

Multilevel regression coefficients estimating the effects of role, infant sex, and continuous pregnancy IPV and depression on negative touch response

	Estimate	Standard Error	*df*	*t*	*p*
Intercept	.473	.105	168	4.50	.000
Role	-.425	.104	168	-4.07	.000
IPV	.004	.013	168	.31	.760
Depression	.012	.016	168	.72	.472
Infant Sex	.043	.105	168	.41	.682
Role x IPV	-.006	.013	168	-.44	.659
Role x Depression	-.011	.016	168	-.69	.495
Role x Infant Sex	-.068	.104	168	-.66	.512
IPV x Infant Sex	-.002	.013	168	-.16	.872
Depression x Infant Sex	.028	.016	168	1.73	.086
Role x IPV x Infant Sex	.003	.013	168	.23	.820
Role x Depression x Infant Sex	-.027	.016	168	-1.69	.094
Demographic Risk	.018	.018	167	1.03	.304

Table 48a:

Multilevel regression coefficients estimating the effects of role, infant sex, and continuous postpartum IPV and depression on negative touch response

	Estimate	**Standard Error**	***df***	***t***	***p***
Intercept	.477	.106	168	4.52	.000
Role	-.430	.104	168	-4.12	.000
IPV	.016	.016	168	.98	.328
Depression	.016	.019	168	.85	.395
Infant Sex	.053	.106	168	.50	.619
Role x IPV	-.018	.016	168	-1.13	.259
Role x Depression	-.019	.019	168	-1.04	.300
Role x Infant Sex	-.080	.104	168	-.77	.444
IPV x Infant Sex	.014	.016	168	.89	.373
Depression x Infant Sex	.035	.019	168	1.87	.063
Role x IPV x Infant Sex	-.014	.016	168	-.89	.376
Role x Depression x Infant Sex	-.036	.019	168	-1.94	.054
Demographic Risk	.017	.017	167	1.04	.300

Table 49a:

Multilevel regression coefficients estimating the effects of role, infant sex, and categorical pregnancy IPV and depression on negative touch response

	F	***df***	***p***
Intercept	24.849	172	.000
Role	21.243	168	.000
IPV	5.290	169	.023
Depression	.109	168	.742
Infant Sex	.044	168	.834
Role x IPV	5.453	168	.021
Role x Depression	.098	168	.755
Role x Infant Sex	.115	168	.735
IPV x Infant Sex	1.358	168	.245
Depression x Infant Sex	7.880	168	.006
Role x IPV x Infant Sex	2.104	168	.149
Role x Depression x Infant Sex	7.131	168	.008
Demographic Risk	.654	164	.625

Table 49b:

Estimated marginal means for the effects of role, infant sex, and categorical pregnancy IPV and depression on negative touch response

		Mean	Standard Error	*df*	*95% CI*
Role	Baby	1.049	.217	169	[.620, 1.478]
	Mother	.050	.025	164	[.000, .100]
IPV	No	.278	.128	173	[.025, .531]
	Yes	.820	.189	169	[.448, 1.193]
Role x IPV	Baby - No	.506	.252	169	[.008, 1.004]
	Baby - Yes	1.592	.373	168	[.855, 2.328]
	Mother - No	.051	.030	164	[-.008, .110]
	Mother - Yes	.049	.040	164	[-.029, .127]
Infant Sex x Depression	Female - No	.868	.225	169	[.423, 1.312]
	Female - Yes	.185	.201	169	[-.211, .581]
	Male - No	.303	.235	169	[-.160, .766]
	Male - Yes	.842	.213	168	[.422, 1.262]
Role x Depression x Infant Sex	Infant - Female - No	1.651	.445	168	[.773, 2.530]
	Infant - Female - Yes	.327	.396	168	[-.456, 1.110]
	Infant - Male - No	.585	.464	168	[-.330, 1.501]
	Infant - Male - Yes	1.632	.421	168	[.801, 2.462]

Table 49b (cont'd)

	Mother - Female - No	.084	.047	164	[-.008, .176]
	Mother - Female - Yes	.044	.042	164	[-.004, .127]
	Mother - Male - No	.021	.049	164	[-.076, .117]
	Mother - Male - Yes	.052	.043	164	[-.034, .137]

Table 50a:

Multilevel regression coefficients estimating the effects of role, infant sex, and categorical postpartum IPV and depression on negative touch response

	F	***df***	***p***
Intercept	22.378	172	.000
Role	21.913	168	.000
IPV	7.837	168	.006
Depression	.126	168	.723
Infant Sex	3.181	167	.076
Role x IPV	10.069	168	.002
Role x Depression	.204	168	.652
Role x Infant Sex	3.951	168	.048
IPV x Infant Sex	.495	168	.483
Depression x Infant Sex	2.764	168	.098
Role x IPV x Infant Sex	.304	168	.582
Role x Depression x Infant Sex	3.057	168	.082
Demographic Risk	.785	164	.537

Table 50b:

Estimated marginal means for the effects of role, infant sex, and categorical postpartum IPV and depression on negative touch response

		Mean	Standard Error	*df*	*95% CI*
Role	Baby	1.306	.276	169	[.761, 1.850]
	Mother	.022	.032	164	[-.041, .084]
IPV	No	.326	.144	170	[.041, .611]
	Yes	1.002	.218	170	[.571, 1.433]
Role x IPV	Baby – No	.591	.284	168	[.030, 1.152]
	Baby – Yes	2.020	.430	168	[1.172, 2.869]
	Mother – No	.060	.031	164	[-.001, .122]
	Mother – Yes	-.017	.047	164	[-.109, .076]
Role x Infant Sex	Baby – Female	.784	.354	168	[.086, 1.483]
	Baby – Male	1.827	.422	168	[.993, 2.660]
	Mother – Female	.046	.038	164	[-.030, .122]
	Mother – Male	-.002	.045	164	[-.091, .086]

Table 51a:

Multilevel regression coefficients estimating the effects of role, infant sex, and continuous pregnancy IPV and depression on no touch response

	Estimate	Standard Error	*df*	*t*	*p*
Intercept	3.079	.171	165	17.99	.000
Role	-1.047	.157	168	-6.65	.000
IPV	.001	.022	171	.05	.959
Depression	.044	.027	166	1.68	.095
Infant Sex	.317	.171	165	1.85	.066
Role x IPV	-.023	.020	168	-1.12	.263
Role x Depression	.008	.024	168	.33	.742
Role x Infant Sex	.091	.157	168	.58	.562
IPV x Infant Sex	.012	.022	166	.56	.577
Depression x Infant Sex	.031	.027	167	1.14	.255
Role x IPV x Infant Sex	-.015	.020	168	-.74	.462
Role x Depression x Infant Sex	.038	.024	168	1.55	.124
Demographic Risk	.148	.123	167	1.21	.229

Table 52a:

Multilevel regression coefficients estimating the effects of role, infant sex, and continuous postpartum IPV and depression on no touch response

	Estimate	**Standard Error**	***df***	***t***	***p***
Intercept	3.110	.172	166	18.10	.000
Role	-1.067	.160	168	-6.68	.000
IPV	.024	.026	167	.89	.375
Depression	.024	.031	166	.77	.442
Infant Sex	.311	.172	166	1.81	.072
Role x IPV	.009	.025	168	.35	.726
Role x Depression	.015	.028	168	.54	.588
Role x Infant Sex	.129	.160	168	.81	.421
IPV x Infant Sex	.045	.026	166	1.72	.087
Depression x Infant Sex	.047	.031	167	1.52	.130
Role x IPV x Infant Sex	-.005	.025	168	-.20	.840
Role x Depression x Infant Sex	.023	.028	168	.80	.427
Demographic Risk	.129	.116	167	1.11	.267

Table 53a:

Multilevel regression coefficients estimating the effects of role, infant sex, and categorical pregnancy IPV and depression on no touch response

	F	***df***	***p***
Intercept	224.750	183	.000
Role	43.215	168	.000
IPV	.265	171	.607
Depression	.993	166	.321
Infant Sex	4.020	164	.047
Role x IPV	1.520	168	.219
Role x Depression	1.081	168	.300
Role x Infant Sex	.852	168	.357
IPV x Infant Sex	.014	164	.906
Depression x Infant Sex	.935	165	.335
Role x IPV x Infant Sex	.737	168	.392
Role x Depression x Infant Sex	.113	168	.738
Demographic Risk	1.715	164	.149

Table 54a:

Multilevel regression coefficients estimating the effects of role, infant sex, and categorical postpartum IPV and depression on no touch response

	F	***df***	***p***
Intercept	163.631	183	.000
Role	26.247	168	.000
IPV	.109	169	.741
Depression	2.337	168	.128
Infant Sex	8.240	164	.005
Role x IPV	1.676	168	.197
Role x Depression	.587	168	.445
Role x Infant Sex	.444	168	.506
IPV x Infant Sex	.950	165	.331
Depression x Infant Sex	3.271	165	.072
Role x IPV x Infant Sex	.123	168	.726
Role x Depression x Infant Sex	.597	168	.441
Demographic Risk	2.357	164	.056

Table 55:

Pregnancy maternal representations mediating the relationship between continuous IPV/depression and affectionate touch

	b	*SE of b*	*β*	*p*
Path: Predictor ⟶ Mediator				
Pregnancy IPV -> Maternal Reps	-.007	.007	-.075	.310
Pregnancy Depression -> Maternal Reps	-.028	.008	-.249	.001
Path: Mediator ⟶ Outcome				
Maternal Reps -> Affectionate Touch	1.456	1.153	.124	.207
Path: Predictor ⟶ Outcome (Direct)				
Pregnancy IPV -> Affectionate Touch	.156	.088	.147	.077
Pregnancy Depression -> Affectionate Touch	-.114	.111	-.085	.304
Path: Predictor ⟶ Outcome (Indirect)				
Pregnancy IPV -> Affectionate Touch	-.010	.012	-.009	.427
Pregnancy Depression -> Affectionate Touch	-.041	.034	-.031	.233
Control Variables				
Demographic Risk -> Maternal Reps	-.299	.049	-.453	.000
Infant Sex -> Maternal Reps	.039	.105	.025	.709
Demographic Risk -> Affectionate Touch	.264	.700	.034	.707
Infant Sex -> Affectionate Touch	.451	1.398	.024	.747

Model fit: Free parameters = 27; $X^2 = 49.279$, DF = 24, $p = .002$; RMSEA = .078; CFI = .964; $R^2 = .032$, $p = .231$

Table 56:

Pregnancy maternal representations mediating the relationship between continuous IPV/depression and instrumental touch

	b	*SE of b*	*β*	*p*
Path: Predictor ⟶ Mediator				
Pregnancy IPV -> Maternal Reps	-.007	.007	-.075	.311
Pregnancy Depression -> Maternal Reps	-.028	.008	-.248	.001
Path: Mediator ⟶ Outcome				
Maternal Reps -> Instrumental Touch	1.174	1.541	.074	.446
Path: Predictor ⟶ Outcome (Direct)				
Pregnancy IPV -> Instrumental Touch	.270	.118	.189	.022
Pregnancy Depression -> Instrumental Touch	-.276	.148	-.154	.062
Path: Predictor ⟶ Outcome (Indirect)				
Pregnancy IPV -> Instrumental Touch	-.008	.013	-.006	.541
Pregnancy Depression -> Instrumental Touch	-.033	.044	-.018	.455
Control Variables				
Demographic Risk -> Maternal Reps	-.299	.049	-.453	.000
Infant Sex -> Maternal Reps	.039	.105	.025	.709
Demographic Risk -> Instrumental Touch	.442	.939	.042	.638
Infant Sex -> Instrumental Touch	-.174	1.873	-.007	.926

Model fit: Free parameters = 27; $X^2 = 47.772$, DF = 24, $p = .003$; RMSEA = .075; CFI = .967; $R^2 = .047$, $p = .136$

Table 57:

Pregnancy maternal representations mediating the relationship between continuous IPV/depression and passive touch

	b	*SE of b*	*β*	*p*
Path: Predictor ⟶ Mediator				
Pregnancy IPV -> Maternal Reps	-.007	.007	-.075	.309
Pregnancy Depression -> Maternal Reps	-.028	.008	-.247	.001
Path: Mediator ⟶ Outcome				
Maternal Reps -> Passive Touch	2.899	2.488	.117	.244
Path: Predictor ⟶ Outcome (Direct)				
Pregnancy IPV -> Passive Touch	.017	.187	.007	.930
Pregnancy Depression -> Passive Touch	-.219	.235	-.078	.352
Path: Predictor ⟶ Outcome (Indirect)				
Pregnancy IPV -> Passive Touch	-.020	.026	-.009	.442
Pregnancy Depression -> Passive Touch	-.082	.073	-.029	.265
Control Variables				
Demographic Risk -> Maternal Reps	-.298	.049	-.452	.000
Infant Sex -> Maternal Reps	.037	.105	.023	.728
Demographic Risk -> Passive Touch	1.168	1.493	.072	.434
Infant Sex -> Passive Touch	-.640	2.970	-.016	.829

Model fit: Free parameters = 27; $X^2 = 53.353$, DF = 24, $p = .001$; RMSEA = .084; CFI = .959; $R^2 = .020$, $p = .359$

Table 58:

Pregnancy maternal representations mediating the relationship between continuous IPV/depression and negative touch

	b	*SE of b*	*β*	*p*
Path: Predictor ⟶ Mediator				
Pregnancy IPV -> Maternal Reps	-.007	.007	-.075	.307
Pregnancy Depression -> Maternal Reps	-.028	.008	-.249	.001
Path: Mediator ⟶ Outcome				
Maternal Reps -> Negative Touch	-.008	.057	-.015	.888
Path: Predictor ⟶ Outcome (Direct)				
Pregnancy IPV -> Negative Touch	.002	.004	.046	.574
Pregnancy Depression -> Negative Touch	-.007	.005	-.108	.193
Path: Predictor ⟶ Outcome (Indirect)				
Pregnancy IPV -> Negative Touch	.000	.000	.001	.889
Pregnancy Depression -> Negative Touch	.000	.002	.004	.888
Control Variables				
Demographic Risk -> Maternal Reps	-.299	.049	-.452	.000
Infant Sex -> Maternal Reps	.040	.106	.023	.705
Demographic Risk -> Negative Touch	.064	.034	.173	.057
Infant Sex -> Negative Touch	-.077	.066	-.087	.246

Model fit: Free parameters = 27; X^2 = 47.488, DF = 24, p = .003; RMSEA = .075; CFI = .967; R^2 = .049, p = .126

Table 59:

Pregnancy maternal representations mediating the relationship between continuous IPV/depression and no touch

	b	*SE of b*	*β*	*p*
Path: Predictor ⟶ Mediator				
Pregnancy IPV -> Maternal Reps	-.007	.007	-.075	.311
Pregnancy Depression -> Maternal Reps	-.028	.008	-.248	.001
Path: Mediator ⟶ Outcome				
Maternal Reps -> No Touch	-2.240	2.857	-.078	.433
Path: Predictor ⟶ Outcome (Direct)				
Pregnancy IPV -> No Touch	-.304	.216	-.117	.160
Pregnancy Depression -> No Touch	.428	.272	.131	.115
Path: Predictor ⟶ Outcome (Indirect)				
Pregnancy IPV -> No Touch	.015	.024	.006	.533
Pregnancy Depression -> No Touch	.063	.082	.019	.441
Control Variables				
Demographic Risk -> Maternal Reps	-.299	.049	-.453	.000
Infant Sex -> Maternal Reps	.038	.105	.024	.717
Demographic Risk -> No Touch	-.585	1.724	-.031	.734
Infant Sex -> No Touch	-2.274	3.432	-.050	.508

Model fit: Free parameters = 27; $X^2 = 49.897$, DF = 24, $p = .002$; RMSEA = .079; CFI = .964; $R^2 = .031$, $p = .235$

Table 60:

Pregnancy maternal representations mediating the relationship between categorical IPV/depression and affectionate touch

	b	*SE of b*	*β*	*p*
Path: Predictor ⟶ Mediator				
Pregnancy IPV -> Maternal Reps	.002	.088	.001	.985
Pregnancy Depression -> Maternal Reps	-.277	.083	-.264	.001
Path: Mediator ⟶ Outcome				
Maternal Reps -> Affectionate Touch	3.722	1.767	.212	.035
Path: Predictor ⟶ Outcome (Direct)				
Pregnancy IPV -> Affectionate Touch	.346	1.680	.018	.837
Pregnancy Depression -> Affectionate Touch	.673	1.571	.036	.668
Path: Predictor ⟶ Outcome (Indirect)				
Pregnancy IPV -> Affectionate Touch	.006	.327	.000	.985
Pregnancy Depression -> Affectionate Touch	-1.033	.561	-.056	.065
Control Variables				
Demographic Risk -> Maternal Reps	-.194	.039	-.441	.000
Infant Sex -> Maternal Reps	.040	.073	.038	.585
Demographic Risk -> Affectionate Touch	.732	.703	.095	.298
Infant Sex -> Affectionate Touch	.290	1.395	.016	.835

Model fit: Free parameters = 27; X^2 = 20.963, DF = 24, p = .641; RMSEA = .000; CFI = 1.000; R^2 = .032, p = .265

Table 61:

Pregnancy maternal representations mediating the relationship between categorical IPV/depression and instrumental touch

	b	*SE of b*	*β*	*p*
Path: Predictor ⟶ Mediator				
Pregnancy IPV -> Maternal Reps	.000	.088	.000	.999
Pregnancy Depression -> Maternal Reps	-.278	.083	-.265	.001
Path: Mediator ⟶ Outcome				
Maternal Reps -> Affectionate Touch	3.746	2.314	.158	.106
Path: Predictor ⟶ Outcome (Direct)				
Pregnancy IPV -> Affectionate Touch	6.399	2.218	.240	.004
Pregnancy Depression -> Affectionate Touch	-3.125	2.075	-.125	.132
Path: Predictor ⟶ Outcome (Indirect)				
Pregnancy IPV -> Affectionate Touch	.000	.329	.000	.999
Pregnancy Depression -> Affectionate Touch	-1.041	.701	-.042	.137
Control Variables				
Demographic Risk -> Maternal Reps	-.194	.039	-.441	.000
Infant Sex -> Maternal Reps	.039	.073	.037	.593
Demographic Risk -> Affectionate Touch	.637	.929	.061	.493
Infant Sex -> Affectionate Touch	.105	1.842	.004	.955

Model fit: Free parameters = 27; $X^2 = 26.445$, DF = 24, $p = .331$; RMSEA = .024; CFI = .995; $R^2 = .072$, $p = .039$

Table 62:

Pregnancy maternal representations mediating the relationship between categorical IPV/depression and passive touch

	b	*SE of b*	*β*	*p*
Path: Predictor ⟶ Mediator				
Pregnancy IPV -> Maternal Reps	.000	.088	.000	.998
Pregnancy Depression -> Maternal Reps	-.276	.083	-.264	.001
Path: Mediator ⟶ Outcome				
Maternal Reps -> Passive Touch	6.051	3.740	.163	.106
Path: Predictor ⟶ Outcome (Direct)				
Pregnancy IPV -> Passive Touch	-1.520	3.560	-.037	.669
Pregnancy Depression -> Passive Touch	.256	3.330	.007	.939
Path: Predictor ⟶ Outcome (Indirect)				
Pregnancy IPV -> Passive Touch	-.002	.531	.000	.998
Pregnancy Depression -> Passive Touch	-1.673	1.123	-.043	.134
Control Variables				
Demographic Risk -> Maternal Reps	-.194	.039	-.441	.000
Infant Sex -> Maternal Reps	.039	.073	.037	.591
Demographic Risk -> Passive Touch	1.517	1.493	.093	.310
Infant Sex -> Passive Touch	-.518	2.957	-.013	.861

Model fit: Free parameters = 27; X^2 = 19.456, DF = 24, p = .727; RMSEA = .000; CFI = 1.000; R^2 = .021, p = .363

Table 63:

Pregnancy maternal representations mediating the relationship between categorical IPV/depression and negative touch

	b	*SE of b*	*β*	*p*
Path: Predictor ⟶ Mediator				
Pregnancy IPV -> Maternal Reps	.001	.088	.001	.989
Pregnancy Depression -> Maternal Reps	-.276	.082	-.264	.001
Path: Mediator ⟶ Outcome				
Maternal Reps -> Negative Touch	.021	.082	.024	.802
Path: Predictor ⟶ Outcome (Direct)				
Pregnancy IPV -> Negative Touch	.030	.079	.032	.703
Pregnancy Depression -> Negative Touch	-.080	.074	-.091	.282
Path: Predictor ⟶ Outcome (Indirect)				
Pregnancy IPV -> Negative Touch	.000	.002	.000	.989
Pregnancy Depression -> Negative Touch	-.006	.023	-.006	.802
Control Variables				
Demographic Risk -> Maternal Reps	-.193	.038	-.441	.000
Infant Sex -> Maternal Reps	.039	.072	.038	.587
Demographic Risk -> Negative Touch	.073	.033	.198	.028
Infant Sex -> Negative Touch	-.075	.066	-.085	.257

Model fit: Free parameters = 27; X^2 = 18.756, DF = 24, p = .765; RMSEA = .000; CFI = 1.000; R^2 = .047, p = .132

Table 64:

Pregnancy maternal representations mediating the relationship between categorical IPV/depression and no touch

	b	*SE of b*	*β*	*p*
Path: Predictor ⟶ Mediator				
Pregnancy IPV -> Maternal Reps	.000	.088	.000	.998
Pregnancy Depression -> Maternal Reps	-.277	.083	-.264	.001
Path: Mediator ⟶ Outcome				
Maternal Reps -> No Touch	-7.165	4.312	-.166	.097
Path: Predictor ⟶ Outcome (Direct)				
Pregnancy IPV -> No Touch	-2.537	4.125	-.052	.539
Pregnancy Depression -> No Touch	1.573	3.859	.035	.684
Path: Predictor ⟶ Outcome (Indirect)				
Pregnancy IPV -> No Touch	.001	.630	.000	.998
Pregnancy Depression -> No Touch	1.987	1.306	.044	.128
Control Variables				
Demographic Risk -> Maternal Reps	-.194	.039	-.441	.000
Infant Sex -> Maternal Reps	.039	.073	.037	.592
Demographic Risk -> No Touch	-1.488	1.728	-.079	.389
Infant Sex -> No Touch	-2.285	3.427	-.051	.505

Model fit: Free parameters = 27; X^2 = 21.480, DF = 24, p = .610; RMSEA = .000; CFI = 1.000; R^2 = .028, p = .287

Table 65a:

Multilevel regression coefficients estimating the effects of role, touch, and IPV/depression touch responses

	F	***df***	***p***
Continuous Pregnancy IPV x Role x Touch x Response	2.585	2040	.017
Continuous Pregnancy Dep x Role x Touch x Response	1.583	2040	.148
Continuous Postpartum IPV x Role x Touch x Response	.300	2040	.937
Continuous Postpartum Dep x Role x Touch x Response	.705	2040	.646
Categorical Pregnancy IPV x Role x Touch x Response	1.884	2040	.080
Categorical Pregnancy Dep x Role x Touch x Response	1.811	2040	.093
Categorical Postpartum IPV x Role x Touch x Response	.089	2040	.997
Categorical Postpartum Dep x Role x Touch x Response	1.182	2040	.313

Table 65b:

Estimating separate effects for role, different touch types and continuous pregnancy IPV on touch responses

	F	***df***	***p***
IPV x Role x Affectionate Touch x Response	1.060	2064	.347
IPV x Role x Instrumental Touch x Response	3.214	2064	.040
IPV x Role x Passive Touch x Response	2.806	2064	.061
IPV x Role x Negative Touch x Response	.015	2064	.985

Table 65c:

Estimating separate effects for role, different touch types and continuous pregnancy IPV on specific touch responses

	F	***df***	***p***
IPV x Role x Instrumental Touch x Positive Response	11.618	2064	.001
IPV x Role x Instrumental Touch x Negative Response	.012	2064	.913
IPV x Role x Instrumental Touch x No Response	.296	2064	.587

Table 65d:

Estimating separate effects for role, different touch types and continuous pregnancy IPV on positive touch response

	F	***df***	***p***
IPV x Mother x Instrumental Touch x Positive Response	6.490	2076	.011
IPV x Infant x Instrumental Touch x Positive Response	.695	1977	.405

APPENDIX F: Figures

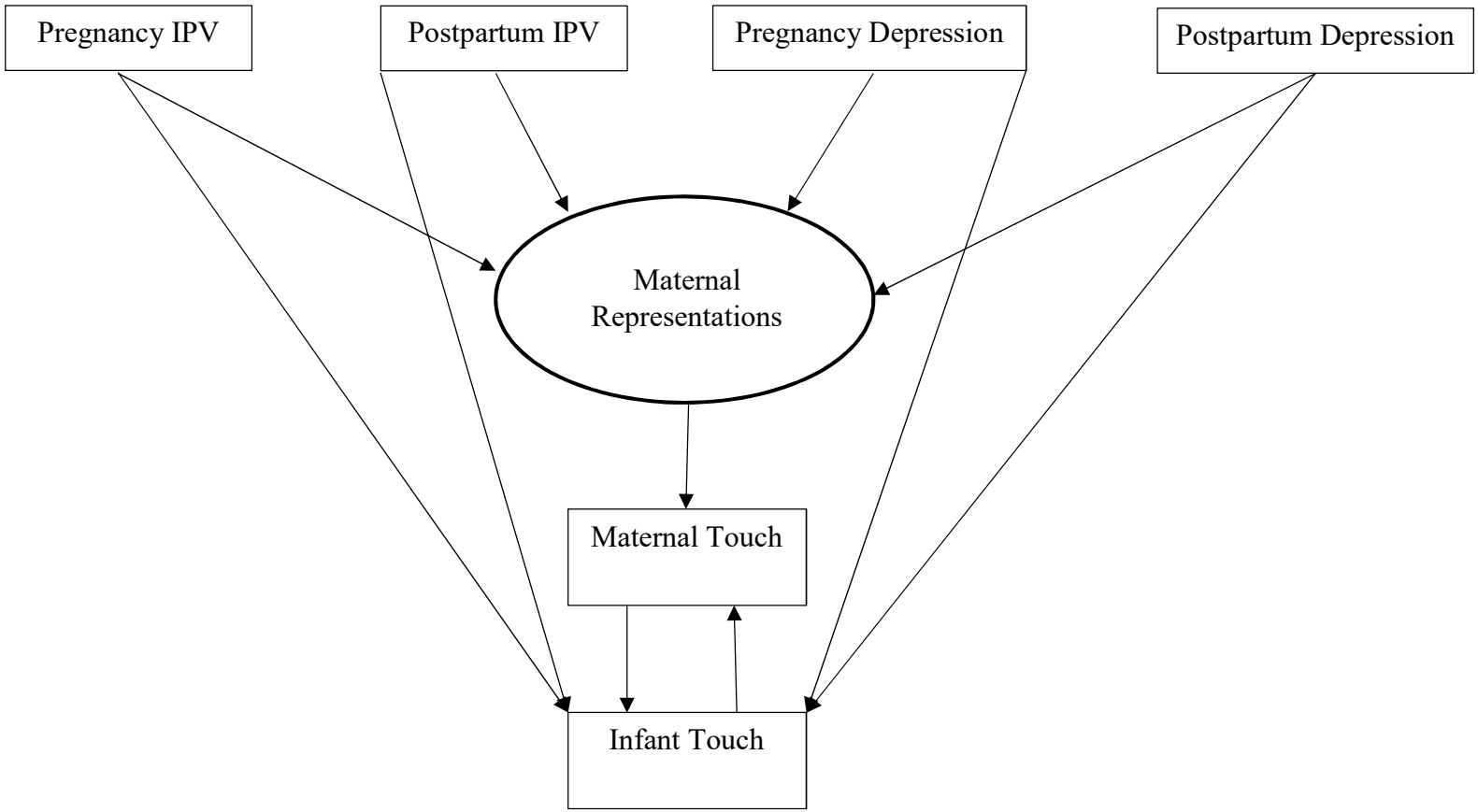

Figure 1: Theoretical model

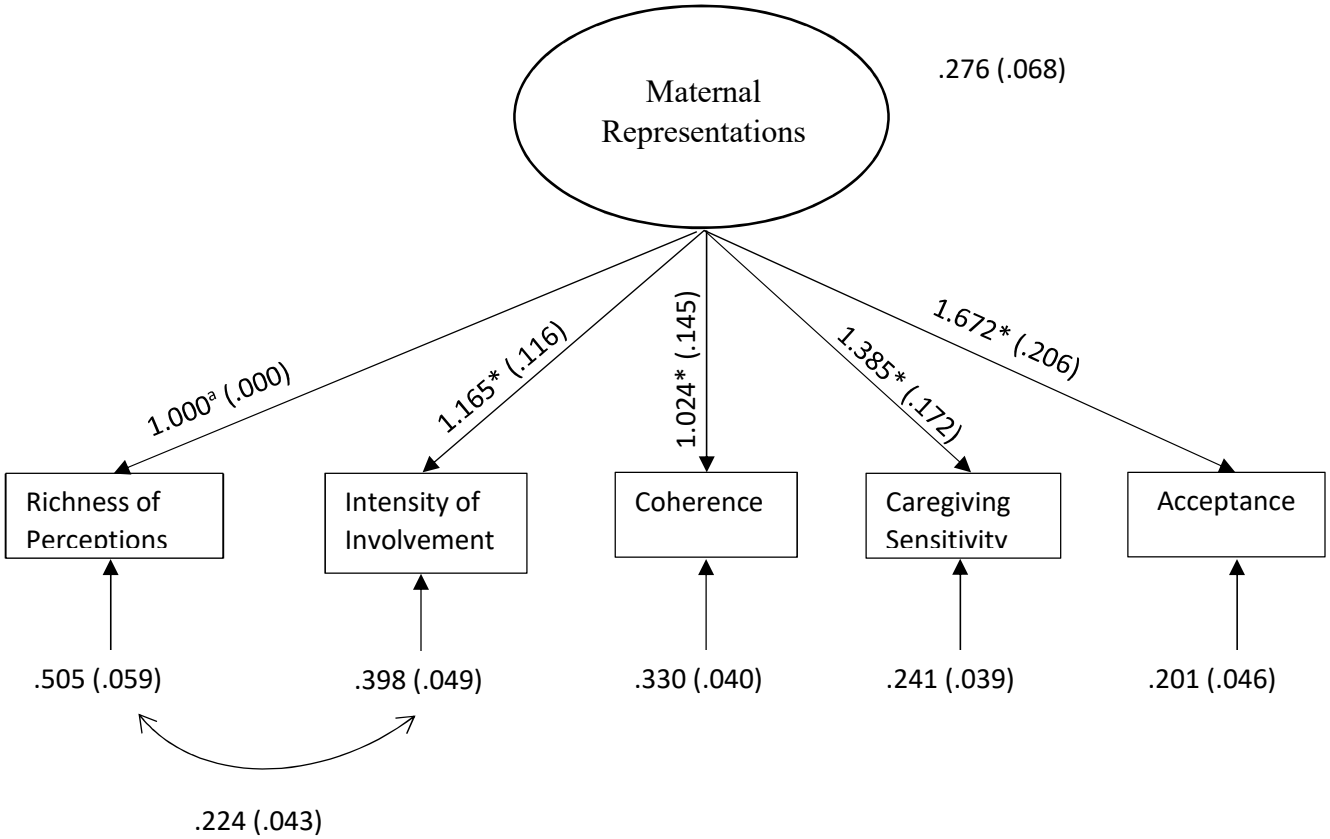

Figure 2: Maternal postpartum representations. * indicates $p < .05$
Model fit: Free parameters = 16; $X^2 = 1.405$, DF = 4, $p = .843$; RMSEA = .000; CFI = 1.000

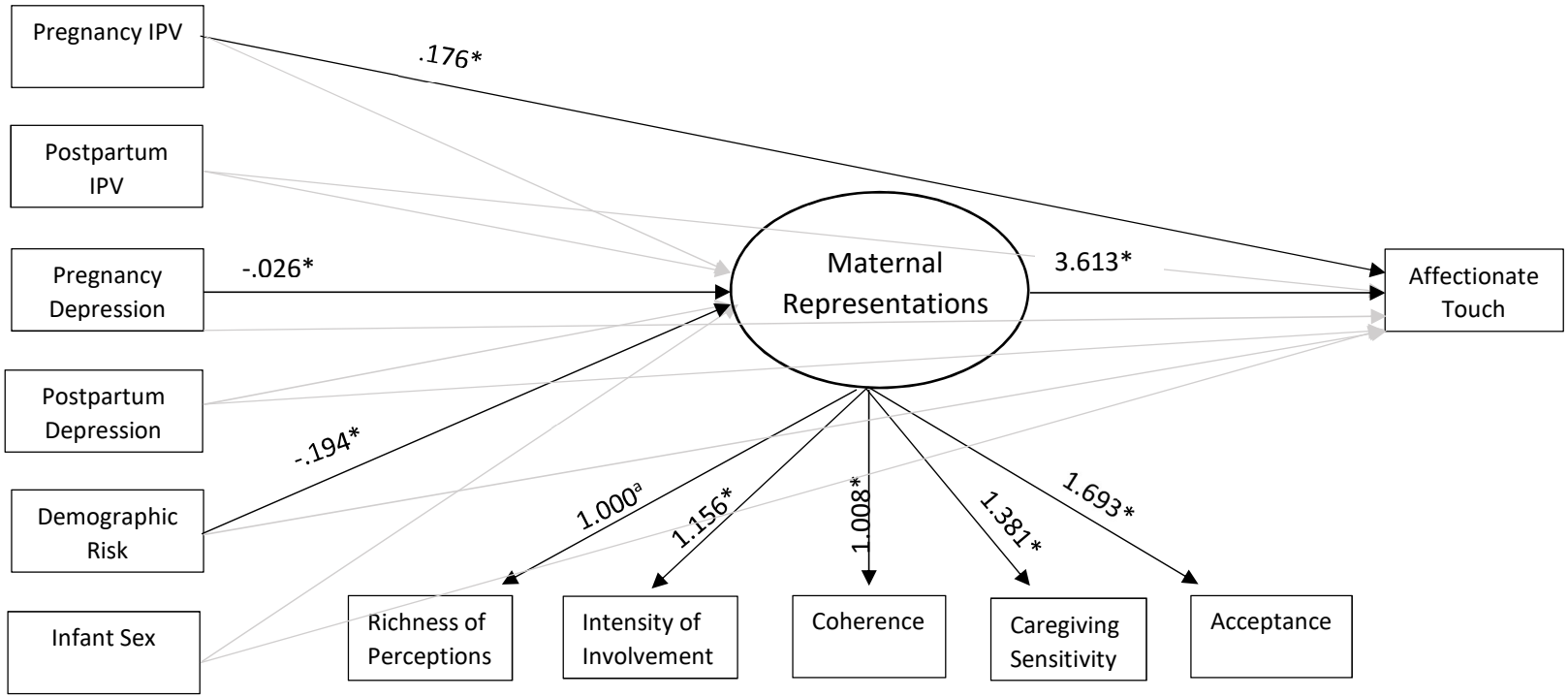

Figure 3: Maternal representations mediating the effects of IPV and depression on affectionate touch
* indicates $p < .05$; Gray lines indicate nonsignificant pathways.

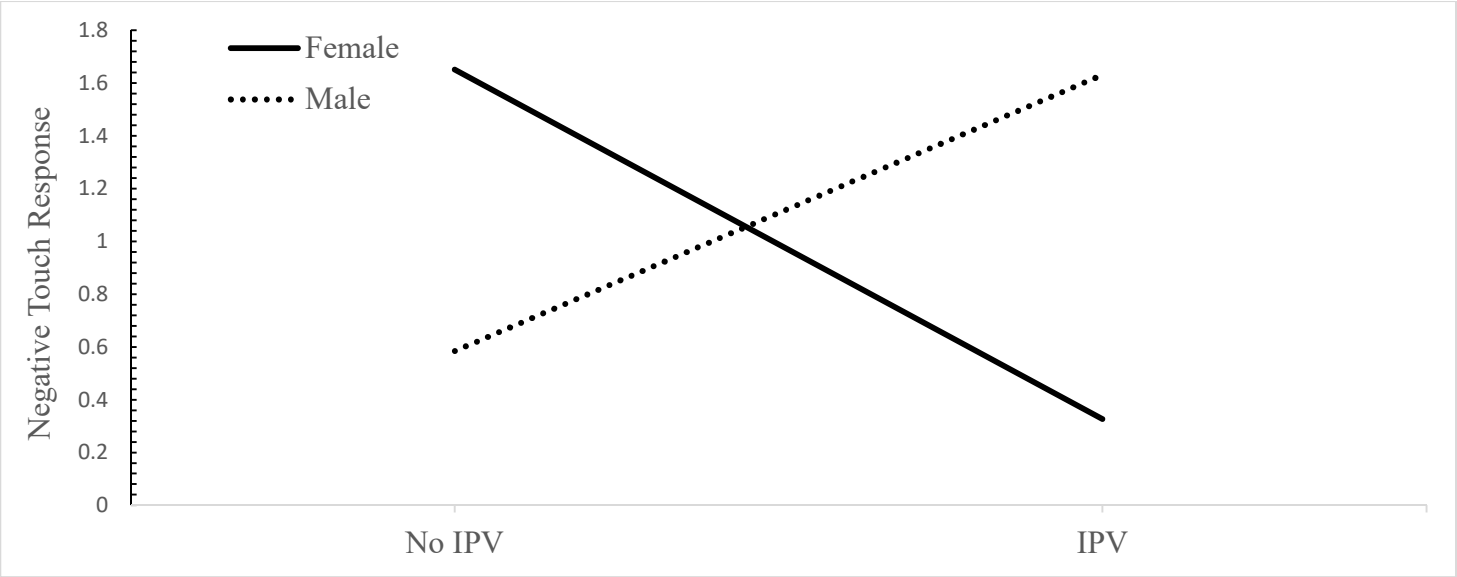

Figure 4: The interaction between infant sex, and categorical pregnancy depression on negative infant touch response

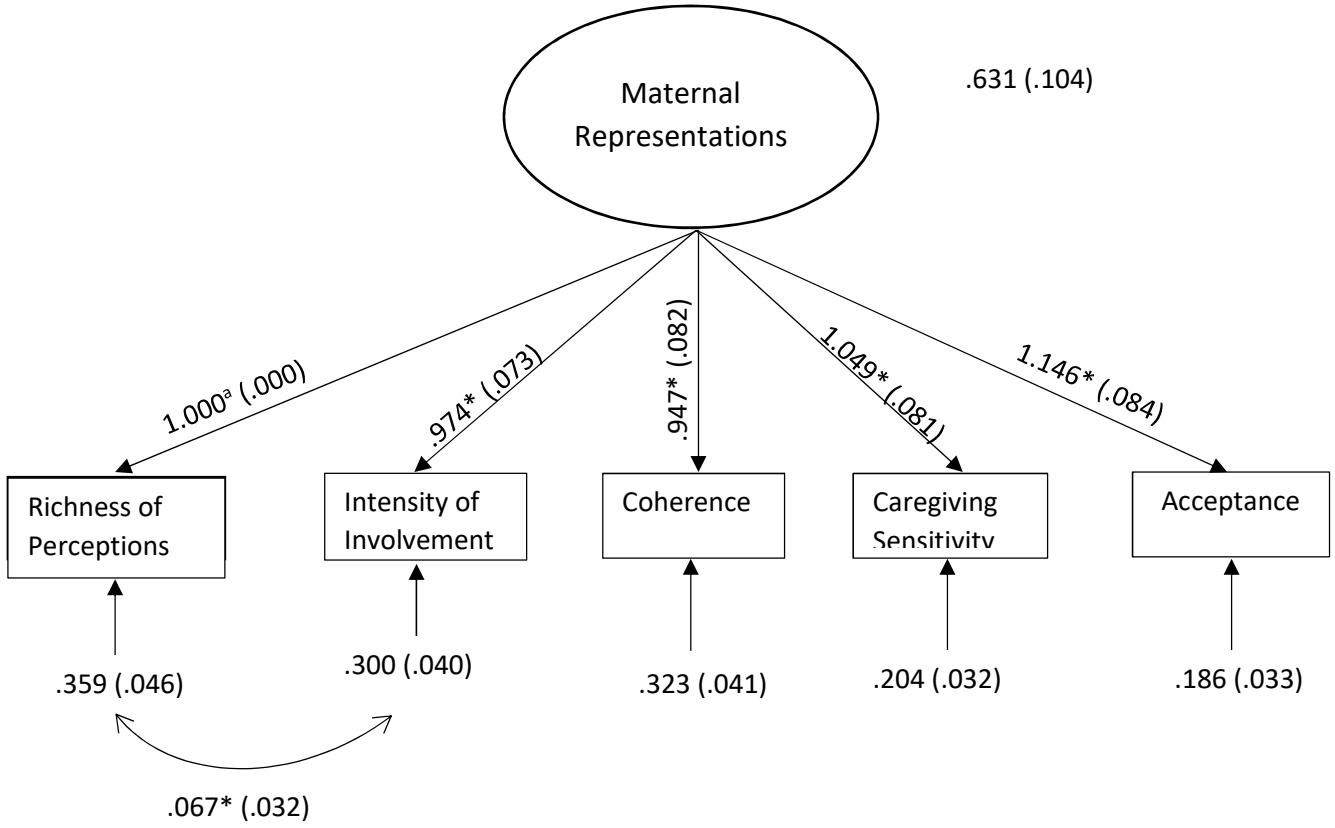

Figure 5: Maternal pregnancy representations. * indicates $p < .05$
Model fit: Free parameters = 16; $X^2 = 10.580$, DF = 4, $p = .037$; RMSEA = .099; CFI = .990

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