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Effects of Childhood Health and Adversity on Women's Estrous and Extended Sexuality in Romantic Relationships

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by

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ABSTRACT

Variations in childhood conditions may favor different strategies of investment in pair-bonds and reproduction. The current study followed 213 romantically-involved women up to four times across the ovulatory cycle. Analyses find that childhood health and adversity moderate hormone-dependent changes in women's sexual interests, oxytocin responses, and mate preferences. In light of proposed paternity assurance functions of extended (non-conceptive) sexuality, results suggest women with poorer, compared to better, childhood conditions prioritize bond formation but invest less in maintaining or bolstering partner investment. The estrous (conceptive) sexuality of women with poor childhood health may reflect greater investments in current reproduction, even when partner investment is lacking or uncertain, whereas women with better childhood health and security suppress conceptive sexual motivations in those circumstances. Evidence indicates that women with adverse childhoods place higher value on sire genetic quality. Overall, findings suggest women's mating strategies depend on the value and expectations of partner investment.

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1 Introduction

1.1 Women's estrous and extended sexuality

Women have evolved to be continuously sexually receptive and proceptive throughout the menstrual cycle. Women's sexual strategies are arguably reflective of dual sexuality, shaped by natural selection to garner distinct benefits from sex during conceptive versus non-conceptive phases of the cycle. Like other mammals, women have an *estrous sexuality*—psychological systems that regulate sexual interests, motivations, and behavior during the part of the cycle when sex can lead to conception. Women have also evolved to possess *extended sexuality*, the psychological systems designed to regulate sex during non-conceptive cycle phases (Thornhill & Gangestad, 2008).

The primary function of estrous sexuality is to regulate conception. Sex can only result in conception during the periovulatory phase, a brief window lasting about 5 days in human ovulatory cycles. Although each fecund cycle may provide a different opportunity for potential conception, women can only successfully rear a limited number of offspring in their lifetimes. Each offspring requires substantial time and energetic investments, including nine months of gestation, a calorically costly period of lactating altricial infants (averaging over three years in foraging societies), and many more years of post-weaning investment during an extended period of juvenile dependency (Kramer, 2010; Marlowe, 2003; Meehan et al., 2013; Reiches et al., 2009). Women hence have limited reproductive opportunities, especially relative to the number of mating opportunities and ovulatory cycles in which they can potentially conceive offspring. Therefore, women should possess adaptations that discern and regulate when and under what circumstances to optimally reproduce. Such adaptations plausibly include design features of estrous sexuality that adaptively regulate fertility—

including managing sire choice, facilitating conception, or avoiding conception when the fitness costs are expected to exceed the benefits of reproduction in present circumstances (Gangestad, Dinh, Lesko, & Haselton, 2022).

From an adaptationist perspective, extended sexuality evolved in humans because non-conceptive sex offered women fitness benefits other than conception, that exceeded the costs of sex. The benefits and circumstances that elicit women's extended sexual interests are not well understood. Scholars conjecture that extended sexuality evolved in humans in the context of pair-bonding and biparental care (Thornhill, 2007; Gangestad & Haselton, 2015). Male investment, whether through provisioning or direct care of offspring, was arguably important for women's reproductive success during human evolutionary history, even if the value of paternal investment is variable across environments. With the evolution of concealed ovulation in humans, men are unable to reliably discern female conceptive status (Strassmann, 1981). Extended sexuality therefore allowed women to have sex without the consequence of conception, while male partners cannot be sure that sex will not result in conception. This allowed women to garner benefits from extended sexuality, through its influence on male behavior, that are distinct from benefits of estrous sexuality (Gangestad et al., 2022).

The Pair Bond Theory of Extended Sexuality proposes that women's extended sexuality can serve paternity assurance functions (Gangestad et al., 2022). By having within-pair sex regularly throughout the cycle, women provide their partner greater certainty that he sired any resulting offspring during times of the cycle when sex was conceptive. Women's extended sexuality can thus function to maintain or bolster partner investment and interest in the pair bond (Grebe, Gangestad, Garver-Apgar, & Thornhill, 2013). With male uncertainty

of women's conceptive status, extended sexuality may offer women other various benefits, without the consequence of conception. For instance, extended sexuality can allow women to evaluate male partners and gauge partner commitment in uncertain or risky relationships, prior to engaging in conceptive sex with them. In addition, women may receive social, material, or other direct benefits from sexual partners; non-conceptive sex may allow women to secure or retain these benefits, even in circumstances in which current reproduction with the present partner is not optimal.

Proximately, women's sexuality is modulated by physiological mechanisms regulating the probability of conception. Ovarian estrogen, released by the dominant follicle, rises during the follicular phase and peaks just prior to ovulation (Dunson et al., 2001). During the non-conceptive luteal phase following ovulation, the corpus luteum secretes high levels of progesterone (and also estrogen). Therefore, high levels of estrogen and low levels of progesterone should promote estrous sexuality. High levels of progesterone, relative to estrogen levels, should promote extended sexuality. Functionally, women's dual sexuality may be designed to respond to interactions between hormone levels and fitness-relevant conditions to achieve distinct benefits during estrus and extended sexuality.

1.2 Conditions affecting estrous sexuality

Women's estrous sexuality should be designed in part to adaptively regulate fertility. Adaptive reproduction depends on various conditions and circumstances that affect the fitness costs and benefits of reproducing at present, relative to waiting to reproduce in future, alternative conditions (Wasser & Barash, 1983). Indeed, biologists have long recognized the fundamental trade-off between current and future reproduction. Reproducing too early or at

the wrong time in one's lifespan can have fitness costs, including greater risks of infant mortality and less fit offspring (e.g., Charnov, 1991). Delaying reproduction also entails costs; the longer the delay, the more reproductive opportunities are missed.

Whether circumstances are suitable for reproduction depends on selective contingencies important to reproductive success under ancestral conditions—such as the value and availability of male investment, the suitability of women's romantic partner, the probability of continued partner investment, the availability of kin support, the value of sire genetic quality, and so on. Moreover, whether delaying reproduction for more advantageous conditions is optimal depends on the expected fitness benefits of future reproduction relative to the costs of waiting. These selective contingencies importantly vary as a function of environmental and internal conditions. Selection should have shaped women's estrous sexual motivations to be sensitive to conditions affecting the costs and benefits of different reproductive decisions.

1.2.1 The value of sire choice based on male investment

In most mammal species, males exhibit minimal to no direct care of offspring. Estrous sexuality of females in these species typically facilitate sire choice based on genetic quality. In humans, however, paternal care is comparatively substantial, even if variable across and within human societies. Women's estrous sexuality may thus have been modified in the context of pair-bonding and biparental care. In strongly bonded relationships, women's primary partner may often be the preferred sire, independent of his genetic quality (Thornhill & Gangestad, 2008). A large study found that women in strongly attached relationships were more likely to experience increased sexual interest in their primary partner relative to extra-pair men when progesterone levels were low (Dinh, Grebe, Emery Thompson, & Gangestad,

2023). Results are consistent with fertility regulation adaptations during estrus favoring valued primary partners over other men as sires. Two other small studies found similar results (Eastwick & Finkel, 2012). Because of the resource and fitness benefits that a pair bond partner can provide, over and above genetic benefits, male partners highly valued for their investment quality may often be the ideal sire.

However, the value and extent of men's investment in offspring varies across environments and circumstances. For instance, men's contributions to the diet—and, thus, to provisioning dependent children—ranges from over 90% to well under 50% across foraging groups and non-industrial societies (Marlowe, 2001; Hewlett, 1991, 2000). Also, fathers invest substantially in the direct care of offspring in some societies and relatively little in others (Gettler, Boyette, & Rosenbaum, 2020). Variations in the amount and forms of investment provided by fathers partly depend on the types of care important for offspring success, fathers' abilities to provide care, whether others are involved in supplying the necessary care (Mattison, Scelza, & Blumenfield, 2014). Fathers may also invest less because offspring quality is relatively insensitive to variations in paternal investment, or because men receive greater returns from other investments, such as in mating effort (Clutton-Brock & Vincent, 1991; Sear & Mace, 2008). Under certain socioecological conditions, enduring pair bonds and substantial or reliable paternal investment are unlikely partly for these reasons (Clutton-Brock & Vincent, 1991; Sear & Mace, 2008).

Women's sexuality may be designed to modulate estrous sexual motivations in response to the value and probability of paternal investment. Male ability and willingness to provide care are variable—as is the value that women in different conditions may place on male investment quality. Low levels of either reduce the fitness benefits of estrous sexuality

aimed at reproducing with investing partners. Conditions in which women have low expectations for reliable or high-quality partner investment in offspring may shift estrous sexuality towards greater preferences for male genetic quality. All else equal, when the marginal benefits of female mate choice for high-investing partners are low, the relative value of sire choice for genetic benefits for offspring increases.

1.2.2 Kin support, relative disadvantage, and childhood adversity

In addition to promoting adaptive sire choice, estrous sexuality may facilitate adaptive regulation of fertility in response to variable conditions of male investment quality. Delaying reproduction to wait for a better partner may be less advantageous in contexts with low likelihood of high-quality male investment. But when high-quality male investment is variable within a society or within an individual's lifespan, social and environmental conditions affecting the probability of offspring success may shift the marginal benefits of waiting to reproduce and, relatedly, investments in offspring quality.

For instance, strong maternal kin support may buffer child outcomes when male resource contributions are unreliable or variable. In traditional matrilineal or matrilocal societies where females hold more power and resources, women have greater reproductive and sexual autonomy. Relative to patriarchal societies, reproduction more often occurs outside of exclusive pair bonds (e.g., in the Canela, Himba, Mosuo; also, the Ache; Hartung, 1985; Hrdy, 2000; Scelza, 2011; Scelza et al., 2020; Wu et al., 2013). Women's estrous sexuality may be expected to adaptively regulate sire choice and fertility in these contexts, though empirical investigations are currently lacking.

In societies where male investment quality is highly variable but important for offspring competitive success, early-life and family environments may shift an individual's

optimal strategies of investment in social capital,[1] as well as the value and expectations of pair bonds for fostering offspring quality. Poor-quality parental investment places offspring at a relative competitive disadvantage, with suppressed marginal gains for paying increasingly high catch-up costs when there are high disparities in abilities of competitors (Dinh, 2021). Therefore, early-life conditions that cue or place individuals at a relative disadvantage may shift optimal strategies away from quality-based investments in self and offspring.

Childhood experiences of family instability, conflictual household relationships, and poor parental support may lead women to place less value on and have low expectations for reliable, high-quality partner investment in offspring. Women may expect that relatively low-quality male investment is reflective of optimal male strategies or of male investment capabilities within that particular socioecology or social strata and, thus, most likely in a pair bond partner. Therefore, relative disadvantage, low kin support, and low expectations of male partner investment may favor greater allocation of effort into offspring quantity relative to quality.

To increase offspring competitiveness in given circumstances, women's estrous sexuality may promote heightened mate preferences for sires with heritable traits facilitating dominance. When there is lower value to investments in offspring quality and skills-based social capital, strategies to increase offspring competitiveness through other means may be favored. Acquiring genetic benefits may be a relatively more effective method for enhancing offspring quality in relatively disadvantaged and unsupportive conditions (in which adaptive

[1] Social capital is defined broadly as any form of capital that affects an individual's success in a rank-dependent manner (Shenk et al., 2016). It may include skills- and knowledge-based embodied capital (Kaplan, 1996). Importantly, how efficiently individuals can embody social capital in oneself or in offspring depends on the relative stock of social capital of competitors.

male strategies may increase the prevalence of violence and criminal activity; e.g., Wilson & Daly, 1997). High genetic quality or physical viability and formidability can increase offspring survivorship and facilitate strategies successful in relatively disadvantaged, adverse conditions (e.g., strategies of dominance [for sons] or opportunism; physically attractive daughters may have a better chance of moving up the social ladder through partnerships with high-income men). In countries with more unequal distribution of wealth, women display stronger preferences for men with masculinized faces (Brooks et al., 2011). Masculine traits may serve as ancestral indicators of men's genetic quality (Gangestad et al., 2010; Gildersleeve et al., 2014), social dominance (Boothroyd et al., 2007; Mueller & Mazur, 1996), or heritable health (Rhodes et al., 2003; Thornhill & Gangestad, 2006). Because of the higher gains of obtaining genetic benefits for offspring and relatively lower cost of losing or reproducing without reliable partner investment, estrous sexuality may strategically boost interest in sexually attractive and dominant men when women are from relatively disadvantaged backgrounds.

Women's estrous sexuality may thus be designed to promote adaptive sire choice and rate of reproduction, contingent upon childhood cues and social contexts.

1.2.3 Mortality risk and faster life history strategies

Conditions associated with relatively extrinsic mortality risk may reduce the benefits of delaying reproduction, all else equal. When investments in somatic maintenance and longevity weakly suppress mortality risk, individuals benefit relatively more from allocating energy towards current reproduction. Cues during development of elevated and less controllable mortality risk may accelerate pubertal maturation (Ellis, 2004). Internal conditions may provide a more reliable forecast of mortality risk than cues from the external

environment, leading to calibration of fast-versus-slow life history trajectories (Nettle, Frankenhuis, & Rickard, 2013).

Ancestrally, birth complications and pathogenic threats were major causes of mortality. Being born of low weight poses substantial infant mortality risks, accelerates early growth for short-term survival at costs to somatic maintenance, and predisposes higher mortality risk extending beyond childhood and at least until early adulthood (Jimenez-Chillaron & Patti, 2007; Victoria et al., 2001; Watkins et al., 2016). Furthermore, infectious disease accounts for most childhood deaths and a substantial proportion of adult mortality among foragers (Gurven & Kaplan, 2007). Poor health and multiple or persistent bouts of infectious illness may have forecasted risk of early mortality or morbidity ancestrally, indicating earlier optimal age at menarche. Indeed, in a study of over 1,850 women, poor childhood health—but not socioeconomic status, family instability, or father absence/poor father quality—uniquely predicted earlier pubertal timing (Dinh, Haselton, & Gangestad, 2022). Moreover, girls born of lower weight and after shorter gestations tend to experience earlier menarche in both developing and high-income countries (Aurino, Schott, Penny, & Behrman, 2018; Blell, Pollard, & Pearce, 2008; Sloboda, Hart, Doherty, Pennell, & Hickey, 2007).

After reproductive maturity is attained, however, women should continue to adaptively regulate their fertility. Women with poor childhood health may benefit from reproducing sooner and more frequently. In addition, cues of high pathogen prevalence and/or heritable susceptibility to poor health may favor increased preferences for sire genetic quality, to increase offspring resistance to illness. Pathogen prevalence is associated with stronger mate preferences for attractive and masculine partners (DeBruine et al., 2010, 2011;

Gangestad & Buss, 1993; Tybur & Gangestad, 2011). Early menarche, an indicator of reduced investment in embodied capital and greater resource allocation towards early reproduction, is also associated with preferences for masculine male faces and voices (Batres & Perrett, 2016; Jones et al., 2010). Preferences may be especially pronounced when women are conceptive, though no study to my knowledge has examined cycle shifts as a function of health-related measures. Women's fertility-regulation systems may calibrate estrous sexual motivations to achieve adaptive fertility outcomes under conditions of poor childhood health or high susceptibility to illness.

1.2.4 Empirical evidence for moderation by childhood conditions

Only a few studies have examined whether women's sexual interests change across the cycle as a function of variations in childhood conditions.

In a between-woman study of over 1,000 naturally-cycling, partnered women, exposure to childhood adversity (low socioeconomic status, family instability, low paternal investment quality) moderated the impact of conception probability on women's sexual motivations (Dinh, Pinsof, Haselton, & Gangestad, 2017; also see the reanalysis including childhood health and exposure to violence in Dinh et al., 2022). Women from adverse childhood backgrounds experienced more sexual attraction to their partners and initiated sex more frequently when conception risk was higher. Women from low-adversity childhood backgrounds showed the opposite pattern: lower in-pair sexual attraction and initiation of sex during the periovulatory phase than during the luteal phase, particularly when relationships were relatively new. Male partner commitment and investment are likely less certain at early stages of a relationship, and women may benefit from avoiding conception. Yet women from harsh childhood backgrounds that portend shorter lifespans or lower value or probability of

high-quality partner investment may pay larger costs by delaying reproduction (including failure to reproduce at all). Therefore, they may require less commitment from a partner before engaging in conceptive sex.

Dinh et al. (2017, 2022) also found that women from adverse backgrounds experienced more interest in going out to places where they could meet men during the periovulatory phase relative to the luteal phase, and increased interest in having conceptive extra-pair sex, especially at early stages of their relationship. In contrast, women with lower childhood adversity experienced less motivation to engage in extra-pair behaviors at higher conception risk. Two other studies (between-woman $N = 500$, within-woman $N = 71$) found that single women with low childhood socioeconomic status (SES) showed greater interest in having a one-night stand when conceptive, whereas women with higher childhood SES showed less interest (Kim et al., 2018). Partnered women did not show significant changes in their interest in having extra-pair sex as a function of childhood SES, though these studies did not examine interactions with relationship length. Another between-subjects study of over 700 women recruited from communities in Hong Kong found that women with "faster" scores on the mini-K and Fast-Slow Scale (Figueredo et al., 2006; Lu et al., 2017) reported elevated levels of general sexual desire with higher conception risk, independent of relationship status (Lu, 2023). Women with "slower" scores did not show an association between general sexual desire and conception risk. A daily diary study on a subsample of 130 of these participants replicated these effects.

In sum, these studies suggest that women who grew up with less favorable childhood conditions show greater sexual motivations when conceptive. And they may be more likely to experience heightened estrous sexual motivations in circumstances with less assurance of

reliable partner investment, compared to women who grew up with more favorable childhood conditions.

No published study to my knowledge has examined whether childhood experiences moderate mate preference shifts across the cycle. In provisional analyses on data from Gangestad et al. (2007), I found that women's childhood experiences of physical abuse and witnessing child abuse independently predicted higher short-term mate preferences for intrasexually-competitive, socially dominant, and muscular men when conception risk was elevated.

An important caveat to this line of research is that the causal factors underlying differential changes in sexual interests are unclear. Given covariation between many childhood indicators of harshness or adversity, it is difficult to ascertain that empirical associations with a specific variable are not driven by correlated but conceptually distinct factors (see Dinh et al., 2022). For example, child maltreatment is associated with family instability, constrained household resources, high income inequality, and pathogen prevalence (Daly & Wilson, 1985; Eckenrode et al., 2014; Thornhill & Fincher, 2011). Whether childhood experiences of abuse or other associated factors calibrate developmental and later adult outcomes is unknown. In addition, many evolutionary psychological studies on the fast-slow dimension use socioeconomic status as a proxy for life history strategy; yet each socioeconomic class encompasses widely heterogeneous experiences. It is unclear whether effects of SES are due to resource scarcity, extrinsic mortality risk, family instability, or poor health, or whether effects are contingent on unmeasured experiences of theoretical relevance, such as income inequality. Potential confounds also obscure whether effects are truly reflective of different theoretical phenomena (e.g., life history trajectories,

social competition, attachment styles). Better understanding of adaptive calibration by childhood experiences requires examination of multiple variables of interest.

1.3 Conditions affecting extended sexuality

1.3.1 Relative lack of partner investment

The extension of women's sexual interests into non-conceptive cycle phases may have evolved in part to enhance the paternity confidence of male partners and solidify pair bonds (Gangestad & Dinh, 2022). As such, women's extended sexuality may be sensitive to relationship qualities indicating a relative lack of partner investment in a valued pair bond and future offspring. In a study of 50 romantically-involved couples, women initiated sex more often during the luteal phase, relative to the periovulatory phase, when they were highly invested in the relationship but perceived their partner's investment to lag behind (Grebe et al., 2013). The current study of this dissertation further distinguished between specific facets of relationship investment. In separate analyses on this dataset of 181 women, colleagues and I found that women who were more passionate in the relationship than their partner showed increased in-pair relative to extra-pair sexual interest as progesterone levels rose, becoming more characteristic of extended sexuality (Dinh et al., 2023).

Functions of passionate love include solidifying new, tenuous, or uncertain relationships in which bonding is not fully present. Romantic passion is an expression of motivations to foster bond formation and may be an honest signal of romantic interest through self-imposed opportunity costs (Fisher et al., 2006; Frank, 1988; Gangestad & Thornhill, 2007; Gonzaga & Haselton, 2008; Galperin & Haselton, 2010). Partners who show relatively little romantic passion in stages of bond formation or repair may lack interest in

further investment in the relationship. Women who are highly invested in forming strong bonds with their partner, but whose partner shows less interest, may engage in sexual behaviors during extended sexuality to bolster their partner's interest in the relationship.

1.3.2 Differences in value or probability of partner investment

While women's extended sexuality may serve paternity assurance functions to maintain or bolster partner investment, women facing divergent conditions may differentially value partner investment. When fitness benefits or expectations of partner investment are relatively low, women receive lower marginal returns from non-conceptive sex to maintain or increase partner investment. Women also benefit less from extended sexuality to garner partner investment when offspring outcomes are relatively less affected by greater contributions from parents. Heritable vulnerability to illness and/or high pathogen prevalence, for instance, may pose conditions in which parental efforts to reduce offspring mortality risk are relatively less effective. Moreover, sex outside of estrus cannot result in conception, and sex entails costs. Non-conceptive sex can have higher fitness costs under certain conditions. For example, sex potentially entails higher opportunity costs in risky, stressful, or dangerous environments. Sex also carries infection risks, which can be costlier for women with a history of low immunocompetence. Women's sexuality should be designed to manage the costs and benefits of sexual behavior in different contexts and cycle phases.

Depending on the environment, different strategies of reproductive investments may favor enlisting different aspects of partner involvement. For instance, forms of parental investment that foster higher offspring number likely differ from at least some forms of investment for promoting skills-based offspring quality. Therefore, women's extended

sexuality may be sensitive to aspects of relationship involvement important for achieving adaptive reproductive outcomes.

In foraging societies, offspring quantity appears to be most effectively increased through subsidization of maternal energy needs—usually through nutritional provisioning by kin and/or fathers. Across a sample of 26 foraging societies, the association between mean total female fertility rate and the proportion of the diet supplied by men was substantial (r = .50, increasing to .74 with total biomass controlled; Marlowe, 2001). Men's provisioning permits women to wean offspring earlier and thereby experience shorter intervals between births, allowing for more offspring (Marlowe, 2001, 2003). It also helps women maintain energy balance throughout an energetically costly period of lactation (requiring an additional ~700 calories per day), which allows women to resume postpartum conceptive cycling sooner (Peng et al., 1998; Valeggia & Ellison, 2009). Higher female fertility is arguably fostered by formation of long-term pair bonds (Sear, 2020), within which male provisioning increases the rate at which offspring are produced across the female reproductive lifespan. Therefore, women facing conditions favoring current reproduction and higher offspring quantity may highly value the formation of long-term, committed pair bonds, but not necessarily with partners that can invest highly in offspring quality. Their extended sexual motivations may be especially tuned to promoting pair bond formation, particularly when kin support to subsidize female reproduction is lacking.

High-quality, direct paternal care may be more important to offspring quality in environments where competitive success is highly dependent on skills- and knowledge-based social capital, and both parents are important to fostering social capital in offspring (see Gettler et al., 2020). In addition to long-term commitment, partner emotional support and

intimacy (rather than just material support) may be especially important in cooperative partnerships in which both partners invest highly in offspring care and quality. Indeed, romantic partners are closer and spend more time together in societies where both parents contribute substantially to offspring care (Hewlett, 2000). For women prioritizing romantic relationships favorable for heavy investment in high-quality offspring, extended sexuality may motivate behaviors for maintaining investment from highly involved partners, behaviors to bolster partner interest in valued (but vulnerable) relationships, and mate switching when primary partners are unsuitable.

1.4 Potential role of oxytocin

Oxytocin is a peptide hormone involved in many physiological and behavioral aspects of mammalian reproduction, including pair-bonding behavior in some species. Research suggests that oxytocin also affects pair-bonding behavior in humans, perhaps promoting relationship formation and maintenance (e.g., Ditzen et al., 2009; Schneiderman et al., 2012; Light et al., 2005; Grewen et al., 2005; Holt-Lunstad et al., 2008, 2014). However, the nature of oxytocin's potential role is debated. In one perspective, oxytocin purportedly functions to "calm and connect"—dampening stress responses and facilitating bonding (Carter, 1998; Uvnas-Moberg & Petersson, 2005). Another perspective views oxytocin as managing stress and psychological responses to "tend and befriend," by regulating behaviors to protect relationships in distress (Taylor et al., 2000, 2010).

Taking a broader life history perspective, Gangestad (2016) proposed that, like other hormones, oxytocin should be understood as a modulator of trade-offs. Selection has shaped endocrine systems to coordinate wide-ranging physiological and psychological mechanisms

to achieve adaptive outcomes in response to shifting priorities. Oxytocin may modulate allocation of psychological resources to important relationships and away from less pressing competing demands, such as eating motivation.

1.4.1 Oxytocin in vulnerable relationships and interactions with steroid hormones

Steroid hormones, most notably estrogens, influence and interact with the oxytocin system. For instance, estrogens increase oxytocin synthesis and receptor density (Gimpl & Fahrenholz, 2001; Murakami et al., 2011). Estradiol may augment some of oxytocin's effects. As well, oxytocin mediates some of estradiol's effects (Kudwa et al., 2014; Evans & Anderson, 2012). The influence of steroid hormones implies that oxytocin interacts with fluctuating estrogen and progesterone levels to produce systematic variations in effects across the menstrual cycle, perhaps including effects on sexual and pair-bonding behavior.

Grebe et al. (2017) proposed that oxytocin modulates allocation of effort to "identify and invest" in valued but vulnerable relationships. In the context of pair bonds, oxytocin may function to direct attention and other psychological resources to protecting a relationship that an individual is highly invested in, but in which their partner's investment lags behind. Across two studies of romantically-involved couples, discrepancies in an individual's relationship involvement relative to their partner's was positively associated with their oxytocin response to thoughts about their partner's supportiveness or lack of supportiveness in the relationship (Grebe et al., 2017).

Female efforts to protect valued romantic relationships may include greater paternity-assurance behaviors during extended sexuality (Grebe et al., 2013). Oxytocin levels may interact with ovarian steroid hormones to promote female in-pair sexual interest during extended sexuality, but no published study has tested this hypothesized effect. The only study

in humans to test phase-specific associations found that oxytocin levels were positively correlated with women's vaginal lubrication during sex during the luteal phase, but not the follicular phase (Salonia et al., 2005).

1.4.2 Oxytocin and childhood adversity

Childhood experiences of adversity appear to alter oxytocin profiles and responses, which may have implications for attachment and allocation of effort in romantic, parent-offspring, and other social relationships. A meta-analytic review found, on average, lower endogenous levels of oxytocin among children and adults who grew up with more adverse experiences (Ellis et al., 2021). However, associations were modest, and review of individual studies show more complex findings. For instance, research finds that less severe childhood adversity (e.g., abuse, maltreatment) and life-threatening childhood illness are associated with higher oxytocin levels at baseline and following a laboratory stressor (Seltzer et al., 2014; Mizuki & Fukiwara, 2015; Pierrehumbert et al., 2010). But emotional abuse, neglect, or more severe trauma may be associated with lower oxytocin levels (reviewed in Donadon et al., 2018; Johnson & Buisman-Pijlman, 2016; see also, Heim et al., 2009; Muller et al., 2019).

Furthermore, oxytocin may produce different outcomes among those with different childhood experiences. A meta-analysis found that adults who grew up with supportive childhood experiences tended to show more prosocial or positive emotional or physiological responses to intranasal oxytocin administration. Those who grew up with adverse childhood caregiving experiences either showed no response or negative responses to receiving exogenous oxytocin (Ellis et al., 2021). In a study of 40 low-income mother-child dyads, higher levels of maternal oxytocin production following interactions with their child was

associated with more positive parenting among mothers who grew up with low childhood adversity, but less positive parenting among mothers who grew up with high childhood adversity (Julian et al., 2017). In addition, actions at the gene and receptor levels may differentially impact behavioral responses related to oxytocin release (e.g., Johnson & Buisman-Pijlman, 2016; Brown et al., 2020). Evidence suggests that childhood adversity is (weakly) associated with greater methylation of the oxytocin receptor gene (Ellis et al., 2021).

In sum, variation in childhood experiences of adversity may be associated with differences in basal oxytocin levels, responsivity of the oxytocin system to context, and psychological and behavioral responses related to oxytocin release. These differences may reflect adaptive shifts in priorities affecting allocation of effort in the context of social relationships, including romantic and parent-offspring relationships. However, the current state of this literature does not yet permit systematic conclusions regarding how or why different dimensions of childhood experiences might relate to possible changes in the oxytocin system and their potential effects on social behavior.

1.5 The current study

The current study assesses hormone-dependent changes as a function of childhood experiences in the sexual interests, thoughts, feelings, and behaviors of 213 normally ovulating, pair-bonded women. For each participant, up to four sessions were scheduled about a week apart over the course of about a month. Following the initial session, subsequent session scheduling typically targeted a periovulatory day, a mid-luteal day, and an early follicular day.

Women completed background questionnaires on childhood experiences, woman-specific relationship qualities, and partner-specific relationship qualities during their first session. Each session, women reported on their sexual behaviors and experiences of in-pair and extra-pair attraction over the last two days. On certain sessions, women also rated videos of men on their short-term and long-term attractiveness, performed attractiveness ratings of photos of men's bodies varying in muscularity, and completed a relationship thought-listing task on their partner, designed to elicit oxytocin change measured in saliva. During the day of each session, women provided urinary samples for assays of estradiol and progesterone.

In this dissertation, my data analysis and interpretation focus on gaining a deeper understanding of how childhood experiences affect allocation of effort in the context of romantic relationships. Analyses examine whether childhood health and experiences with adversity moderate women's mate preferences and how relationship qualities influence women's in-pair and extra-pair sexual interests during estrus and extended sexuality. Results may provide insight into how childhood experiences influence women's reproductive and mating strategies. In addition, results can potentially elucidate the functions of extended sexuality, as well as the conditions that impact adaptive regulation of fertility.

1.6 Hypotheses

Under childhood conditions of environmental adversity, familial instability, and low-quality parental support, women will adopt optimal mating and reproductive strategies in the context of low expectations for reliable, high-quality partner investment in the relationship and in offspring. Without reliable, high-quality paternal investment, the marginal benefits of investing in offspring quality are suppressed—particularly in environments in which

competitive outcomes depend on parental investment and are highly unequal across individuals. Hence, women receive higher marginal returns for investing in offspring quantity. In contrast, women who grew up with greater childhood security, family stability, and high-quality parental support will highly value and expect reliable, high-quality partner investment in the relationship and in offspring. Their mating strategies will prioritize building and maintaining pair bonds that promote heavy investment in offspring quality.

Poor childhood health, reflecting relatively high extrinsic mortality risk, will favor mating and reproductive strategies that facilitate current over future reproduction and offspring quantity over quality. By comparison, women with good childhood health will allocate relatively greater effort into future reproduction. Their reproductive strategies favor reproducing when conditions are propitious but greater willingness to delay reproduction when conditions are unideal.

Although the underlying functional reasons modulating optimal strategies for women with poor childhood health and high childhood adversity differ, the outcomes of investment strategies may be similar. Therefore, most predictions outlined below do not distinguish between childhood health and adversity. Differences are expected, even if not specified *a priori*. Divergences in outcomes may provide insight into how optimal mating and reproductive strategies differ in conditions of social adversity, compared to relatively high extrinsic mortality risk.

In the next section, each hypothesis starts with how variations in optimal mating and reproductive strategies are expected to differentially modulate women's estrous and extended sexuality to achieve adaptive outcomes. Testable predictions follow. Predictions regarding estrous/conceptive sexual interests during the periovulatory phase are when within-woman

estrogen levels are high and progesterone levels are low. Predictions pertaining to extended/non-conceptive sexual interests during luteal phase are when within-woman progesterone levels are high and estrogen levels are relatively low.

1.6.1 Fertility regulation in new or less committed relationships

Women allocating more effort into future reproduction and offspring quality are more likely to delay reproduction, by suppressing sexual motivation during estrus, until partner commitment and continued investment become more certain.

When women benefit from higher offspring quantity, the fitness gains of conceiving with an extra-pair partner relative to the benefits of continued reproduction with a primary partner decrease with more reliable partner provisioning.

Predictions:

1. Greater increases in in-pair and/or extra-pair estrous sexual motivations as a function of poor childhood conditions will be more pronounced at early stages of a pair bond.
2. Greater increases in in-pair and/or extra-pair estrous sexual motivations as a function of poor childhood conditions will be more pronounced at lower levels of relationship involvement and attachment.

The estrous sexual motivations of women prioritizing high offspring quality, relative to quantity, promote adaptive sire choice for valued, high-investing partners over extra-pair men and reproduction within strong, supportive pair bonds.

For women investing more in current reproduction and in higher fertility over offspring quality, reproducing with a primary partner and suppressing extra-pair interests in

contexts of strong, supportive pair bonds, and avoiding conception in less supportive or valued relationships, are relatively less important.

Prediction:

Total involvement, loving attachment, and emotional support in the relationship from both partners will more positively predict in-pair relative to extra-pair sexual interest during estrus for women who grew up with more secure childhood health and environmental conditions.

1.6.2 Bond formation

Because partner provisioning within a pair bond promotes shorter interbirth intervals and higher fertility, women with adaptive strategies for increasing reproductive rate and fertility will allocate more effort to pair bond formation during extended sexuality.

Prediction:

As functions of passionate love include solidifying new, risky, or tenuous pair bonds, women with poorer childhood conditions in highly passionate relationships will experience heightened sexual interest in their partner as estrogen levels decrease and/or progesterone levels increase.

1.6.3 Relationship maintenance

After bond formation, women who grew up with risky or adverse childhood conditions—and adopt strategies of greater investment in offspring quantity versus quality—receive lower marginal returns from non-conceptive sexual behaviors that promote maintenance of partner support and investment in stronger bonds.

In contrast, women who grew up with more secure childhood conditions have increased fitness benefits from investing in relationship maintenance as bonds become stronger and thus more valuable for fostering high offspring quality.

Prediction:

When estrogen and/or progesterone levels are characteristic of extended sexuality, total relationship involvement, loving attachment, and emotional support become more negatively associated with in-pair sexual interest for women with poorer childhood conditions, and more positively associated for women with more secure childhood conditions.

1.6.4 Bolstering partner investment

When male partner interest and commitment in the relationship lags behind women's, women who value high levels of partner involvement in cooperative partnerships for production of competitive offspring will show increased in-pair sexual interest during extended sexuality to bolster partner investment in the relationship. Because continued partner investment is uncertain, women will experience decreased estrous sexual motivations for their partner to avoid conception.

But for women with low expectations of partner investment, the expected value of non-conceptive sexual behaviors to increase partner interest in the relationship is relatively low. Moreover, with strategies of investment in current over future reproduction, women will be less likely to suppress conceptive in-pair sexual motivation when their partner's interest in the relationship lags behind their own.

Prediction:

Discrepancies in women's relative to their partner's relationship involvement, romantic passion, supportiveness, and loving attachment will more positively predict in-pair sexual interest during extended sexuality and more negatively predict in-pair sexual interest during estrus for women with more secure childhood conditions.

1.6.5 Mate retention versus mate-switching

When involved in relationships relatively lacking in high-quality partner investment, or when their partner is otherwise unsuitable as a long-term partner, women prioritizing high offspring quality benefit more from mate-switching. They will be more likely to experience increased extra-pair interest during extended sexuality to facilitate mate search and evaluation of potential alternatives, while suppressing sexual motivations for their partner during estrus to avoid conception.

By contrast, women benefit relatively less from mate-switching and from avoiding conception with their partner when optimal strategies favor current reproduction, and when there is a low probability of better-quality investment from men in alternative relationships.

When male investment in offspring is unlikely, unreliable, or has lower relative value, the fitness benefits of genetic contributions to offspring increase. Alternative mates have the potential to provide greater genetic benefits relative to direct benefits under these conditions. Therefore, when circumstances foster women's interest in alternative mates, women are more likely to experience elevated extra-pair sexual interest during estrus for conceptive benefits.

Predictions:

1. When the discrepancy in women's relative to their partner's supportiveness is high, women with more secure childhood conditions will experience greater increases in extra-pair sexual interest during extended sexuality and greater decreases in in-pair sexual interest during estrus.
2. When women are interested in romantic alternatives, those with more secure childhood conditions will experience increased extra-pair sexual interest during extended sexuality; those with less secure childhood conditions will experience increased extra-pair sexual interest during estrus.
3. When primary partners are interested in romantic alternatives, women with secure childhood conditions will have suppressed in-pair sexual motivation during estrus and heightened extra-pair sexual motivation during extended sexuality, relative to women with poor childhood conditions.

1.6.6 Oxytocin and vulnerable relationships

Oxytocin release following thoughts about women's partner will function to coordinate efforts to protect valued but vulnerable relationships, especially for women with strategies of greater investment in offspring quality.

Predictions:

Women from more secure childhood conditions, relative to women from poorer childhood conditions, will exhibit larger oxytocin increases when their partner's relationship involvement is lower than women's (e.g., when discrepancies in women's versus partner's loving attachment, supportiveness, and romantic

passion are high). Their oxytocin responses will be more positively associated with increases in sexual interest in their partner relative to other men during extended sexuality, compared to women with poorer childhood conditions.

1.6.7 Mate preferences

Women with low expectations for reliable, high-quality partner investment will place higher relative value on sire genetic quality. In contrast, partner investment is relatively more fitness-enhancing than genetic benefits for women who value strong, supportive pair bonds for fostering offspring quality. Therefore, women who benefit more from sire genetic quality will experience stronger estrous increases in sexual desire and short-term mate preferences for men with ancestral markers of genetic quality.

Predictions:

1. During estrus, women with high childhood adversity, relative to women with secure childhoods, will experience heightened in-pair relative to extra-pair sexual interest when paired with more sexually attractive partners and partners with higher mate value relative to women's mate value.
2. Women with high childhood adversity will experience more pronounced increases in arousal to attractive bodily features and short-term (relative to long-term) mate preferences for male muscularity and social dominance during estrus.
3. Women from secure childhood backgrounds will experience dampened, or an absence of, estrous shifts in mate preferences for putative indicators of male genetic quality.

Women who grew up in risky, adverse, or relatively disadvantaged environmental conditions will value heritable traits facilitating dominance in a sire.

Predictions:

1. During estrus, women with high childhood adversity, relative to women with secure childhoods, will experience more pronounced increases in short-term mate preferences for male muscularity, physical strength, behavioral masculinity, and social dominance.
2. During estrus, women with high childhood adversity will be more likely to experience heightened in-pair sexual interest when their partner possesses these features, and increased extra-pair sexual interest when their primary partner lacks these features.

When women have higher sexual interest in extra-pair men relative to their partner, those who benefit more from sire choice for heritable qualities for offspring will more strongly prefer men possessing indicators of genetic quality and heritable dominance as sexual partners during estrus. For women who receive greater fitness benefits from male investment in offspring relative to male genetic contributions, estrous shifts in mate preferences are relatively unaffected by their interest in extra-pair men.

Prediction:

Women's extra-pair relative to in-pair sexual interests will moderate estrous shifts in short-term mate preferences for women with high childhood adversity, but not for women with secure childhoods. Women with high childhood adversity will exhibit even stronger increases in sexual preferences for muscularity and social

dominance during estrus when they have higher sexual interest in extra-pair men than in primary partners.

Women with greater susceptibility to illness benefit relatively more from increasing offspring's heritable resistance to disease. Therefore, women with poorer childhood health will experience greater increases in short-term mate preferences for, and sexual interest in, men with ancestral markers of genetic quality during estrus relative to extended sexuality.

Predictions:

Similar predictions are made for women with poor childhood health as for women with high childhood adversity, to the extent that male sexual attractiveness, muscularity, and social dominance reflect high genetic quality conferring heritable resistance to illness.

2 Methods

2.1 Participants

A total of 229 women participated in at least one session of the four-session Relationship Dynamics and Endocrinology Study at the University of New Mexico. Participants were recruited via flyers posted around campus, an advertisement posted on the UNM Psychology Department's website for research participation, and via the UNM Psychology Department's SONA systems subject pool. All participants provided written informed consent to participate in the study. Of these women, only 213 met eligibility requirements of being between the ages of 18–35 years, naturally cycling (not using hormonal birth control, pregnant, or breastfeeding), and currently involved in a heterosexual romantic relationship of at least 3 months duration. Participants who were ineligible included twelve women who were currently using hormonal contraceptives, one who learned she was pregnant, two who were in non-heterosexual relationships, and one who was single.

The relationships of eleven participants ended during the study. Analyses retained all sessions prior to relationship dissolution. The relationships of two other participants were on hiatus during one of their sessions; these non-qualifying sessions were excluded from analyses. Of the 213 eligible participants who completed the first session, 181 attended at least two qualifying sessions, 158 attended at least three sessions, and 154 attended all four sessions (mean number of qualifying sessions = 3.7).

Mean participant age was 20.9 (*SD* = 3.8; range = 18–35). Mean partner age was 22.6 (*SD* = 5.9; range = 17–53). Mean relationship length was 24.7 months (*SD* = 29.6; range = 3–228). Eighteen (8.5%) participants were married. Twenty non-married (9.4%) participants cohabited with their partner. Ten (4.7%) women had children. Most participants were

involved in an exclusive romantic relationship; two (.9%) women were involved with a second person.

The target sample size was 260. In March 2020, new enrollment ceased due to the COVID-19 pandemic. Seven participants who were currently enrolled at the time were unable to complete all four sessions.

2.2 Procedures

2.2.1 Session scheduling

Because we were interested in capturing hormonal variation within women to test effects of interest, sessions were typically scheduled about a week apart over about a month of participation. During Session 1, women reported the first day of their last menses and their typical cycle length. The day of the current cycle was calculated from that information (where day 1 is the first day of the last menses). Based on current cycle day and typical cycle length, we targeted Session 2 for a periovulatory day (depending on cycle length, typically day 10-15) or a mid-luteal day (typically day 19-25). If neither timeframe was upcoming, we targeted an early-to-mid follicular phase day for the next session. Using similar guidelines and updated information about last menses, we scheduled Sessions 3 and 4 at the conclusion of Sessions 2 and 3, respectively.

2.2.2 Study design

The *first session* lasted about 1.75 hours. Women completed an initial questionnaire on their demographics, birth history and experiences, menstrual cycle characteristics (date of last menstrual onset, typical cycle length, cycle regularity), current and past use of hormonal contraceptives, and health qualities and behaviors. They next completed a 10-minute

thought-listing task concerning their partner and relationship (see *Oxytocin and relationship thought-listing task*). Subsequently, they responded to background questionnaires assessing childhood experiences, pubertal timing, their attractiveness, their partner's attractiveness and masculine traits (muscularity, bodily strength, and facial, bodily, and behavioral masculinity), qualities of their relationship specific to themselves, and qualities of their relationship specific to how their partner felt or behaved. They also responded to questions pertaining to their sexual thoughts, feelings, and behaviors over the past 48 hours. Women also provided a urine sample for assays of estrogen, progesterone, testosterone, cortisol, and isoprostane (a measure of oxidative stress; see Appendix section A8 for associations between isoprostane and childhood experiences). At the conclusion of the session, as well as at the end of Sessions 2–3, women were scheduled for their next session and provided collection kits for their first morning urination on the day of their next session.

Sessions 2-4 lasted about one hour. Women brought into the lab the urine sample they collected at home that morning. During the *targeted periovulatory phase session* and *targeted luteal-phase session* (e.g., Sessions 2 and 3), women again performed a 10-minute thought-listing task concerning their partner and relationship. They completed questionnaires on their sexual thoughts, feelings, and behaviors over the past 48 hours. Next, women watched and rated the mate attractiveness of videos of men competing for a lunch date with an attractive woman (*video rating task*). They then rated the attractiveness of photographs of men's bodies varying in muscularity (*body rating task*).

During the *remaining session*, usually a targeted early-mid follicular phase day, women completed questionnaires on their sexual thoughts, feelings, and behaviors over the past 48 hours. They performed attractiveness ratings on photographs of men's bodies and

faces. At the end of each session, participants were compensated for their time. Participants received a $20 bonus upon completing all four sessions and assigned luteinizing hormone (LH) tests (see Appendix, section A1, for details on LH testing).

2.2.3 Study tasks

2.2.3.1 Oxytocin and relationship thought-listing task

Women provided a baseline salivary oxytocin sample via passive drool. Then, they spent 10 minutes writing down their thoughts to the following prompt:

> "Please spend a few minutes thinking about your relationship with your partner. Then write about ways that your partner responds to you in ways that show that your partner truly accepts and connects with you, or how you wish your partner would respond to you in ways that show that your partner truly accepts and connects with you."

Twenty-five minutes after they started the thought-listing task (15 minutes following completion of the task), women provided a second salivary oxytocin sample.

2.2.3.2 Body rating task

During sessions 2–4, women performed a computerized rating task of photographic images of 50 muscular and 50 non-muscular male torsos. Women indicated the sexual attractiveness of each body on a scale from 1 to 10 (least attractive to most attractive) on a keyboard. Perhaps partly because of the short time frames for rating each photograph, using a keyboard, there was wide variability in women's scale usage (within-woman *SDs* in ratings range from 1.83 to 4.43). Primary analyses reported in the main text are on women's ratings, scaled by woman-specific standard deviations in ratings. Analyses on ratings, standardized across women, are reported in Appendix section A7.2.1 and https://osf.io/5t2mb/.

Independently, female undergraduate research assistants rated each torso on their attractiveness. Ratings were averaged together for a cycle phase-independent measure of bodily attractiveness.

2.2.3.3 Video rating task

During their targeted periovulatory and mid-luteal sessions, women watched one of two sets of video clips of 16 men. The order in which the sets were watched was randomized via coin flip.

The videos were taped as part of a past research study (Gangestad et al., 2004). In the original study, 76 male college undergraduates were individually interviewed by an attractive woman over a video camera system for a chance to go out on a lunch date with her. The first set of video clips (*introductory scenario*) were composed of the first minute of the interview, in which men answered six questions asked by the female interviewer. After this portion of the interview, the male participants were introduced to another male competitor that the woman was also considering for the date. In the second set of video clips (*competitive scenario*), the men were filmed telling their competitor why the woman should choose them for the date.

Third-party raters scored the men on their physical attractiveness, muscularity, and behavioral displays. Ratings were factor analyzed. Videos of the eight men scoring at the lowest and highest in social dominance were selected for women to watch in the current study.

Women rated the men on their attractiveness as short-term, sexual partners and as long-term romantic partners on a 7-point Likert scale (1 = not at all, 4 = about average, 7 = very attractive). Women's ratings for two items on short-term attractiveness were averaged

together: “How sexually attractive do you find this person?” “If you were single, how attractive would you find this person as a casual sexual partner?” Their responses for the two items on long-term attractiveness were also averaged: “If you were single, how attractive would this person be for an exclusive, committed relationship?” “If you were single, how attractive would you find this person for a long-term stable relationship?” A difference score was computed for short-term versus long-term attractiveness.

Woman-specific standard deviations in ratings for short-term attractiveness ranged from .09 to 2.44. Woman-specific standard deviations in ratings for long-term attractiveness ranged from 0 to 2.47. Those with 0 variability in responses (1.1% of observations) were excluded from analyses. Primary analyses reported in the main text are on women’s ratings, scaled by woman-specific standard deviations in ratings. Analyses on ratings, standardized across women, are shown in Appendix section 7.2.2. and https://osf.io/5t2mb/.

2.3 Hormone measures

2.3.1 Ovarian hormones

Hormone assays. Estrogens and progesterone are excreted into urine in their metabolized form; thus, we analyzed for the major metabolites using antibodies for estrogen conjugates (E1C, capturing several metabolites) and pregnanediol-glucuronide (PdG) (O’Connor et al., 2014; Roos et al., 2015). See Appendix section A1 for details on hormone assays.

Log-transformation of hormone values. Women’s estrogen and progesterone concentrations were non-normally distributed and thus log-transformed prior to analysis. In separate analyses on the current dataset and another large, publicly available dataset, log-

transformed estrogen and progesterone levels outperformed raw levels in predicting women's luteinizing hormone surge, sexual desire, and mate preferences for male muscularity (Dinh, Emery Thompson, & Gangestad, 2022). As Sollberger and Ehlert (2016) argue on statistical and substantive grounds, ratios of hormone levels are best log-transformed prior to use in analyses. Additionally, log-transformation decreases positive skew in hormone distributions and tends to linearize associations between hormone levels and outcomes (Sherry et al., 2014). As specified in our preregistration of the overall study, analyses use log-transformed estrogen and progesterone.

Within-woman and between-woman hormone levels. Within-woman variations in hormone levels are of primary interest. Each woman's estrogen levels and progesterone levels were averaged across her sessions for computation of between-woman hormone values. Session-specific hormone levels were then centered within-woman, by subtracting each woman's average estrogen or progesterone level from her respective session-specific hormone level.

2.3.2 Oxytocin

Salivary oxytocin levels were assayed at baseline and 15 minutes following completion of the 10-minute thought-listing task. Standardized residualized oxytocin change scores were derived from regressing post-manipulation oxytocin on baseline oxytocin.

228 participants provided oxytocin samples. Due to a freezer malfunction, assays were not obtained for 87 participants. Samples from 141 participants were retained.

2.4 Childhood measures

During their initial session, women responded to items pertaining to their birth experiences, history of childhood infectious illness, and timing of pubertal development. They also responded to scales assessing their early-life family environments, relationship quality with their parents, and exposure to violence.

2.4.1 Childhood health

Birth complications. Participants indicated whether the following experiences applied to their birth: born by C-Section; born premature; born late; born with low birth weight (less than 5 lbs, 8 oz.); born with very low birth weight (less than 3 lbs, 5 oz.); received specialized care in a neo-natal intensive care unit; hospitalized longer than typical following birth; mother was bedridden due to complications during her pregnancy; mother experienced gestational diabetes; mother experienced hypertension during her pregnancy.

Responses were factor analyzed using principal axis factoring, and the first factor was extracted via regression method. Visual inspection of the factor score frequency distribution revealed an outlier falling beyond a gap in the continuous distribution of values (+6.12 SD gap). The outlying value was winsorized to the next highest non-outlying value.

Vulnerability to infectious illness. Participants answered, from much less (1) to much more (7), "Relative to other students, how many days of elementary school, junior high, and high school did you miss because you were sick?"

2.4.2 Childhood adversity

Women responded to the five scales below assessing their early-life family environments, relationship quality with their parents, and exposure to violence. Rather than creating composite measures for each childhood scale, responses on individual items from

the five scales were entered into an exploratory factor analysis. Results of the factor analysis were used to create composite measures of more closely related items (see *Composite measures of childhood experiences*).

Family unpredictability and conflict. The Childhood Unpredictability Scale included 10 items that assess early-life family instability (e.g., "My family life was generally inconsistent and unpredictable from day-to-day"; α=.91), with responses anchored on a 7-point Likert scale (1 = not at all true, to 7 = extremely true) (Fennis et al., 2020; Maner et al., 2017; Mittal & Sundie, 2017; Young et al., 2018). In addition, the Risky Families Questionnaire included 15 items measuring the frequency of experiences of cold parenting, conflict, and neglect (e.g., "How often did a parent or other adult in the household swear at you, insult you, put you down, or act in a way that made you feel threatened?") on a scale from 1 (not at all) to 5 (very often) (Taylor et al., 2004).

Maternal and paternal relationship quality. Women rated their relationship quality with their mother and their father from before age sixteen, from worst (1) to best (7) possible relationship. Women also responded to four questions each, on the warmth and supportiveness of their mother and father (e.g., "When I was growing up, my [MOTHER / FATHER] made me feel loved, supported, and cared for"). Responses were anchored on a 7-point Likert scale, from 1 (not at all true) to 7 (extremely true).

Exposure to violence. Five questions assessed the childhood frequency that an adult in the household physically abused the participant (2 items: "push, shove, or slap"; "hit, kick, or beat you up"), sexually abused the participant (1 item: "sexually molest or assault"), and physically abused another child (2 items: "push, shove, or slap"; "hit, kick, or beat up"). Three items, adapted from screening questions from Crouch et al. (2000), assessed childhood

frequency of witnessing someone hurt another person, witnessing someone hurt or threatened with a weapon, or witnessing someone being robbed.

2.4.3 Composite measures of childhood experiences

2.4.3.1 Initial composites and factor analysis

Items on childhood unpredictability, risky families, paternal relationship quality, maternal relationship quality, and exposure to violence were entered in an exploratory factor analysis. Five factors were extracted. Because a missing response on any item would generate missing values on participant factor scores, I instead created five mean composites: Items with the highest loadings on each factor were *z*-scored and then averaged into composites for family instability, paternal warmth, maternal warmth, household violence, and observed violence.

Two uncorrelated factors ($r = .02$, $p = .61$) were extracted, with direct oblimin rotation, in an exploratory factor analysis of the birth complications factor, childhood illness, and the five childhood adversity composites. Family instability, paternal warmth, maternal warmth, household violence, and observed violence loaded on the first factor. Birth complications and childhood illness loaded on a second factor.

2.4.3.2 Childhood Health composite and Childhood Adversity factor

Because of highly unequal weighting of birth experiences and childhood illness in a factor score, I averaged together their standardized scores and multiplied by –1 to create a composite for *Childhood Health* (i.e., higher scores indicate better health). This composite was then standardized.

Next, I performed a separate factor analysis of the five childhood adversity composites, using principal axis factoring. Using regression method, I extracted a factor for *Childhood Adversity*.

2.4.4 Age of pubertal onset

Women reported their age of first menses and whether their first menses occurred earlier or later than their female peers. They also reported whether their breasts developed earlier or later, and whether they started development of a "womanly shape" earlier or later, compared to female peers. The three relative timing items were anchored on a Likert scale from 1 (at a much younger age) to 7 (at a much older age). Retrospective reports of relative timing have reasonable validity for large-scale studies (Mendle et al., 2019). Responses on the two menarche items (age and relative timing) were *z*-scored and averaged to form a composite for *timing of menarche.* Responses on the two items measuring relative timing of physical maturity (breasts and womanly shape) were averaged to form a composite for *developmental timing of secondary sexual characteristics.* Finally, these two composites (timing of menarche and developmental timing of secondary sexual characteristics) were *z*-scored and averaged to form an overall composite of *age of pubertal onset.*

2.5 Mate value and partner features

As part of the relationship background questionnaire, measures assessed women's mate value, their partner's mate value, and characteristics of their partner.

Attractiveness/mate value. Women rated their partner's attractiveness on seven items (adapted from Landolt et al., 1995): "Relative to most men of his age: (1) "Members of the opposite sex notice my partner"; (2) "Members of the opposite sex are *not* very attracted to

my partner" [reverse-coded]; (3) "Members of the opposite sex are attracted to my partner"; (4) "Members of the opposite sex are *not* very interested in my partner" [reverse-coded]; (5) "I consider my partner (much less to much more attractive)"; (6) "My partner has a very attractive face"; (7) "My partner has a very attractive body." Items 1–4 were rated on a 1 (strongly disagree) to 7 (strongly agree) scale. Items 5–7 were rated on a 1 (much less attractive) to 7 (much more attractive) scale. Women also rated their own attractiveness on the seven items, with references to self instead of references to partner.

As items may differentially capture attractiveness, principal axis factor analysis was performed on the items on partner attractiveness, and separately on the items on women's attractiveness. A single factor was extracted for each, with scores estimated via regression method. For partner attractiveness, loadings ranged from .61 to .77. For women's attractiveness, loadings ranged from .65 to .84. A *partner attractiveness versus women's attractiveness* difference score was computed by subtracting women's attractiveness from partner attractiveness.

Partner strength/bodily attractiveness. Male partner *strength* was assessed with, "Compared to other men of the same age, my partner is physically stronger than __" (1 = 1% to 11 = 99% scale). Women rated their partner's *bodily masculinity*: "How masculine is your partner's body, compared to most men of the same age? (By masculine, we mean stereotypically male)" (1 = much less, 7 = much more). A rating of partner *bodily attractiveness* was taken from the Partner Attractiveness measure (see item 7 above). Partner strength, bodily masculinity, and bodily attractiveness were factor analyzed using principal axis factoring. A single factor was extracted, with scores for *partner strength/bodily attractiveness* estimated using regression method.

Partner behavioral masculinity. Women rated their partner on, "How masculine is your partner's behavior, compared to most men of the same age? (By masculine, we mean stereotypically male)" (1 = much less, 7 = much more).

Partner social potency. Ten items assessed male partner's social potency (from the MPQ; Tellegen & Waller, 2008). Using principal axis factor analysis, a first factor was extracted, with scores estimated using regression method. Items with the highest loadings included, "My partner has a natural talent for influencing people," "My partner is quite good at talking people into things," and "My partner is quite good at getting others to see his way."

2.6 Relationship features

2.6.1 Relationship length

The duration women had been involved with their partner, in months, was log-transformed and standardized prior to analysis.

2.6.2 Relationship scales

During their first session, women completed a battery of questionnaires on qualities of their relationship. Women responded to the same scales, first in relation to themselves and next in relation to how their partner felt or behaved in the relationship.

The Partner-Specific Investment Inventory (PSII; Ellis, 1998). We administered a total of 50 items, from 8 subscales: Expressive/Nurturing; Tolerant/Permissive/Agreeable; Future-Oriented; Giving of Time; Sexually Proceptive; Honest; Socially Attentive; Not Sexualizing of Others.

The Perceived Relationship Quality Components (PRQC; Fletcher et al., 2001). The following 6 components of relationship quality were assessed with 18 total items: Satisfaction, Commitment, Intimacy, Trust, Passion, Love.

Social Responsiveness (based on Canavello & Crocker, 2010). Four items assessed responsiveness to a relationship partner's needs and feelings.

Bond Strength (based on Tancredy & Fraley, 2006; see also Eastwick & Finkel, 2012). Ten items pertained to attachment and bonding to their partner.

2.6.3 Relationship quality factor scores

First, a general dimension of *relationship involvement* for women and their partner was extracted using principal components analysis of composite scores for the 16 scales. First-pass analyses will use this general dimension. However, this general dimension is likely insufficient for capturing important variation in relationship qualities. Using principal axis factor analysis of the 16 scales, four correlated factors were extracted using direct oblimin rotation following visual inspection of scree plots. Scores were estimated using Bartlett's method, which yields more independent, less correlated factor scores in comparison to regression method (DiStefano et al., 2009). As these factors appear to represent distinct dimensions of relationship qualities, primary analyses will examine interactions with each of these factors simultaneously for analysis of unique effects of each.

Loving attachment. High loadings (> .4) by Bond Strength (.83), Future-Oriented (.67), Love (.67), Commitment (.53), Giving of Time (.45). This factor can be interpreted as how attached and bonded each partner is to the other. High scores indicate long-term-oriented, high levels of commitment in the relationship.

Emotional support and trust. High loadings by Tolerant/Permissive/Agreeable (.70), Social Responsiveness (.63), Expressive/Nurturant (.61), Trust (.58), Intimacy (.54), Satisfaction (.43). The subscale with the highest loading (named Tolerant/Permissive/Agreeable) comprises of items on trust, jealousy, and being controlling. Social Responsiveness and Expressive/Nurturant consisted of items on being sensitive, understanding, and willing to share and listen to thoughts, opinions, secrets, etc. This factor can be interpreted as the amount of emotional support and trust in the relationship, as opposed to antagonism, intolerance, and suspicion.

Romantic/sexual passion. High loadings by Passion (.93) and Sexually Proceptive (.63). This factor is self-explanatory, though the functions of sexual passion are less straightforward and may differ for men and women. Presumably, sexual passion motivates sex and perhaps also to *communicate* willingness and interest in sex. Possible functions may include solidifying tenuous bonds (e.g., new or unstable relationships), paternity assurance, conception with a particular partner. Previous research indicates that sexual passion is positively associated with attachment anxiety and negatively associated with attachment avoidance (Davis et al., 2004).

Dishonesty and interest in romantic alternatives (non-exclusivity). High loadings by Dishonest (.62), Sexualizing of Others (.45), and Socially Neglectful (.43). Women first indicated their dishonesty/feelings of non-exclusivity and then reported on their perceptions of their partner's dishonesty/non-exclusivity. Neglecting one's partner when around others, being deceptive, and being physically interested in others may indicate an interest in seeking alternative mates.

For relationship involvement and each relationship quality factor, we computed a *total* score summing woman-specific and partner-specific factor scores and a *discrepancy* score subtracting partner-specific scores from woman-specific scores.

2.7 Sexual thoughts, feelings, and behaviors

During each session, women reported on their sexual thoughts, feelings, and behaviors over the past two days (48 hours). They indicated their interest in having sex with an attractive stranger and rated their sexual arousal to seeing attractive bodies on that current day.

2.7.1 In-pair sexual interest and behavior

In-pair attraction. Five items assessed women's attraction to and sexual interest in their primary partner over the past two days. Of these, one item assessed women's *absolute strength* of attraction to their partner: "I felt strong sexual attraction toward my primary current partner" (rated 0 [not at all] to 4 [a great deal]). The other four items assessed the *frequency* of sexual thoughts and feelings over the past two days, *relative* to typical days: "Had sexual thoughts/fantasies about my partner," "Wanted to spend time alone with my partner," "Felt sexual attraction towards my partner," "Noticed that my partner looked attractive" (rated -3 [far less than usual] to +3 [far more than usual]).

To create a composite score of overall in-pair attraction, we placed the five items on the same scale (0 to 6) prior to averaging responses: scores for the absolute strength of attraction item (on a 0 to 4 scale) were multiplied by 1.5; for the four relative frequency of attraction items, we added 3 to each score (on a -3 to 3 scale). Composite scores were not

computed for observations with missing values on more than 2 items (2/702 cases = .3%), which were thus excluded from analyses.

Frequency of woman-initiated sex. Participants gave a numerical response to the question, "On how many occasions did you initiate sexual activity with your partner?" Responses were treated as indicators of female interest in in-pair sex. Participants also reported frequencies of sex with their partner, their partner's initiation of sex, and their rejections of partner advances.

2.7.2 Extra-pair sexual interest

Extra-pair attraction. Six items assessed women's attraction to and sexual interest in men other than their primary partner over the past two days. One of the six items assessed the *absolute strength* of women's attraction to extra-pair men: "I felt strong sexual attraction toward someone other than a current partner" (rated 0 [not at all] to 4 [a great deal]). The other five items assessed the *frequency* of sexual thoughts and feelings over the past two days, *relative* to most days: "Felt sexual attraction toward a man other than my partner," "Had sexual thoughts/fantasies about someone other than my partner," "Noticed attractive men around town," "Been physically attracted to an acquaintance, friend, or co-worker," "Been physically attracted to a stranger" (rated -3 [far less than usual] to +3 [far more than usual]).

We created extra-pair attraction composite scores, with the same procedures used to create in-pair attraction composites.

Interest in having extra-pair sex. Women responded to the following scenario about the potential for sex with a highly attractive extra-pair partner, on a 1 (not at all likely) to 7 (very likely) scale:

> "Imagine that you met a very interesting and attractive person today, and you were very sexually attracted to this person and this person was very sexually attracted to you. Imagine that you have the evening free and you are able to spend the evening with this person. How likely do you think you would be to have sex with this person today, if you could be sure that no one would ever find out about it?"

2.7.3 In-Pair and Extra-Pair Sexual Interest composite measures and difference scores

In-Pair Sexual Interest. We averaged together the standardized scores for the frequency of woman-initiated sex and for the in-pair attraction composite to create an overall composite score for In-Pair Sexual Interest. Primary analyses use this standardized measure.

Extra-Pair Sexual Interest. We averaged together the standardized scores for women's interest in having extra-pair sex and for the extra-pair attraction composite to create an overall composite score for Extra-Pair Sexual Interest. Primary analyses use this standardized measure.

In-Pair vs. Extra-Pair Sexual Interests. We computed a difference score for In-Pair versus Extra-Pair Sexual Interests (In-Pair Sexual Interest – Extra-Pair Sexual Interest). Analyses first assess associations with In-Pair versus Extra-Pair Sexual Interest, followed by analyses separately examining In-Pair and Extra-Pair Sexual Interests.

2.7.4 Sexual interest in attractive bodily features

Women responded to ten items regarding their sexual arousal to and interest in seeing an attractive person's body (e.g, "Seeing the arm or leg muscles of an attractive opposite-sex person subtly flex would be a real turn-on right now"). They indicated how they felt on the current day (1 = agree not at all, to 7 = very strongly agree).

2.8 Statistical analyses

Multilevel linear regression models, with observations nested within women, were conducted using lme4 on R version 4.2.2. Parameters were estimated via restricted maximum likelihood, with Satterthwaite approximation for degrees of freedom. Analyses examined whether interactions between women's hormones, childhood adversity/health, and relationship features or a male moderator of interest (e.g., partner attractiveness, target male's muscularity) predicted women's sexual interests, change in oxytocin levels, and mate preferences. Predictors and outcome variables were standardized prior to analysis, except for dichotomous (dummy/effect coded) variables, oxytocin change scores (standardized residual change scores, with 0 = no change), and partner attractiveness versus women's attractiveness (where 0 = no difference). Model descriptions below focus on highest-order interactions; all lower-order terms are also included in analyses.

2.8.1 Random components

All analyses modeled random intercept variation across participants. In initial models in which the only level-1 variables of interest are hormone levels, I included random slopes for within-woman estrogen and progesterone. In final models, I applied Matuschek et al.'s (2017) criteria of inclusion, to control for Type I error rates while retaining power to test fixed effects (see also Bates et al., 2015). I retained any random slope with $p \leq .20$. This was a backward sequential elimination process. If, in the initial model, at least one random slope term had $p > .20$, I excluded the term with the greatest p value and re-ran the model with the remaining term. If one or more random slope was retained, I retained covariances between random slopes and intercepts if $p \leq .20$. I did not model random slope variation for control

variables (e.g., menses); these components sacrifice power without affecting Type I error rates in tests of fixed effects of interests.

Preference shifts. For cross-classified models on preference shifts, random intercept variation was modeled across women and across target males. Random effects for the participant × target male interaction was also modeled, which accounts for variation in different women's idiosyncratic preferences for particular men (Judd et al., 2012). I used the same backwards-elimination model selection criteria for these analyses. In initial models in which within-woman hormones × In-Pair vs. Extra-Pair Sexual Interests × male feature interactions are the level-1 variables of interest, I included the only highest-order within-woman interaction terms (e.g., within-woman estrogen × In-Pair vs. Extra-Pair Sexual Interests × target muscularity). Final models allow for interpretation of higher-order effects without inflating Type I error rates (Barr, 2013). In marginal effects models, I applied the same inclusion criteria for random slopes of simple effect variables of interest. Because convergence issues were more common due to more complex error structures, cross-classified models included random slope and intercept variation but did not model covariances between random components.

2.8.2 Primary predictors of interest

All analyses presented simultaneously examine interactions between within-woman estrogen levels and childhood experience (adversity/health) and between within-woman progesterone levels and childhood experience (adversity/health). Most, but not all, models test whether a third interaction term of interest moderate these hormone × childhood experience interactions.

Hormone measures. Hormonal predictors included four log-transformed variables: within-woman estrogen, between-woman estrogen, within-woman progesterone, and between-woman progesterone. Within-woman hormone changes are of primary interest. Main effects of between-woman hormone levels and whether women were menstruating (dummy coded, with not currently menstruating = 0) are included in all models, except for analyses on the video rating task, which often did not converge when these control variables were included. Interactions with between-woman hormone levels are not of primary interest and thus not included in analyses presented, unless of meaningful effect. Within- and between-woman components are orthogonal; hence, inclusion versus exclusion of interactions with between-woman components makes little to no difference to estimates for interactions involving within-woman hormone levels.

When interpreting interactions with estrogen and progesterone levels, references to cycle phases describe the direction of the interaction effect. Interactions with estrogen that are positive in direction, and interactions with progesterone that are negative in direction, are described as the effect of the moderating variable as hormone levels approach or become characteristic of *periovulatory phase levels*. Interactions with progesterone that are positive in direction, and/or interactions with estrogen that are negative in direction, are described as the effect of the moderating variable as hormone levels approach or become characteristic of *luteal phase levels*.

For simple effects estimated during *estrus*, estrogen levels are centered at 1 *SD* above the mean and progesterone levels are centered at 1 *SD* below the mean. Simple effects estimated during *extended sexuality* are with estrogen levels centered at 1 *SD* below the mean and progesterone levels centered at 1 *SD* above the mean. In most cases, effects of estrogen

and progesterone levels are opposite in direction (even if nonsignificant). For analyses in which progesterone's effect is significant, while estrogen's effect runs nonsignificantly in the same direction, simple slopes models are run with estrogen levels mean-centered and progesterone levels centered at 1 *SD* above and below the mean. In these cases, simple effects estimated during the *follicular phase* are with progesterone levels centered at 1 *SD* below the mean and estrogen levels mean-centered; simple effects estimated during the *luteal phase* are with progesterone levels centered at 1 *SD* above the mean and estrogen levels mean-centered.

Childhood experiences. Separate analyses are performed using either adversity or health as the childhood predictor. These measures are weakly correlated, $r = -.08$. Simple effects for women with adverse childhoods/high childhood adversity and for women with secure childhoods/low childhood adversity are estimated with childhood adversity centered at 1 *SD* above and below the mean, respectively. Simple effects for women with good childhood health and for women with poor childhood health are estimated with health centered at 1 *SD* above and below the mean, respectively.

2.8.3 Analyses on in-pair and extra-pair sexual interests

2.8.3.1 Dependent variables

In-Pair vs. Extra-Pair Sexual Interests. I first ran multilevel models on the difference score of In-Pair Sexual Interest – Extra-Pair Sexual Interest.

In-Pair Sexual Interest. I next ran multilevel models on In-Pair Sexual Interest. In follow-up analyses, I performed these multilevel models on the two constituents of In-Pair Sexual Interest: overall in-pair attraction and woman-initiated sex. I also separately analyzed

frequency of in-pair attraction relative to other days and absolute strength of in-pair attraction.

Extra-Pair Sexual Interest. I ran the same multilevel models substituting Extra-Pair Sexual Interest for In-Pair Sexual Interest. In follow-up analyses, I performed these same multilevel models on the two components of Extra-Pair Sexual Interest: overall extra-pair attraction and interest in having extra-pair sex. I next ran separate analyses on the two constituents of extra-pair attraction: frequency of extra-pair attraction relative to other days and absolute strength of extra-pair attraction.

2.8.3.2 Independent variables

For each analysis set, highest-order interactions of interest included 3-way interactions between childhood experiences (adversity/health), within-woman hormones (estrogen and progesterone), and the following predictor variables.

Analysis set 1: Relationship length. Analyses examined interactions between childhood experience, within-woman hormones, and relationship length.

Analysis set 2: Relationship involvement. Analyses first entered hormone × childhood experience interactions with the total (women's + partner's) and discrepancy (women's – partner's) in relationship involvement (four 3-way interactions in each analysis). Follow-up analyses examined whether women's and partner's relationship involvement had unique effects on women's sexual interests, by substituting total and discrepancy in involvement with women's and partner's involvement.

Analysis set 3: Relationship qualities. For each childhood measure, four separate sets of analyses were performed to investigate the potential moderating effects of different relationship qualities. First, primary analyses simultaneously examined the total (women's +

partner's) of, and discrepancy (women's – partner's) in, woman- and partner-specific loving attachment, emotional support/trust, romantic passion, and interest in romantic alternatives. Second, follow-up analyses simultaneously examined woman- and partner-specific measures. These analyses probe whether the unique effects of woman- or partner-specific scores drive results from the previous set of analyses. But because woman- and partner-specific scores for each relationship quality highly correlate, multicollinearity can obscure moderation effects. Therefore, the third and fourth sets of analyses separately tested woman-specific or partner-specific relationship qualities, respectively. These final sets of analyses permit a reduction in the number of terms and offer a test for robustness.

Analyses on relationship qualities also include tests of interactions between hormones, childhood adversity, and partner attractiveness. Results for relationship qualities are virtually identical without their inclusion.

Analysis set 4: Partner mate value. Analyses on whether partner features moderate hormone × childhood adversity interactions on women's sexual interests were performed controlling for and without controlling for relationship qualities. Primary analyses tested whether partner attractiveness moderated associations with sexual interests. Subsequent analyses substituted partner attractiveness with the following measures: partner attractiveness relative to women's attractiveness (a difference score), partner behavioral masculinity, partner social potency, and partner strength/bodily attractiveness. Follow-up analyses examined effects of the components of partner strength/bodily attractiveness: strength, bodily masculinity, and bodily attractiveness.

Analysis set 5: Oxytocin change. Analyses tested whether interactions between hormones, childhood experience, and oxytocin residuals predicted women's sexual interests.

2.8.4 Analyses on oxytocin change as the outcome

The same four sets of analyses with 3-way interactions between childhood experience, hormones, and relationship qualities were performed (see *Analysis set 3: Relationship qualities*), with oxytocin change as the outcome variable.

2.8.5 Analyses on mate preferences

2.8.5.1 Sexual interest in attractive bodily features

Analyses tested whether interactions between within-woman hormones and childhood experience predicted women's sexual arousal to and interest in seeing an attractive person's body.

2.8.5.2 Photo ratings: Preferences for bodily muscularity

For analyses on women's preferences for muscular male bodies in the photo-rating task, I performed cross-classified, multilevel models. The outcome variable, *sexual attractiveness rating*, was regressed on childhood experience (adversity/health) × hormones (estrogen and progesterone) × In-Pair vs. Extra-Pair Sexual Interests × torso muscularity and all lower-order terms.

2.8.5.3 Video ratings: Preferences for social dominance and muscularity

Cross-classified, multilevel models on women's ratings of *short-term versus long-term attractiveness* of men in the video rating task assessed women's short-term mate preferences for muscular and socially dominant men. I followed up with analyses on ratings of *short-term attractiveness* and *long-term attractiveness*, although no predictions were made for the latter.

The predictor variables included interactions between childhood experience (adversity/health), hormones (estrogen and progesterone), In-Pair vs. Extra-Pair Sexual Interests, and target male social dominance and all lower-order terms. Separate analyses examined equivalent interactions with male muscularity as the mate preference predictor (instead of social dominance). Both sets of analyses also control for parallel interactions with target male attractiveness.

3 Results

First, I assess bivariate relationships between specific childhood experiences and *pubertal timing*, a core biomarker of fast-versus-slow life history trajectories. I next report results of multilevel regression models analyzing how childhood adversity and health differentially impact effects of moderating variables on hormone-dependent changes in women's *in-pair and extra-pair sexual interests*. Moderating variables examined include relationship characteristics (length, overall involvement, relationship qualities), partner mate value, and women's oxytocin response following a relationship thought-listing task. I follow with examination of whether relationship qualities predict women's *oxytocin response*. Subsequently, I assess whether hormone-dependent shifts in women's *mate preferences* differ as a function of childhood experiences and women's in-pair versus extra-pair sexual interests.

Complete output and syntax of analyses are available on my dissertation project page on Open Science Forum: https://osf.io/57pm3/.

3.1 Associations between childhood experiences and pubertal timing

Bivariate correlations between pubertal timing and childhood experiences are displayed in Table 1. Childhood health and its components, birth complications and infectious illness, were significantly correlated with age of pubertal onset—positively for childhood health and negatively for birth complications and infectious illness. Childhood adversity and its components were not (except for a marginally significant negative correlation with observed violence).

Table 1. Correlations between age of pubertal onset and childhood experiences

	Childhood Health Composite	Birth Complications	Infectious Illness
r	**.19**	**-.14**	**-.18**
p	**.006**	**.049**	**.008**

	Childhood Adversity Factor	Family Instability	Paternal Warmth	Maternal Warmth	Household Violence	Observed Violence
r	-.06	-.05	.02	.06	-.03	*-.13*
p	.375	.486	.770	.389	.679	*.070*

Notes. Significant (***p* < .05**) correlations are **bolded**. Correlations with *p < .10* are *italicized*.

3.2 Hormonal interactions with relationship length

Initial analyses assessed whether women with poor childhood health or from more adverse childhood backgrounds are more likely to experience increases in-pair and extra-pair sexual interests when conceptive, and whether cyclic differences in sexual interests as a function of childhood adversity/health are further moderated by relationship length. All else equal, changes in estrogen and progesterone did not differentially predict In-Pair or Extra-Pair Sexual Interests as a function of childhood health or adversity. However, hormonal effects moderated by childhood adversity—but not childhood health—appeared to be qualified by differences in the length of women's relationship with their partner.

Analyses on In-Pair versus Extra-Sexual Interests and separately on In-Pair Sexual Interest showed no significant interactions between childhood adversity, relationship length, and within-woman hormone levels (*p*'s > .3). For Extra-Pair Sexual Interest, the 3-way

interaction was significant for both estrogen ($\gamma = -.07$, $p = .008$) and progesterone ($\gamma = .08$, $p = .008$). See Appendix section A2, Table A1. When women were in relationships of relatively short duration (1 *SD* below the mean), estrogen more positively and progesterone more negatively predicted Extra-Pair Sexual Interest as childhood experiences with adversity increased (estrogen × adversity interaction: $\gamma = .07$, $p = .046$; progesterone × adversity: $\gamma = -.08$, $p = .036$).

In relatively new relationships, women with adverse childhoods (1 *SD* above the mean) experienced significant increases in Extra-Pair Sexual Interest as estrogen levels rose ($\gamma = .13$, $p = .007$) and progesterone levels fell ($\gamma = -.13$, $p = .012$). In contrast, women with secure childhoods did not show hormone-dependent changes in their sexual interests for other men when involved in relatively new relationships ($p > .5$). Differences in women's Extra-Pair Sexual Interest as a function of the interaction between childhood adversity and relationship length were specific to estrus (2-way interaction: $\gamma = -.25$, $p = .003$ [estrus]; $\gamma = .05$, $p = .54$ [extended sexuality]). As relationship duration increased, however, estrogen's effect became less positive (estrogen × relationship length: $\gamma = -.12$, $p = .0007$) and progesterone's effect became less negative (progesterone × relationship length: $\gamma = .07$, $p = .047$) for women with high childhood adversity.

3.3 Moderation by relationship involvement

Prior to examining impacts of separate relationship qualities on women's sexual interests, simplified models first assessed hormonal interactions with overall relationship involvement and childhood experiences.

3.3.1 Interactions with childhood adversity

Results revealed a significant negative 3-way interaction between childhood adversity, total relationship involvement, and progesterone in predicting women's In-Pair versus Extra-Pair Sexual Interests ($\gamma = –.06$, $p < .010$). These results were driven primarily by effects on women's In-Pair, but not Extra-Pair, Sexual Interest (3-way interaction for In-Pair: $\gamma = –.09$, $p = .002$; for Extra-Pair: $\gamma = –.01$, $p = .793$). See Appendix A3.1, Tables A2-A3.

For women with high childhood adversity, total relationship involvement became less positively associated with women's In-Pair Sexual Interest as hormones approached luteal-phase levels (progesterone × total involvement: $\gamma = –.10$, $p = .017$; estrogen × total involvement: $\gamma = .09$, $p = .024$). The reverse was observed for women from secure childhoods: Total relationship involvement became more positively associated with In-Pair Sexual Interest as progesterone levels increased and estrogen levels decreased (progesterone × total involvement: $\gamma = .08$, $p = .093$; estrogen × total involvement: $\gamma = .08$, $p = .123$). The association between total relationship involvement and In-Pair Sexual Interest was significantly different across experiences with childhood adversity during extended sexuality (adversity × total involvement: $\gamma = –.25$, $p = .0005$), but not during estrus (adversity × total involvement: $\gamma = –.05$, $p = .412$). In particular, total relationship involvement was positively and significantly associated with In-Pair Sexual Interest across cycle phases for women with low childhood adversity but only during estrus for women with high childhood adversity (Figure 1).

Women's and partner's involvement in the relationship did not have independent effects on women's sexual interests (p's > .10)

Figure 1. Marginal effects of total relationship involvement on In-Pair Sexual Interest during estrus and extended sexuality, for women with low and high childhood adversity

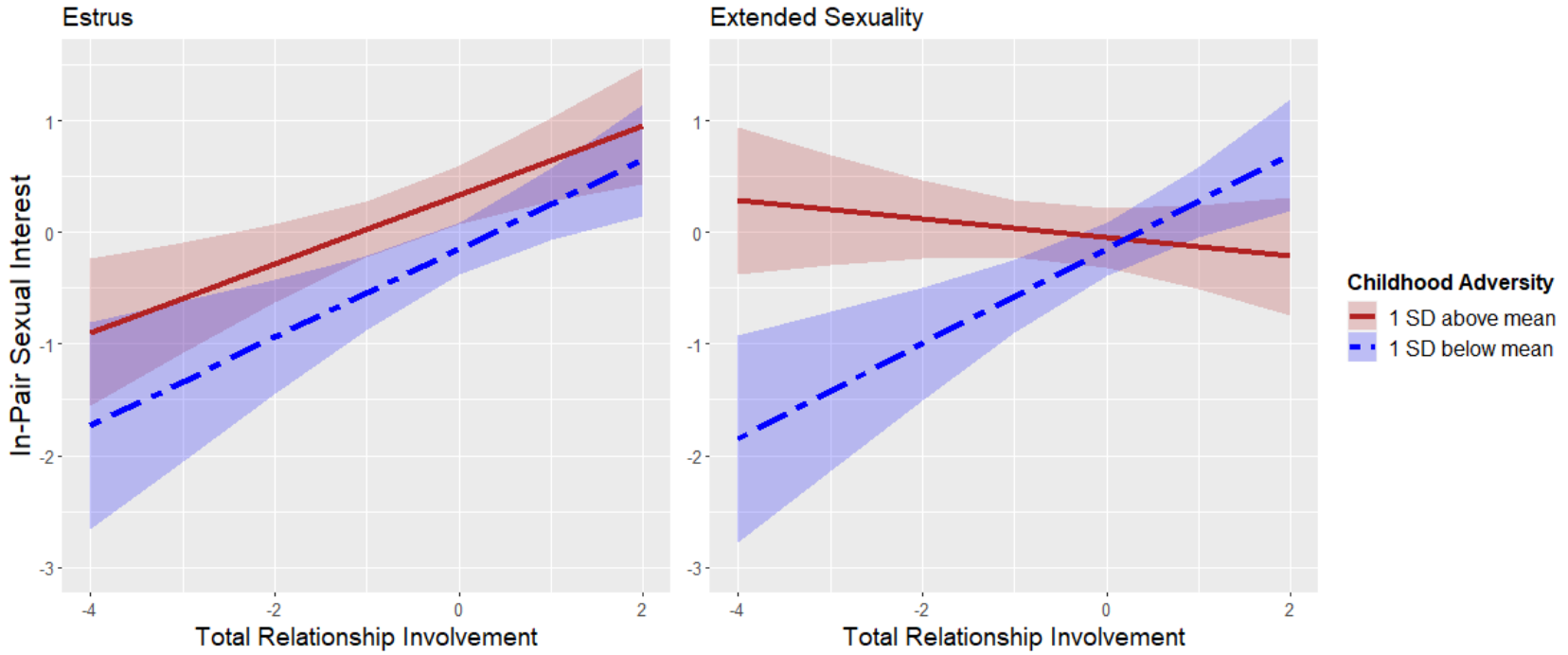


Figure caption. Total relationship involvement is positively associated with In-Pair Sexual Interest during *extended sexuality* (right graph) for women with *low childhood adversity* (blue dashed line), while there is no significant association for women with *high childhood adversity* (red solid line).

3.3.2 Interactions with childhood health

In analyses involving childhood health, the discrepancy in women's versus partner's relationship involvement significantly interacted with health and progesterone levels to predict women's In-Pair versus Extra-Pair Sexual Interests ($\gamma = .10$, $p = .048$). This effect was driven by unique effects of women's and partner's involvement in the relationship in opposing directions: positive for the 3-way interaction with women's involvement ($\gamma = .20$, $p = .058$) and negative for the 3-way interaction with partner's involvement ($\gamma = –.20$, $p = .048$). For women with poor childhood health, the discrepancy in relationship involvement became more positively associated with women's In-Pair versus Extra-Pair Sexual Interest as progesterone levels decreased ($\gamma = –.17$, $p = .014$). Women's involvement more positively predicted their In-Pair over Extra-Pair Sexual Interest, while partner's involvement more negatively predicted it, as progesterone approached periovulatory phase levels (women's involvement × progesterone: $\gamma = –.39$, $p = .010$; partner's involvement × progesterone: $\gamma = .32$, $p = .026$). See Figure 2.

There were no significant hormone-dependent changes in In-Pair versus Extra-Pair Sexual Interests for women with good childhood health. Three-way interactions with total relationship involvement were nonsignificant, such that total involvement was significantly and positively associated with women's In-Pair versus Extra-Pair Sexual Interests across hormone profiles and across childhood health experiences (though there was a marginally significant negative interaction between estrogen, health, and total involvement, $\gamma = –.07$, $p < .10$).

Effects on In-Pair Sexual Interests and Extra-Pair Sexual Interests separately were weaker, though stronger effects emerged for the latter. See Appendix section A3.2.

Figure 2. Marginal effects of women's and partner's relationship involvement on In-Pair vs. Extra-Pair Sexual Interests of women with poor childhood health, during estrus

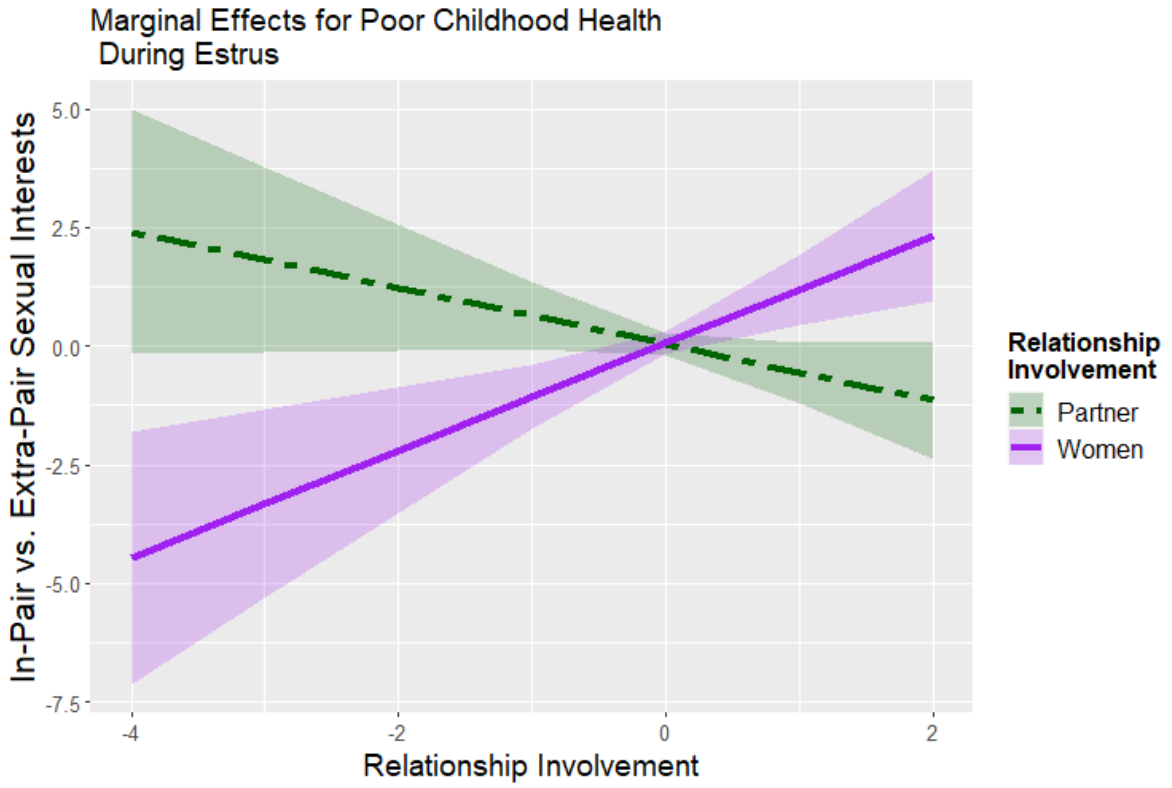


Figure caption. During estrus (when conceptive), women with poor childhood health are more likely to have higher sexual interest in primary partners (relative to extra-pair men) who are *less involved* in the relationship than women are. But when partners are *more highly involved* and women are relatively less involved, women are more likely to have increased estrous sexual interest in extra-pair men than in their partner.

3.4 Moderation by relationship qualities

Table 2 reports correlations between childhood health, childhood adversity, women's and partner's relationship qualities, and partner attractiveness. Childhood health was not significantly correlated with any relationship quality. Childhood adversity was negatively

associated with women's and partner's loving attachment and positively associated with partner's (but not women's) interest in romantic alternatives.

Analyses next examined simultaneous moderation by the four relationship qualities on women's sexual interests.

3.4.1 In-Pair versus Extra-Pair Sexual Interests

Analyses on women's In-Pair versus Extra-Pair Sexual Interests showed evidence for significant 3-way interactions between childhood adversity and at least one hormone (estrogen and/or progesterone) with all relationship qualities, except for a marginally significant interaction with interest in romantic alternatives (Table 3). When using childhood health in the place of adversity, evidence for significant 3-way interactions with at least one hormone emerged for all relationship qualities, except for a marginally significant interaction with loving attachment (Table 4). See Appendix section A4.1, Tables A7-8, for complete results involving interactions with relationship qualities.

3.4.2 In-Pair Sexual Interest: Moderation by childhood adversity

Follow-up analyses using childhood adversity revealed that moderation effects of relationship qualities on women's In-Pair Sexual Interest were specific to romantic passion and loving attachment—though 3-way interactions were most robust across analyses for romantic passion and not always significant for loving attachment (Table 5). See Appendix A4.2, Tables A9a-b, for full results for romantic passion and loving attachment, respectively.

Table 2. Correlations between level-2 variables

	Health	Adversity	W Support	W Passion	W Attachment	W Non-Exclusivity	P Support	P Passion	P Attachment	P Non-Exclusivity
Adversity	-0.08									
W Support	-0.07	**-0.28**								
W Passion	*-0.13*	-0.03	**0.33**							
W Attachment	0.04	**-0.25**	**0.45**	**0.42**						
W Non-Exclusivity	0.03	0.01	-0.11	**-0.20**	**-0.21**					
P Support	-0.04	**-0.24**	**0.74**	**0.32**	**0.50**	-0.09				
P Passion	-0.10	-0.08	**0.19**	**0.77**	**0.22**	-0.04	**0.17**			
P Attachment	0.03	**-0.27**	**0.41**	**0.39**	**0.78**	-0.02	**0.33**	**0.37**		
P Non-Exclusivity	0.02	**0.29**	**-0.46**	**-0.26**	**-0.33**	**0.28**	**-0.30**	**-0.23**	**-0.36**	
P Attractiveness	-0.10	-0.09	**0.37**	**0.33**	**0.35**	**-0.29**	**0.31**	**0.22**	**0.23**	**-0.27**

Notes. W = Women's; P = Partner's; correlations with $p <$ **.05** are **bolded**; correlations with $p < .10$ are *italicized.*

Table 3. Estimates for highest-order interactions between childhood adversity, hormones, and relationship qualities/partner attractiveness on women's In-Pair vs. Extra-Pair Sexual Interests

In-Pair vs. Extra-Pair Sexual Interests

	γ	SE	*t*-value	*p*-value
ln(E) ww * Adversity * Support total	-.12	.05	-2.41	**.017**
ln(E) ww * Adversity * Support discrepancy	-.09	.06	-1.60	.110
ln(P) ww * Adversity * Support total	.16	.05	3.09	**.002**
ln(P) ww * Adversity * Support discrepancy	.12	.06	2.22	**.027**
ln(E) ww * Adversity * Passion total	-.12	.05	-2.23	**.026**
ln(E) ww * Adversity * Passion discrepancy	.10	.05	1.97	**.049**
ln(P) ww * Adversity * Passion total	.10	.05	1.97	**< .050**
ln(P) ww * Adversity * Passion discrepancy	-.09	.06	-1.56	.120
ln(E) ww * Adversity * Attachment total	.04	.04	0.94	.350
ln(E) ww * Adversity * Attachment discrepancy	.005	.06	0.08	.938
ln(P) ww * Adversity * Attachment total	-.10	.03	-3.03	**.003**
ln(P) ww * Adversity * Attachment discrepancy	-.04	.06	-0.65	.519
ln(E) ww * Adversity * Non-exclusivity total	-.02	.05	-0.41	.683
ln(E) ww * Adversity * Non-exclusivity discrep.	.03	.06	0.53	.599
ln(P) ww * Adversity * Non-exclusivity total	-.02	.05	-0.36	.721
ln(P) ww * Adversity * Non-exclusivity discrep.	-.08	.04	-1.86	*.064*
ln(E) ww * Adversity * Partner Attractiveness	.09	.05	1.98	**.049**
ln(P) ww * Adversity * Partner Attractiveness	-.10	.05	-1.96	*.051*

Notes. Dependent variable, relationship qualities, and hormone measures are standardized. Childhood adversity and partner attractiveness are factor scores.

ln(E) ww = within-woman estrogen
ln(P) ww = within-woman progesterone
p's **< .05** are **bolded**
p's < *.10* are *italicized*

Table 4. Estimates for highest-order interactions between childhood health, hormones, and relationship qualities/partner attractiveness on women's In-Pair vs. Extra-Pair Sexual Interests

In-Pair vs. Extra-Pair Sexual Interests

	γ	SE	*t*-value	*p*-value
ln(E) ww * Health * Support total	.03	.06	0.52	.607
ln(E) ww * Health * Support discrepancy	.05	.06	0.85	.394
ln(P) ww * Health * Support total	.15	.05	2.95	**.003**
ln(P) ww * Health * Support discrepancy	.15	.06	2.54	**.012**
ln(E) ww * Health * Passion total	.07	.06	1.15	.252
ln(E) ww * Health * Passion discrepancy	.01	.05	0.18	.860
ln(P) ww * Health * Passion total	-.11	.05	-2.11	**.036**
ln(P) ww * Health * Passion discrepancy	-.08	.06	-1.47	.141
ln(E) ww * Health * Attachment total	-.03	.06	-0.45	.650
ln(E) ww * Health * Attachment discrepancy	.06	.06	0.87	.386
ln(P) ww * Health * Attachment total	.09	.05	1.72	*.086*
ln(P) ww * Health * Attachment discrepancy	-.01	.06	-0.19	.846
ln(E) ww * Health * Non-exclusivity total	.07	.05	1.33	.185
ln(E) ww * Health * Non-exclusivity discrep.	.05	.06	0.96	.339
ln(P) ww * Health * Non-exclusivity total	.05	.05	1.00	.319
ln(P) ww * Health * Non-exclusivity discrep.	-.18	.05	-3.38	**.001**
ln(E) ww * Health * Partner Attractiveness	-.09	.06	-1.61	.108
ln(P) ww * Health * Partner Attractiveness	.06	.07	0.83	.405

Notes. Dependent variable, childhood health, relationship qualities, and hormone measures are standardized. Partner attractiveness is a factor score.

ln(E) ww = within-woman estrogen
ln(P) ww = within-woman progesterone
p's **< .05** are **bolded**
p's < *.10* are *italicized*

Table 5. Estimates for highest-order interactions between childhood adversity, hormones, and relationship qualities/partner attractiveness on women's In-Pair Sexual Interest

In-Pair Sexual Interest

	γ	SE	*t*-value	*p*-value
ln(E) ww * Adversity * Support total	-.10	.06	-1.68	*.094*
ln(E) ww * Adversity * Support discrepancy	-.10	.07	-1.47	.142
ln(P) ww * Adversity * Support total	.09	.06	1.46	.146
ln(P) ww * Adversity * Support discrepancy	.09	.06	1.37	.171
ln(E) ww * Adversity * Passion total	-.13	.06	-2.05	**.041**
ln(E) ww * Adversity * Passion discrepancy	.07	.05	1.24	.215
ln(P) ww * Adversity * Passion total	.16	.05	2.96	**.003**
ln(P) ww * Adversity * Passion discrepancy	-.11	.06	-1.73	*.084*
ln(E) ww * Adversity * Attachment total	.05	.05	0.92	.358
ln(E) ww * Adversity * Attachment discrepancy	.002	.07	0.02	.982
ln(P) ww * Adversity * Attachment total	-.07	.04	-1.85	*.065*
ln(P) ww * Adversity * Attachment discrepancy	-.05	.07	-0.70	.487
ln(E) ww * Adversity * Non-exclusivity total	-.03	.06	-0.52	.605
ln(E) ww * Adversity * Non-exclusivity discrep.	-.04	.07	-0.55	.581
ln(P) ww * Adversity * Non-exclusivity total	.06	.06	0.98	.326
ln(P) ww * Adversity * Non-exclusivity discrep.	-.01	.05	-0.29	.776
ln(E) ww * Adversity * Partner Attractiveness	.13	.05	2.42	**.016**
ln(P) ww * Adversity * Partner Attractiveness	-.08	.06	-1.30	.195

Notes. Dependent variable, relationship qualities, and hormone measures are standardized. Childhood adversity and partner attractiveness are factor scores.

ln(E) ww = within-woman estrogen
ln(P) ww = within-woman progesterone
p's **< .05** are **bolded**
p's < *.10* are *italicized*

3.4.2.1 Romantic passion

Total romantic passion significantly moderated childhood adversity interactions with estrogen ($\gamma = -.13$, $p = .041$) and progesterone ($\gamma = .16$, $p = .003$): As estrogen levels decreased and progesterone levels increased, becoming more characteristic of the luteal phase, total romantic passion became more positively associated with In-Pair Sexual Interest when women had more experiences of childhood adversity.

If functions of passionate love include solidifying new, risky, or tenuous pair-bonds, its effects may be especially pronounced during extended sexuality. And hormonal associations may be stronger for women prioritizing relationship formation and higher reproductive output. Do results of simple effects analyses support the hypothesis that women from adverse backgrounds especially benefit from higher in-pair extended sexual interest when total romantic passion is high? As experiences with childhood adversity increased, total romantic passion was more positively associated with women's extended sexual interest for their partner ($\gamma = .28$, $p = .027$). Effects were indeed stronger for women from adverse backgrounds. Total romantic passion more positively predicted high childhood adversity women's sexual interest in their partner as hormones approached luteal-phase levels (progesterone × total passion: $\gamma = .23$, $p = .004$; estrogen × total passion: $\gamma = -.20$, $p = .033$). For women from secure backgrounds, hormonal interactions with total passion were nonsignificant ($p = .119, .374$). During extended sexuality, total romantic passion had a strong positive effect on In-Pair Sexual Interest for women from adverse backgrounds ($\gamma = .56$, $p = .002$; Figure 4) but virtually no effect for women from secure childhoods ($\gamma = .01$, $p = .95$).

And if partner romantic interest is low relative to women's, are women from secure backgrounds less likely to experience conceptive in-pair sexual interest, compared to women from adverse backgrounds? Results imply that this may be the case. As experiences with childhood adversity decreased, total romantic passion ($\gamma = -.30$, $p = .018$) and partner's romantic passion were more positively associated with women's estrous In-Pair Sexual Interest ($\gamma = -.25$, $p = .023$; with women's passion controlled: $\gamma = -.35$, $p = .071$). Simple slopes during estrus showed that partner's romantic passion was positively associated with In-Pair Sexual Interest for women from secure backgrounds ($\gamma = .28$, $p = .017$; with women's passion controlled: $\gamma = .22$, $p = .279$; total passion: $\gamma = .30$, $p = .023$) and negatively but not significantly associated for women from adverse backgrounds ($\gamma = -.22$, $p = .175$; with women's passion controlled: $\gamma = -.49$, $p = .078$; total: $\gamma = -.30$, $p = .111$). See Figure 3.

I next assessed whether women from secure backgrounds are more likely to experience heightened in-pair sexual interest during extended sexuality when partner romantic interest is low relative to women's. The negative interaction between childhood adversity, progesterone, and discrepancy in women's versus partner's romantic passion was in the predicted direction but was marginally significant ($\gamma = -.11$, $p = .084$). As childhood adversity decreased, the discrepancy in women's relative to partner's romantic passion was more positively associated with In-Pair Sexual Interest during extended sexuality, though this interaction was short of marginally significant ($\gamma = -.20$, $p = .113$). Women from secure childhoods tended to experience higher In-Pair Sexual Interest during extended sexuality when their partner's romantic passion lagged behind their own (passion discrepancy: $\gamma = .31$, $p = .031$). Women's romantic passion positively predicted their extended In-Pair Sexual

Interest ($\gamma = .50$, $p = .039$), while their partner's passion predicted it negatively ($\gamma = –.40$, $p = .044$). See Figure 4.

Moderation effects were more strongly driven by male partners' romantic passion. Over and above women's romantic passion, the interaction of partner's romantic passion with childhood adversity and hormone levels was significant for progesterone ($\gamma = .22$, $p = .016$) and short of significant for estrogen ($\gamma = –.15$, $p = .099$). There were no independent effects of women's romantic passion (p's > .4). When the other's passion in the relationship was not controlled for, the 3-way interaction with men's romantic passion was significant for both estrogen ($\gamma = –.10$, $p = .045$) and progesterone ($\gamma = .16$, $p = .0008$); the 3-way interaction with women's passion was just short of significant for progesterone ($\gamma = .10$, $p = .056$; for estrogen: $\gamma = –.06$, $p = .183$).

Figure 3. Marginal effects of partner's romantic passion on women's In-Pair Sexual Interest during estrus, for women with high and low childhood adversity

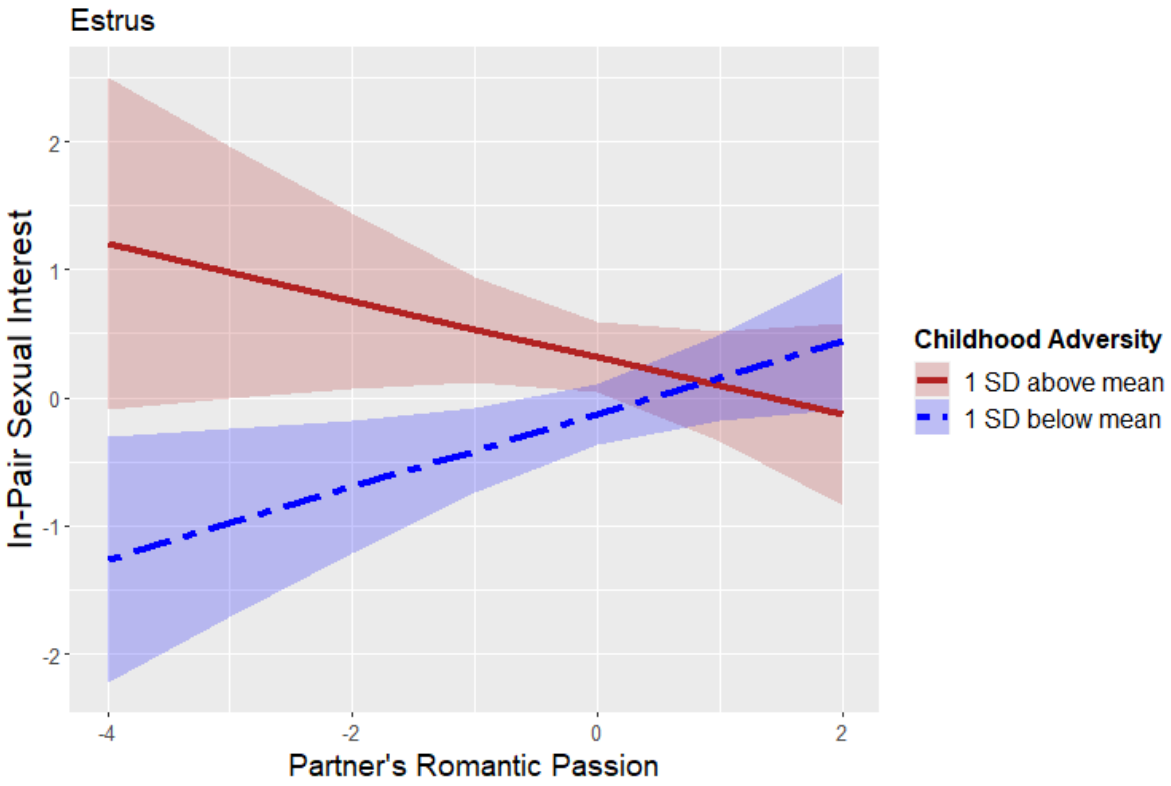


Figure caption. When male partners lack romantic passion relative to women (i.e., controlling for women's passion), women with *low childhood adversity* (dashed blue line) show lower levels of In-Pair Sexual Interest during estrus, compared to women with *high childhood adversity* (solid red line).

Figure 4. Marginal effects of women's and partner's romantic passion on In-Pair Sexual Interest during extended sexuality, for women with high and low childhood adversity

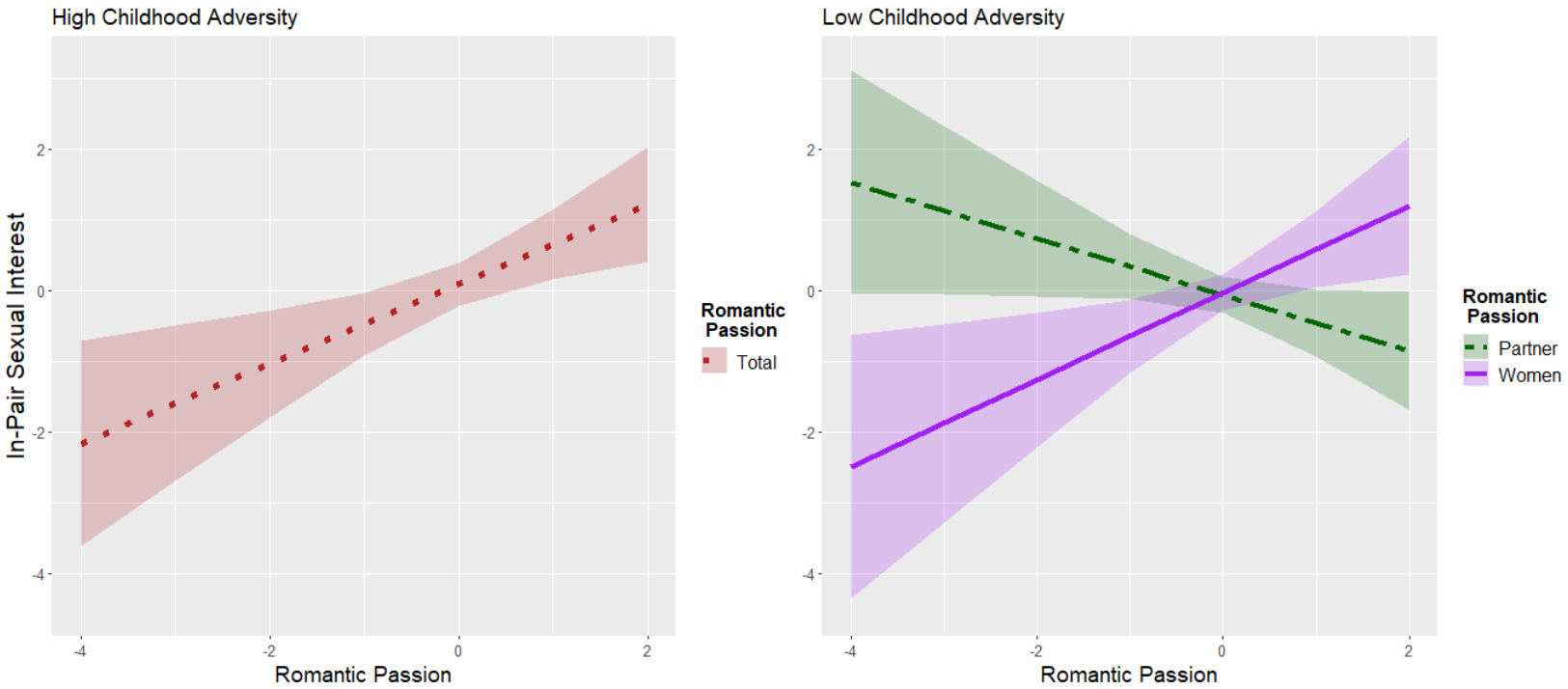


Figure caption. Women with *high childhood adversity* who are in relationships with higher total (women's + partner's) romantic passion display heightened In-Pair Sexual Interest during extended sexuality (left graph). For women with *low childhood adversity* (right graph), their romantic passion (solid purple line) positively predicts their extended In-Pair Sexual Interest, while their partner's romantic passion (dashed green line) negatively predicts it; that is, women become more sexually interested in their partner during extended sexuality when their partner's romantic passion lags behind their own.

3.4.2.2 Loving attachment

On average across childhood experiences, total loving attachment positively interacted with estrogen and negatively interacted with progesterone to predict In-Pair Sexual Interest. As estrogen levels increased and progesterone levels decreased—levels becoming characteristic of the periovulatory phase—total loving attachment became more strongly associated with In-Pair Sexual Interest. In particular, associations with loving attachment were significant during estrus but not during extended sexuality. Are these ostensible fertility-regulation effects more strongly driven by women from secure childhoods? Results suggest no. During estrus, total loving attachment similarly (attachment × adversity: $\gamma = .02$, $p = .83$) and positively predicted In-Pair Sexual Interest for women from secure and adverse childhoods ($\gamma = .33, 37$; $p = .046, .005$; respectively). Possible differences in loving attachment moderation effects as a function of childhood adversity appear to be specific to extended sexuality.

Total loving attachment moderated the interaction between childhood adversity and progesterone in a negative direction, though this effect fell short of significant ($\gamma = –.07$, $p = .065$). Follow-up analyses on the components of In-Pair Sexual Interest revealed significant childhood adversity × total loving attachment × hormone effects of both estrogen and progesterone on women's initiation of sex with their partner (3-way interaction with estrogen: $\gamma = .11$, $p = .046$; with progesterone: $\gamma = –.09$, $p = .023$), but not on women's in-pair attraction. Differences in the effect of total loving attachment as a function of childhood adversity were primarily observed during extended sexuality ($\gamma = –.21$, $p = .026$). As progesterone levels increased and estrogen levels decreased, approaching luteal-phase levels, total loving attachment became more negatively associated with In-Pair Sexual Interest for

women from adverse childhoods (progesterone × total attachment: $\gamma = -.19$, $p = .0007$; estrogen × total attachment: $\gamma = .20$, $p = .005$). Hormonal shifts in the effect of total loving attachment were nonsignificant for women with low childhood adversity (p's > .15). See Figure 5.

Moderation by total loving attachment was not driven by unique effects of women's or their partner's loving attachment. Women's and their partner's loving attachment both separately—but not independently—moderated hormonal effects by childhood adversity and significantly and negatively predicted the extended In-Pair Sexual Interests of women from adverse backgrounds.

Figure 5. Marginal effects of total loving attachment on In-Pair Sexual Interest during estrus and extended sexuality, for women with high and low childhood adversity

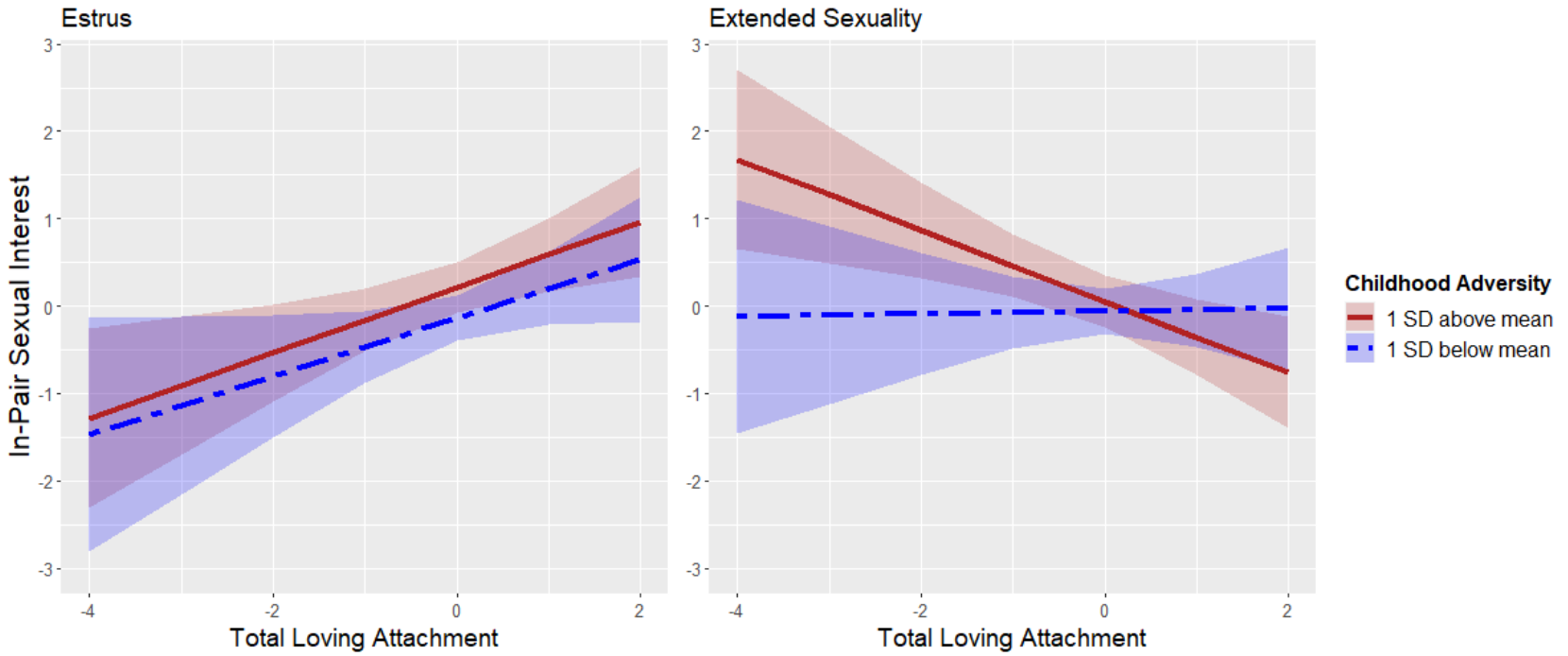


Figure caption. Total loving attachment positively predicts In-Pair Sexual Interest during *estrus* (left graph) for women from both high and low adversity backgrounds. But during *extended sexuality* (right graph), total loving attachment becomes *negatively* associated with the In-Pair Sexual Interests of women with *high childhood adversity* (solid red line): Women in weakly attached relationships show increased extended sexual interest in their partner; and as bonds grow stronger, women become less sexually interested in their partner during extended sexuality.

3.4.3 In-Pair Sexual Interest: Moderation by childhood health

Analyses on In-Pair Sexual Interest using health as the childhood predictor found significant 3-way interactions involving loving attachment, supportiveness/trust, and interest in romantic alternatives (Table 6). For complete results, see Appendix A4.3, Tables A10a-c.

Table 6. Estimates for highest-order interactions between childhood health, hormones, and relationship qualities/partner attractiveness on women's In-Pair Sexual Interest

	In-Pair Sexual Interest			
	γ	SE	*t*-value	*p*-value
ln(E) ww * Health * Support total	.03	.07	0.50	.621
ln(E) ww * Health * Support discrepancy	.10	.07	1.45	.149
ln(P) ww * Health * Support total	.20	.06	3.45	**.001**
ln(P) ww * Health * Support discrepancy	.18	.07	2.57	**.010**
ln(E) ww * Health * Passion total	.01	.06	0.23	.818
ln(E) ww * Health * Passion discrepancy	.01	.05	0.24	.814
ln(P) ww * Health * Passion total	-.06	.06	-1.01	.315
ln(P) ww * Health * Passion discrepancy	-.10	.06	-1.53	.127
ln(E) ww * Health * Attachment total	-.05	.07	-0.75	.455
ln(E) ww * Health * Attachment discrepancy	.11	.07	1.52	.130
ln(P) ww * Health * Attachment total	.15	.06	2.53	**.012**
ln(P) ww * Health * Attachment discrepancy	.01	.07	0.14	.892
ln(E) ww * Health * Non-exclusivity total	-.01	.06	-0.26	.799
ln(E) ww * Health * Non-exclusivity discrep.	.06	.06	0.98	.325
ln(P) ww * Health * Non-exclusivity total	.11	.06	1.97	**.049**
ln(P) ww * Health * Non-exclusivity discrep.	-.15	.06	-2.44	**.015**
ln(E) ww * Health * Partner Attractiveness	-.10	.06	-1.62	.106
ln(P) ww * Health * Partner Attractiveness	.03	.08	0.42	.678

Notes. Dependent variable, childhood health, relationship qualities, and hormone measures are standardized. Partner attractiveness is a factor score.
ln(E) ww = within-woman estrogen; ln(P) ww = within-woman progesterone.
p's **< .05** are **bolded**; *p*'s < *.10* are *italicized.*

3.4.3.1 Loving attachment

Are hormone-dependent changes in within-pair sexual interests similarly affected by variations in loving attachment for women with poor childhood health as for women with high childhood adversity? Results imply yes. The interaction between childhood health, total loving attachment, and progesterone was in the same direction and significant ($\gamma = .24$, $p = .006$). Interactions with estrogen and interactions involving discrepancies in loving attachment were not significant (see Table 6).

Similar to results for childhood adversity, differences in moderation effects as a function of childhood health were observed during extended sexuality ($\gamma = .43$, $p = .027$) and were nonsignificant during estrus ($\gamma = –.22$, $p = .246$). Women with poor childhood health similarly carried this effect: As progesterone increased, approaching luteal-phase levels, total loving attachment became less positively associated with In-Pair Sexual Interest ($\gamma = –.39$, $p = .001$). During extended sexuality, total loving attachment was strongly negatively associated with In-Pair Sexual Interest for women with poor childhood health ($\gamma = –.76$, $p = .005$). For women with good childhood health, the interaction between progesterone and total loving attachment was nonsignificant ($\gamma = .09$, $p = .235$). Moderation by total loving attachment was not driven by independent effects of women's or partner's loving attachment.

3.4.3.2 Emotional support and trust

I next asked: Are women with good childhood health, in comparison to women with women with poor childhood health, relatively less willing to have conceptive sex with their partner if total emotional support and trust in the relationship are low and the discrepancy in women's versus their partner's supportiveness/trust is high? Are they more likely to have

increased extended in-pair sexual interest, compared to women with poor childhood health, when their partner's supportiveness is lower than their own?

Results offered partial support for these hypotheses. Interactions between childhood health, progesterone, and both the total and discrepancy in women's and partner's supportiveness in the relationship were highly significant and positive in direction (3-way interaction with total support: $\gamma = .20$, $p = .0006$; with discrepancy in support: $\gamma = .18$, $p = .010$). Follow-up analyses found three-way interactions with women's and partner's supportiveness that went in opposite directions: positive for women's supportiveness ($\gamma = .28$, $p = .001$) and negative but nonsignificant for partner's ($\gamma = -.14$, $p = .153$). Both women's and partner's supportiveness significantly and positively interacted with childhood health and progesterone when the other's supportiveness was not controlled (3-way interaction with women's supportiveness: $\gamma = .09$, $p = .024$; with partner's: $\gamma = .11$, $p = .023$).

For women with good childhood health, progesterone positively interacted with the discrepancy in women's versus partner's supportiveness—though this predicted interaction fell short of significant ($\gamma = .11$, $p = .081$). Progesterone also positively interacted with total emotional support, which was not expected ($\gamma = .14$, $p = .048$). But effects of the total and difference in women's and partner's supportiveness were largely driven by women's supportiveness, over and above their partner's. When women with good childhood health were more supportive and trusting of their partner than he was of her, women had less In-Pair Sexual Interest as progesterone levels decreased (women's supportiveness × progesterone: $\gamma = .19$, $p = .044$). This effect was specific to when women could potentially conceive in their cycle. Women's greater supportiveness over their partner's significantly predicted lower In-Pair Sexual Interest when progesterone was at follicular-phase levels (1 *SD* below the mean),

$\gamma = -.31$, $p = .049$. In contrast, women with poor childhood health were not less likely to experience In-Pair Sexual Interest during the follicular phase when women's supportiveness and trust were higher, independent of their partner's ($p > .4$). See Figure 6.

Consistent with predictions, extended sexual interests of women with poor childhood health appeared to be less geared towards maintaining partner emotional support and investment. Results showed that the total and discrepancy in emotional support became more negatively predictive of their In-Pair Sexual Interest as progesterone approached luteal-phase levels (total support × progesterone: $\gamma = -.24$, $p = .001$; discrepancy in support × progesterone: $\gamma = -.24$, $p = .023$). See Figure 7. Women's greater supportiveness, over and above their partner's, more negatively predicted their In-Pair Sexual Interest as progesterone levels increased (women's support/trust × progesterone: $\gamma = -.37$, $p = .003$).

In support of hypotheses, the discrepancy in women's versus their partner's supportiveness was more positively associated with women's extended In-Pair Sexual Interest as childhood health conditions improved (health × discrepancy in support: $\gamma = .23$, $p = .046$; health × women's support: $\gamma = .32$, $p = .027$; health × partner's support: $\gamma = -.25$, $p = .130$). See Figure 6. However, this interaction was largely driven by effects of emotional support for women with poor childhood health. When progesterone was at luteal phase levels, women's supportiveness strongly and negatively predicted their In-Pair Sexual Interest when they had poor childhood health ($\gamma = -.56$, $p = .010$). Their partner's supportiveness was positively associated but fell short of statistical significance ($\gamma = .43$, $p = .099$). Although simple slopes of partner's and women's supportiveness were descriptively in the predicted directions for women with good childhood health, slopes were not significantly different from zero (p's $> .5$).

Figure 6. Marginal effects of progesterone levels on In-Pair Sexual Interest for women with poor and good childhood health, in relationships with high discrepancies in emotional supportiveness

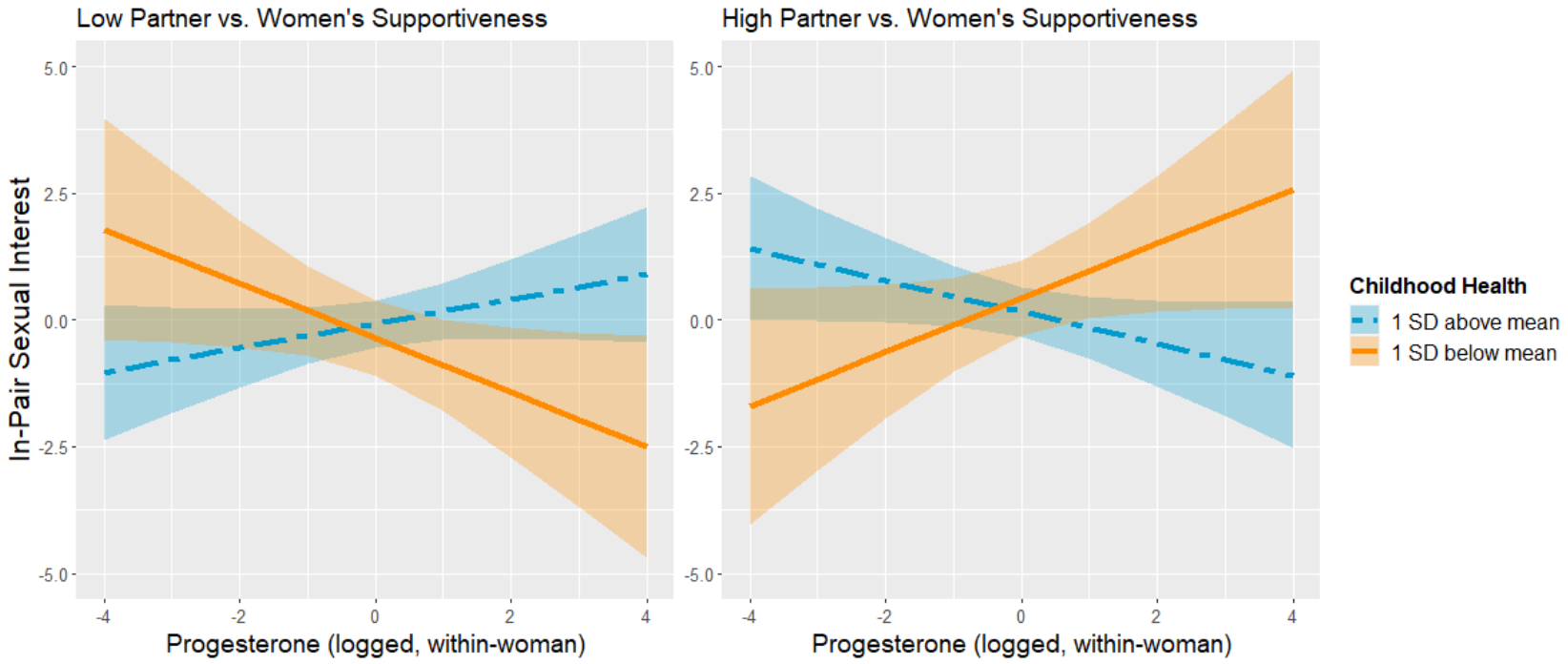


Figure caption. As progesterone falls towards estrous levels, women with *good childhood health* (dashed teal lines) become less sexually interested in partners who are unsupportive relative to women (left graph); but they become more sexually interested in partners who are highly supportive relative to women (right graph). Compared to women with good childhood health, women with *poor childhood health* (solid orange lines) have higher conceptive sexual interest in relatively unsupportive partners and less conceptive sexual interest in relatively supportive partners. Women with poor childhood health invest comparatively less in in-pair extended sexuality (at higher progesterone levels) when their partner's supportiveness lags behind their own.

Figure 7. Marginal effects of total emotional support on In-Pair Sexual Interest during estrus and extended sexuality for women with poor childhood health

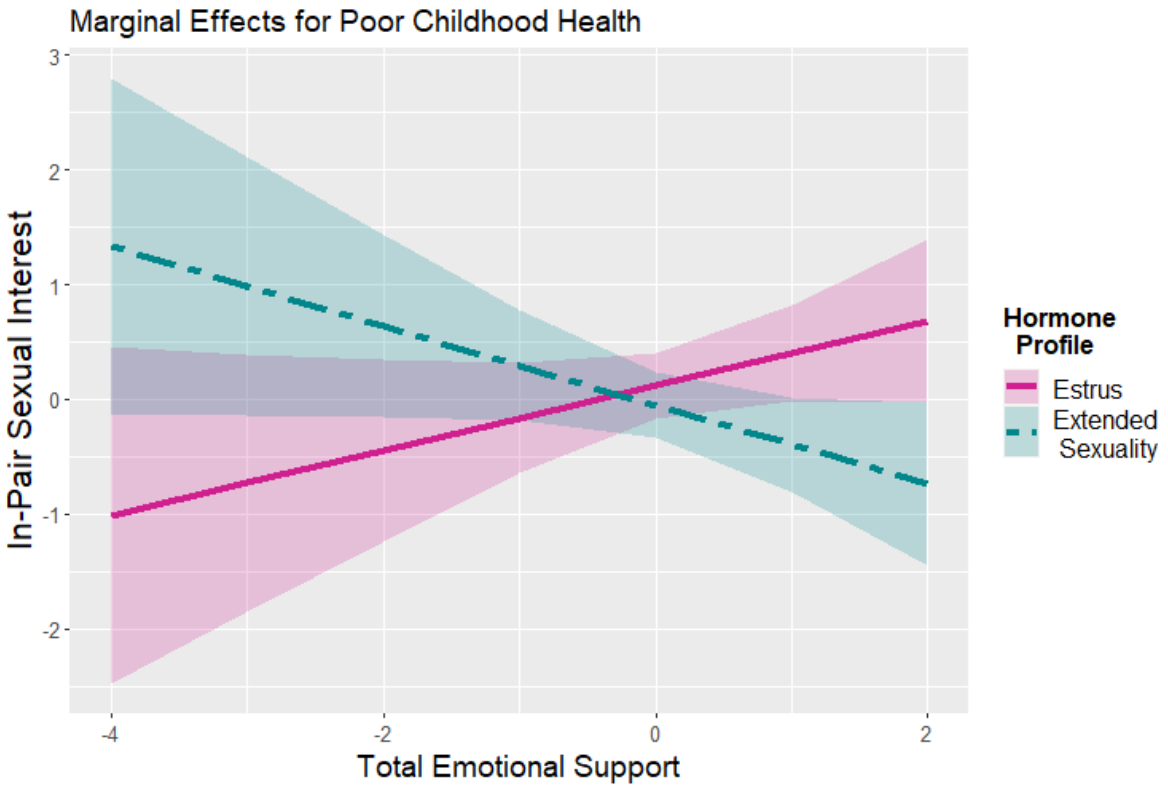


Figure caption. Women with poor childhood health have higher *extended* In-Pair Sexual Interest in *less supportive* relationships. As total emotional support and trust grow, they become less sexually interested in their partner during *extended sexuality* (dashed turquoise line) but more interested during *estrus* (solid pink line).

3.4.3.3 Dishonesty and interest in romantic alternatives

When partners are dishonest and interested in other potential mates, are women with good childhood health less willing to have conceptive sex with their partner, while women with poor childhood health are relatively more willing? Three-way interactions between childhood health, progesterone, and the total and the discrepancy in interest in romantic alternatives were significant and in the predicted directions (3-way interaction with total non-

exclusivity: $\gamma = .11$, $p = .049$; with discrepancy in non-exclusivity: $\gamma = –.15$, $p = .015$). As expected, these effects were driven primarily by male partners' interest in romantic alternatives ($\gamma = .15$, $p = .005$; with women's non-exclusivity controlled: $\gamma = .21$, $p = .0003$). Three-way interactions with estrogen were nonsignificant.

Simple effects analyses offered partial support for this hypothesis. As estrogen levels increased and progesterone levels decreased, women with poor childhood health became more sexually interested in partners that showed more interest in romantic alternatives (estrogen × partner non-exclusivity: $\gamma = .15$, $p = .079$; progesterone × partner non-exclusivity: $\gamma = –.30$, $p = .0006$). During estrus, they were indeed more willing to have conceptive sex, having higher In-Pair Sexual Interest and initiating sex more often with partners that were more dishonest or interested in others (γ's = .52; p's = .003, .004, respectively). Women with good childhood health showed hormone-dependent changes in the impact of partner dishonesty/non-exclusivity in the predicted direction, though effects were not consistently robust across analyses. The positive 2-way interaction between progesterone and partner's interest in romantic alternatives was significant over and above women's interest in others ($\gamma = .13$, $p = .048$), but not when women's interest in others was not controlled ($p > .4$). Interactions between progesterone and total or discrepancy in interest in romantic alternatives were in the expected directions but nonsignificant (γ's = .09, –.07; p's = .170, .277; respectively). Women with good childhood health were less sexually interested in partners that were more dishonest or interested in romantic alternatives during the follicular phase, as predicted, but the simple slope was only marginally significant ($\gamma = –.20$; $p = .091$). See Figure 8.

Figure 8. Marginal effects of partner's interest in romantic alternatives on women's In-Pair Sexual Interest during estrus, for women with poor and good childhood health

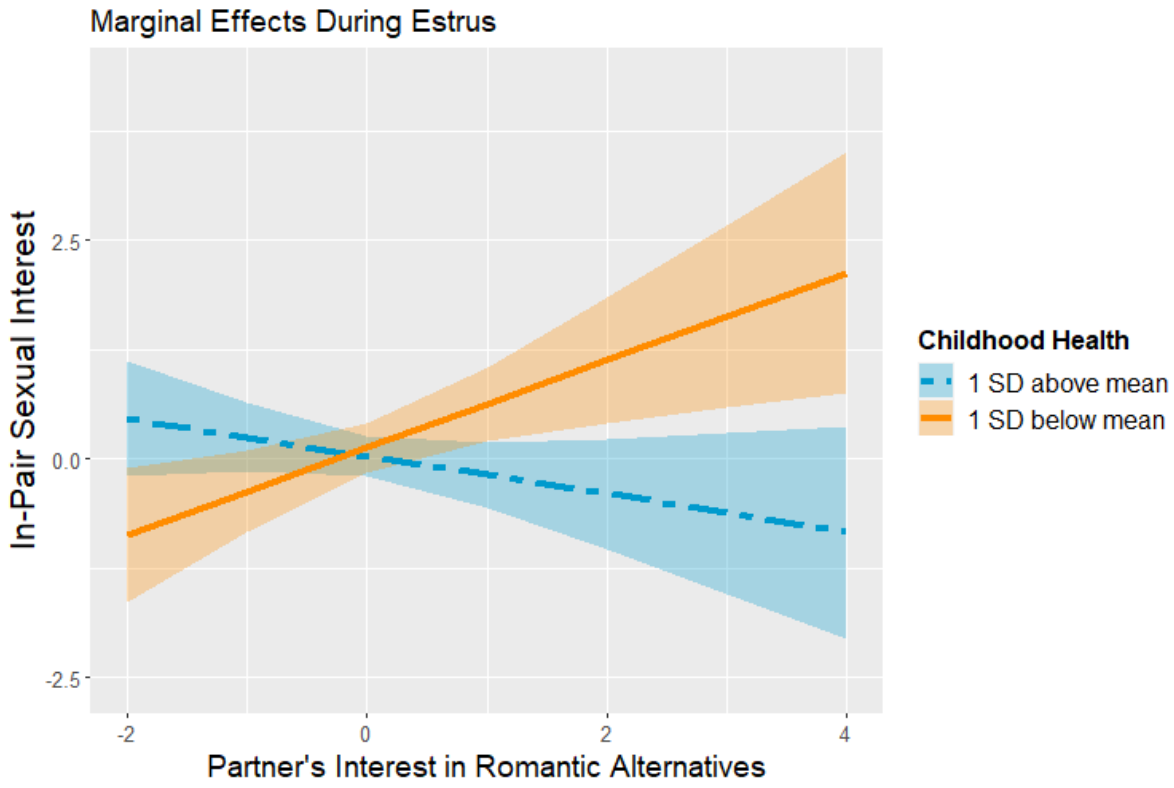


Figure caption. During estrus, women with *poor childhood health* (solid orange line) become *more* sexually interested in partners who have higher interest in romantic alternatives, while women with *good childhood health* (dashed teal line) become less sexually interested in partners.

3.4.4 Extra-Pair Sexual Interest: Moderation by childhood adversity

Significant childhood adversity × progesterone × relationship quality interaction effects on women's Extra-Pair Sexual Interest emerged for interactions involving loving attachment, supportiveness/trust, and dishonesty/interest in romantic alternatives (Table 7). For full results on these relationship qualities, see Appendix A4.4, Tables A11a-c.

Table 7. Estimates for highest-order interactions between childhood adversity, hormones, and relationship qualities/partner attractiveness on women's Extra-Pair Sexual Interest

	Extra-Pair Sexual Interest			
	γ	SE	*t*-value	*p*-value
ln(E) ww * Adversity * Support total	.09	.05	1.86	*.063*
ln(E) ww * Adversity * Support discrepancy	.04	.05	0.80	.426
ln(P) ww * Adversity * Support total	-.15	.05	-3.36	**.001**
ln(P) ww * Adversity * Support discrepancy	-.10	.05	-1.94	*.054*
ln(E) ww * Adversity * Passion total	.05	.05	1.09	.276
ln(E) ww * Adversity * Passion discrepancy	-.07	.04	-1.70	*.089*
ln(P) ww * Adversity * Passion total	.02	.04	0.48	.629
ln(P) ww * Adversity * Passion discrepancy	.02	.05	0.40	.693
ln(E) ww * Adversity * Attachment total	-.02	.04	-0.40	.692
ln(E) ww * Adversity * Attachment discrepancy	-.01	.06	-0.10	.920
ln(P) ww * Adversity * Attachment total	.08	.03	2.66	**.008**
ln(P) ww * Adversity * Attachment discrepancy	.01	.05	0.18	.858
ln(E) ww * Adversity * Non-exclusivity total	.001	.05	0.01	.989
ln(E) ww * Adversity * Non-exclusivity discrep.	-.08	.05	-1.56	.120
ln(P) ww * Adversity * Non-exclusivity total	.08	.05	1.82	*.070*
ln(P) ww * Adversity * Non-exclusivity discrep.	.10	.04	2.69	**.007**
ln(E) ww * Adversity * Partner Attractiveness	-.01	.04	-0.22	.828
ln(P) ww * Adversity * Partner Attractiveness	.07	.05	1.58	.115

Notes. Dependent variable, relationship qualities, and hormone measures are standardized. Childhood adversity and partner attractiveness are factor scores.

ln(E) ww = within-woman estrogen
ln(P) ww = within-woman progesterone
p's **< .05** are **bolded**
p's < *.10* are *italicized*

3.4.4.1 Loving attachment

In previous analyses that did not include effects of childhood experiences, women who were in relationships with greater total loving attachment were less likely to experience sexual interest in other men as hormones approached periovulatory phase levels (Dinh et al., 2023). Contrary to predictions, current analyses revealed that these effects were more strongly driven by women with high childhood adversity. As childhood adversity increased, the interaction between total loving attachment and progesterone became significantly more positive (3-way interaction: $\gamma = .08$, $p = .008$). Analyses separately examining—but not analyses simultaneously examining—women's and partner's relationship qualities similarly found significant positive 3-way interactions involving women's and partner's loving attachment. Highest-order interactions with estrogen were not significant.

As progesterone decreased and estrogen increased, becoming more characteristic of the periovulatory phase, total loving attachment more negatively predicted Extra-Pair Sexual Interest for women with high childhood adversity (progesterone × total loving attachment: $\gamma = .08$, $p = .075$; estrogen × total loving attachment: $\gamma = –.11$, $p = .039$). These results appeared to be more strongly driven by high childhood adversity women's loving attachment than by their partner's. For women with low childhood adversity, hormonal interactions with loving attachment were nonsignificant (progesterone × total loving attachment: $\gamma = –.08$, $p = .196$; estrogen × total loving attachment: $\gamma = –.08$, $p = .176$). As childhood adversity increased, women's, partner's, and total loving attachment became more negatively associated with women's estrous but not extended Extra-Pair Sexual Interest.

Figure 9 depicts, for women with high childhood adversity, effects of total loving attachment on In-Pair and Extra-Pair Sexual Interest in the same plots for comparison.

Figure 9. Marginal effects of total loving attachment on In-Pair and Extra-Pair Sexual Interests of women with high childhood adversity, during estrus and extended sexuality

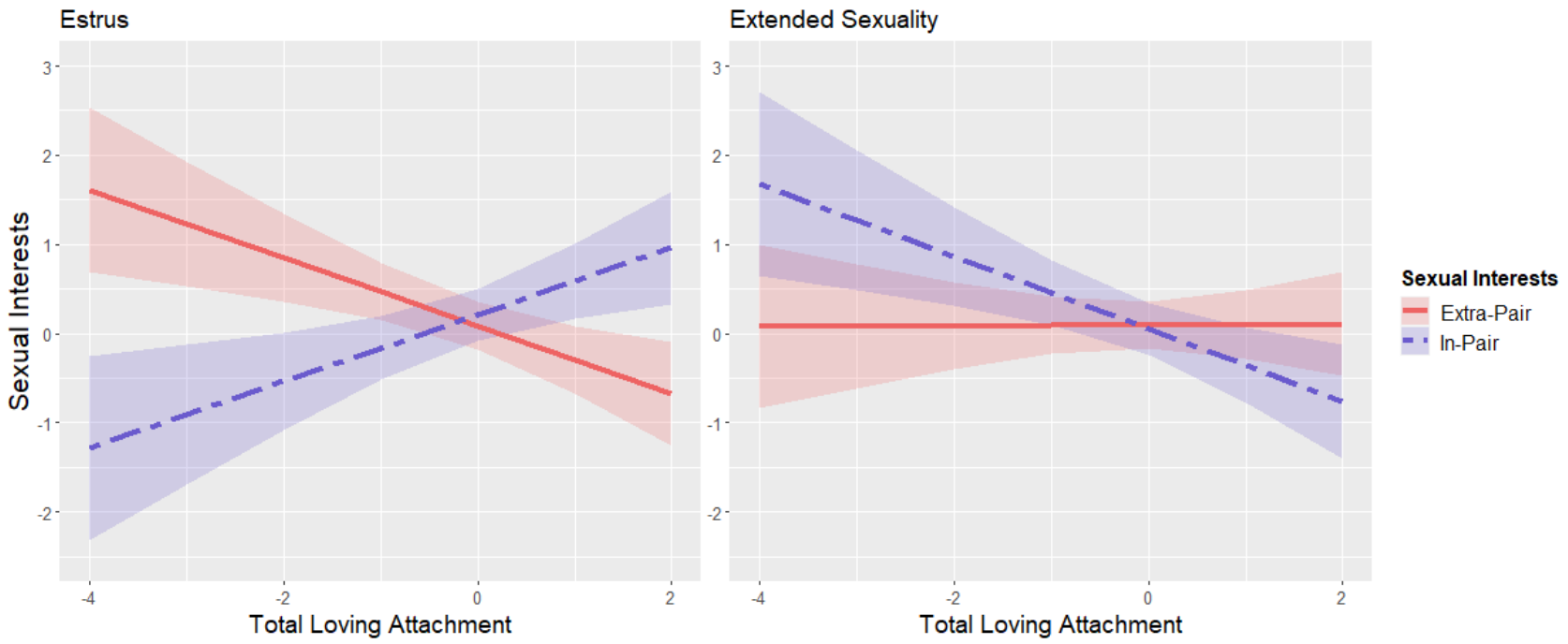


Figure caption. During *estrus* (left graph), women with high childhood adversity experience stronger increases in Extra-Pair Sexual Interest (solid red line) in more weakly attached relationships. As attachment bonds grow stronger, they become more sexually interested primary partners (dashed violet line)—similar to women with low childhood adversity (Figure 5)—and less interested in extra-pair men during estrus. The *extended sexual interests* (right graph) of women with high childhood adversity focus strongly on in-pair partners in more weakly attached relationships. Women become less interested in primary partners as attachment bonds grow stronger but show no significant differences in extended sexual interests for extra-pair men across variations in total loving attachment.

3.4.4.2 Emotional support and trust

When total emotional support and trust are high, are women with high childhood adversity more likely to experience sexual interest in other men during estrus relative to women from secure childhoods? And when the discrepancy in women's versus partner's trust and supportiveness is high, are women from secure childhoods relatively more likely to experience increased extra-pair interest during extended sexuality, for possible mate-switching motivations?

Results offer support for the first hypothesis: The interaction between total emotional support, childhood adversity, and hormones was highly significant for progesterone's negative interaction and short of significant for estrogen's positive interaction (3-way interaction with progesterone: $\gamma = -.15$, $p = .001$; with estrogen: $\gamma = .09$, $p = .063$). As predicted, during estrus, total emotional support was less negatively associated with Extra-Pair Sexual Interest as experiences with childhood adversity increased ($\gamma = .27$, $p = .017$).

The second hypothesis also received support, though less strong: The interaction between the discrepancy in emotional support, childhood adversity, and progesterone was negative but marginally significant ($\gamma = -.10$, $p = .054$). During extended sexuality, with fewer childhood experiences of adversity, the difference in women's relative to partner's supportiveness was more positively associated with Extra-Pair Sexual Interest ($\gamma = -.23$; $p = .059$).

For women with high childhood adversity, estrogen levels became more positively associated and progesterone levels more negatively associated with Extra-Pair Sexual Interest as total emotional support increased (estrogen × total support: $\gamma = .11$, $p = .060$; progesterone × total support: $\gamma = -.19$, $p = .001$). The interactions were such that, for women with high

childhood adversity, simple slopes of total emotional support were negatively associated with Extra-Pair Sexual Interest during extended sexuality ($\gamma = -.44$, $p = .004$) and positively but nonsignificantly associated with Extra-Pair Sexual Interest during estrus ($\gamma = .17$, $p = .269$). For women with low childhood adversity, progesterone's interactions with the total and discrepancy in women's and their partner's supportiveness were positive but fell outside of nominal significance (total support × progesterone: $\gamma = .11$, $p = .092$; discrepancy in support × progesterone: $\gamma = .10$, $p = .144$). Total emotional support was negatively associated with their estrous Extra-Pair Sexual Interest ($\gamma = -.38$, $p = .026$), while the difference in women's over their partner's supportiveness was positively associated with extended Extra-Pair Sexual Interest ($\gamma = .36$, $p = .032$).

Follow-up analyses revealed more robust support for 3-way interactions between childhood adversity and progesterone with women's supportiveness, both separately and over and above partner's supportiveness ($\gamma = -.08, -.17$; $p = .0009, .012$; respectively). Women's supportiveness was more positively associated with Extra-Pair Sexual Interest during estrus as experiences with childhood adversity increased ($\gamma = .23$, $p = .004$). If they grew up with secure childhoods, women who were more supportive and trusting in their relationship tended to have lower Extra-Pair Sexual Interest when conceptive ($\gamma = -.33$, $p = .012$). This association was positive but nonsignificant for women who grew up with adverse childhoods ($\gamma = .12$, $p = .262$). During extended sexuality, as childhood experiences of adversity decreased, women's greater supportiveness over and above their partner's became more positively associated with their Extra-Pair Sexual Interest ($\gamma = -.34$, $p = .040$). When women from secure backgrounds supported their partner more than he supported them, women tended to experience greater Extra-Pair Sexual Interest when non-conceptive (support

discrepancy: $\gamma = .36$, $p = .032$; women's support: $\gamma = .38$, $p = .114$; partner's support: $\gamma = -.57$, $p = .007$).

Childhood adversity's interactions with total and discrepancy in emotional support also significantly predicted hormone-associated changes in women's In-Pair versus Extra-Pair Sexual Interests. Figure 10 depicts marginal effects on In-Pair versus Extra-Pair Sexual Interests for women from secure childhood backgrounds, to highlight possible fertility regulation effects and extended sexuality focused on potential romantic alternatives versus maintenance of primary partner investment.

Figure 10. Marginal effects of women's and partner's supportiveness on In-Pair vs. Extra-Pair Sexual Interests during estrus and extended sexuality, for women with low childhood adversity

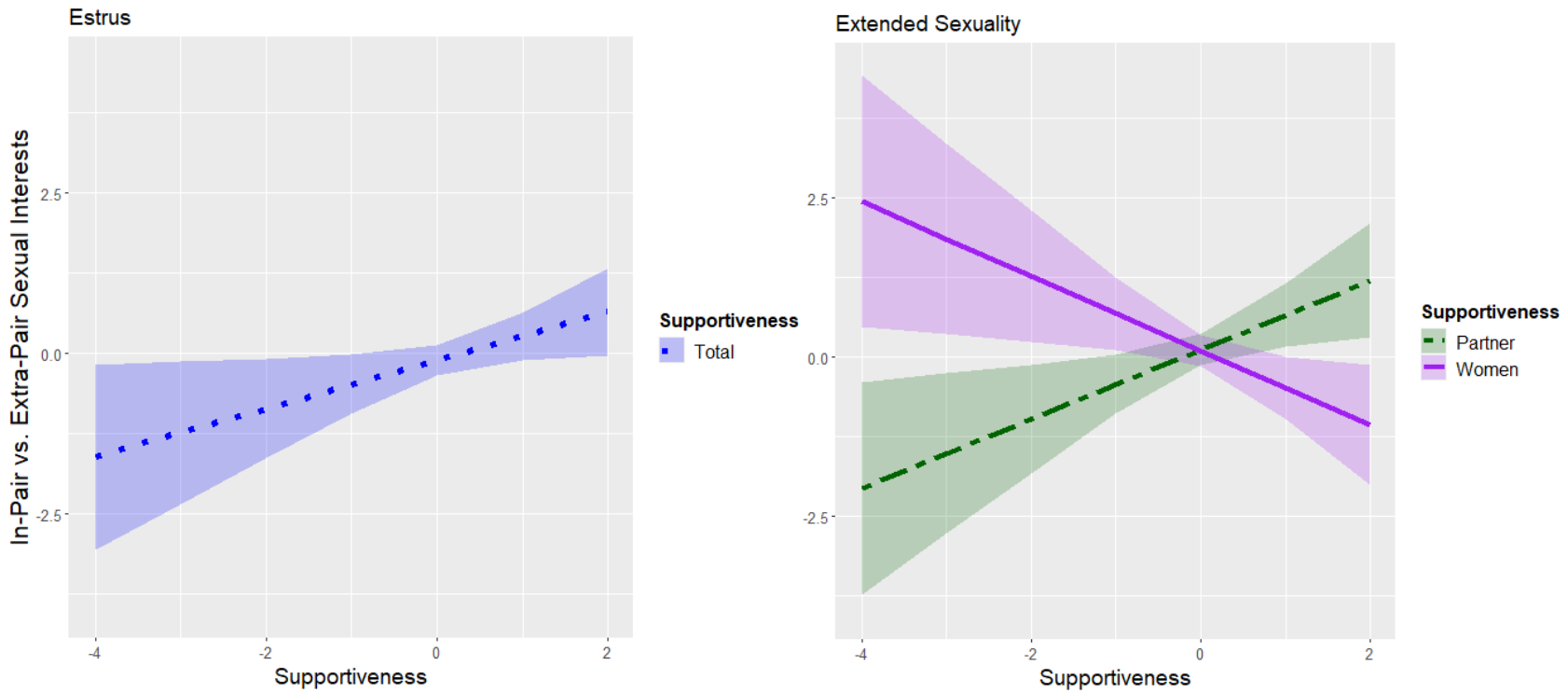


Figure caption. Simple effects for women with low childhood adversity are supportive of fertility regulation favoring primary partners over extra-pair men in relationships with higher total support, and extended sexuality focused on potential romantic alternatives when primary partners are less supportive. During *estrus* (left graph), total emotional support from women and their partner is positively associated with women's In-Pair relative to Extra-Pair Sexual Interests. During *extended sexuality* (right graph), partner support (dashed green line) is positively associated with women's In-Pair vs. Extra-Pair Sexual Interests, while women's support (solid purple line) is negatively associated. When primary partners are less supportive relative to women, women show increased extended sexual interest in other men compared to their partner.

3.4.4.3 Dishonesty and interest in romantic alternatives

When women are not exclusively romantically or sexually interested in their partner, are those from adverse backgrounds more likely to experience extra-pair desires during estrus and those from secure backgrounds more likely to during extended sexuality? Contrary to these predictions, results suggested that non-exclusive desires more strongly predicted greater estrous Extra-Pair Sexual Interest for women from secure childhoods than for women from adverse childhoods (Figure 11). The interaction between childhood adversity, progesterone, and women's interest in other mates was strongly positive ($\gamma = .11$, $p = .002$; controlling for partner's non-exclusivity: $\gamma = .12$, $p = .003$). During estrus, but not during extended sexuality (p's > .45), women's interest in romantic alternatives more positively predicted their Extra-Pair Sexual Interest when they had more secure childhoods (2-way interaction: $\gamma = –.27$, $p = .003$; controlling for partner's non-exclusivity: $\gamma = –.29$, $p = .009$).

Women's non-exclusivity largely drove the positive 3-way interaction effects with total and discrepancy in non-exclusivity on Extra-Pair Sexual Interest (total: $\gamma = .08$, $p = .070$; discrepancy: $\gamma = .10$, $p = .007$). But is there evidence to support the hypothesis that extended sexual interests may serve relationship-stabilizing functions for women prioritizing greater reproductive output? Results suggested that women from adverse backgrounds suppressed their extended Extra-Pair Sexual Interest when their partner's interest in romantic alternatives exceeded women's. For these women, as progesterone increased, the discrepancy in women's versus partner's interest in romantic alternatives became more positively associated with women's Extra Pair Sexual Interest ($\gamma = .18$, $p = .001$). In particular, women's non-exclusivity became more positively predictive while partner's non-exclusivity became more negatively predictive of women's Extra-Pair Sexual Interest (progesterone ×

women's interest in others: γ = .16, p = .005; progesterone × partner's interest in others: γ = –.12, p = .022).

Figure 11. Marginal effects of women's interest in romantic alternatives on Extra-Pair Sexual Interest during estrus, for women with low and high childhood adversity

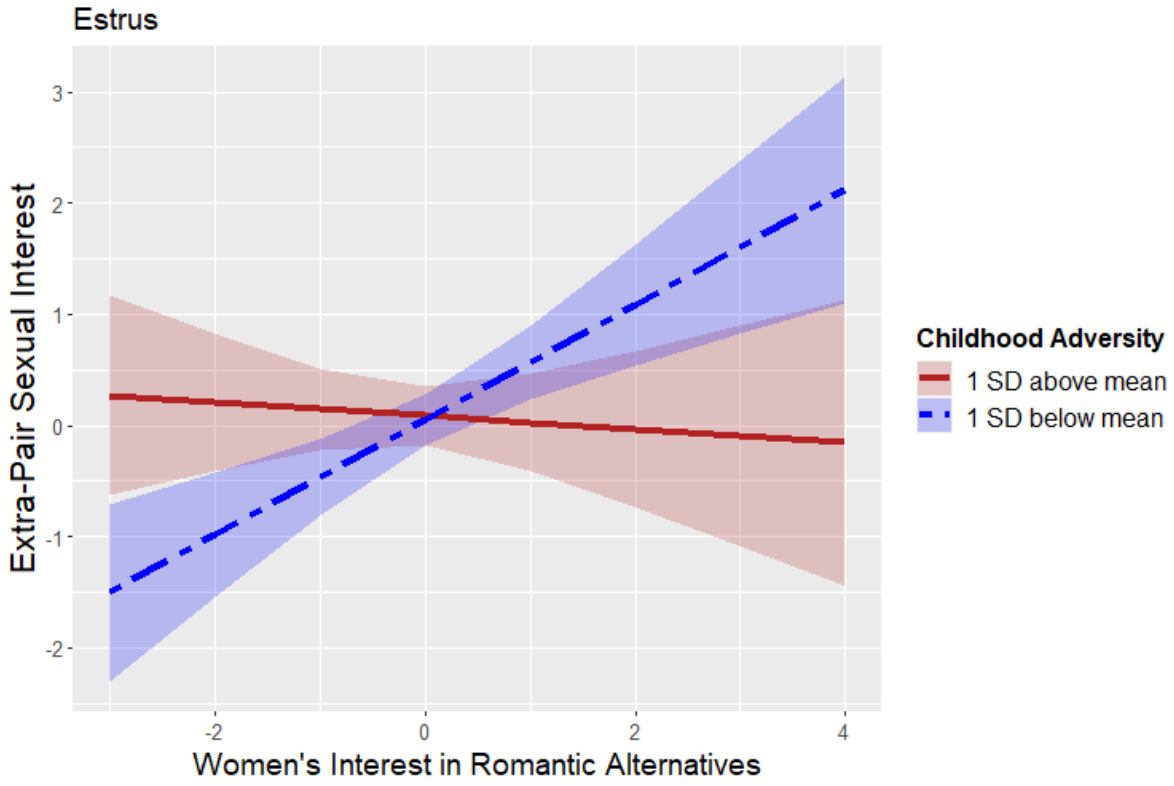


Figure caption. During estrus, women's interest in romantic alternatives strongly and positively predicts their Extra-Pair Sexual Interest when they experienced *low childhood adversity* (dashed blue line) but has no association when they experienced *high childhood adversity* (solid red line).

3.4.5 Extra-Pair Sexual Interest: Moderation by childhood health

In analyses involving moderation by childhood health, significant 3-way interactions with hormone levels and relationship qualities emerged for romantic passion and dishonesty/ interest in romantic alternatives (Table 8; Appendix A4.5). Suggestive evidence also

appeared for interaction effects with loving attachment on Extra-Pair Sexual Interest (Appendix Table A13).

Table 8. Estimates for highest-order terms of interactions between childhood health, hormones, and relationship qualities/partner attractiveness on women's Extra-Pair Sexual Interest

	Extra-Pair Sexual Interest			
	γ	SE	*t*-value	*p*-value
ln(E) ww * Health * Support total	-.01	.05	-0.24	.812
ln(E) ww * Health * Support discrepancy	.02	.05	0.39	.697
ln(P) ww * Health * Support total	-.03	.05	-0.59	.558
ln(P) ww * Health * Support discrepancy	-.05	.05	-1.00	.319
ln(E) ww * Health * Passion total	-.08	.05	-1.58	.115
ln(E) ww * Health * Passion discrepancy	.001	.04	0.03	.979
ln(P) ww * Health * Passion total	.10	.05	2.22	**.027**
ln(P) ww * Health * Passion discrepancy	.02	.05	0.48	.629
ln(E) ww * Health * Attachment total	-.01	.05	-0.20	.842
ln(E) ww * Health * Attachment discrepancy	.02	.06	0.43	.668
ln(P) ww * Health * Attachment total	.02	.05	0.33	.739
ln(P) ww * Health * Attachment discrepancy	.02	.05	0.47	.638
ln(E) ww * Health * Non-exclusivity total	-.12	.05	-2.49	**.013**
ln(E) ww * Health * Non-exclusivity discrep.	-.02	.05	-0.35	.726
ln(P) ww * Health * Non-exclusivity total	.04	.04	0.84	.401
ln(P) ww * Health * Non-exclusivity discrep.	.11	.05	2.32	**.021**
ln(E) ww * Health * Partner Attractiveness	.03	.05	0.62	.539
ln(P) ww * Health * Partner Attractiveness	-.05	.06	-0.82	.415

Notes. Dependent variable, childhood health, relationship qualities, and hormone measures are standardized. Partner attractiveness is a factor score.

ln(E) ww = within-woman estrogen
ln(P) ww = within-woman progesterone
p's **< .05** are **bolded**
p's < *.10* are *italicized*

3.4.5.1 Romantic passion

Previous analyses on the current dataset found that high discrepancies in women's versus their partner's romantic passion predicted decreases in women's extra-pair interests during extended sexuality (Dinh et al., 2023). Estrogen positively interacted with women's romantic passion and negatively interacted with partner's romantic passion. Contrary to predictions, these effects were not further qualified by differences in childhood health (or adversity).

I also predicted that total romantic passion would more strongly predict increases in within-pair relative to extra-pair interests for women with poor childhood health as hormones became more characteristic of extended sexuality. Indeed, the 3-way interaction effect with progesterone on In-Pair versus Extra-Pair Sexual Interests was significant and negative ($\gamma = -.11$, $p = .027$). The effect was largely carried by a significant positive interaction between childhood health, total romantic passion, and progesterone on women's Extra-Pair Sexual Interest in the predicted direction ($\gamma = .10$, $p = .036$). But simple slopes analyses revealed that as childhood health improved, total romantic passion became more negatively associated with women's Extra-Pair Sexual Interest during estrus (total passion × health: $\gamma = -.33$, $p = .011$), but *not* during extended sexuality ($p = .749$). These effects were more strongly driven by the romantic passion of women with poor childhood health, but not independent of their partner's (3-way interaction with progesterone: $\gamma = .10$, $p = .031$). Women with poor childhood health who were in more passionate relationships tended to experience increased Extra-Pair Sexual Interest as progesterone fell to periovulatory phase levels (Figure 12).

Figure 12. Marginal effects of total romantic passion on Extra-Pair Sexual Interest during estrus, for women with poor and good childhood health

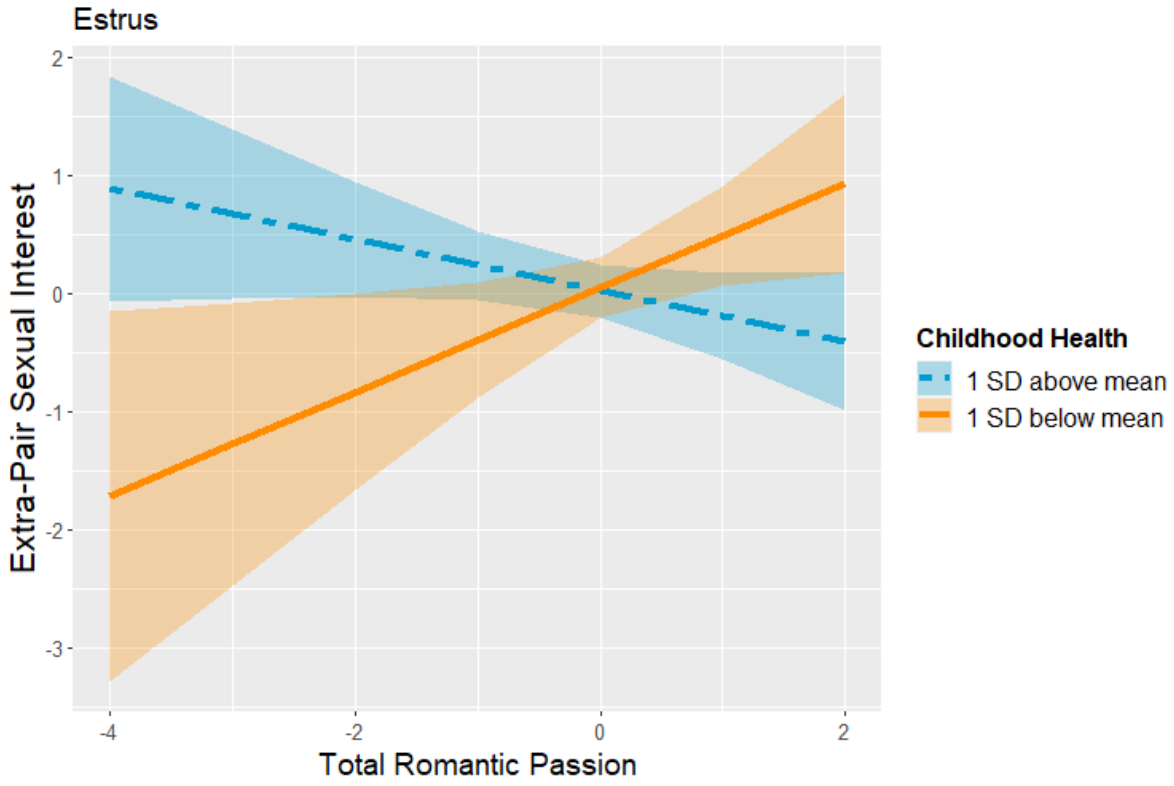


Figure caption. In more passionate relationships, women with *poor childhood health* (solid orange line) have higher Extra-Pair Sexual Interest during estrus.

3.4.5.2 Dishonesty and interest in romantic alternatives

When women are interested in romantic alternatives, are those with good childhood health more likely to experience extra-pair sexual interest when non-conceptive and those with poor childhood health more likely to when conceptive?

Results support these predictions. Analyses revealed a significant negative interaction between estrogen, childhood health, and total interest in romantic alternatives ($\gamma = -.12$, $p = .013$) and a significant positive interaction between progesterone, childhood health, and

discrepancy in women's versus partner's interest in romantic alternatives ($\gamma = .11$, $p = .021$). As expected, women's interest in alternative partners significantly and positively interacted with childhood health and progesterone ($\gamma = .10$, $p = .034$). Independently, the 3-way interaction with partner's non-exclusivity went in the opposite direction but was short of significant ($\gamma = –.08$, $p = .098$).

For women with good childhood health, total non-exclusivity and partner's non-exclusivity more positively predicted women's Extra-Pair Sexual Interest as estrogen levels fell ($\gamma = .13$, $p = .016$). The interactions were such that these women's interest in romantic alternatives (though not independent of their partner's; $\gamma = .26$, $p = .027$) and total interest in others were positively associated with Extra-Pair Sexual Interest during extended sexuality ($\gamma = .31$, $p = .019$). See Figure 13.

As childhood health declined, women's non-exclusivity became more positively associated with their Extra-Pair Sexual Interest during estrus ($\gamma = –.29$, $p = .018$). Indeed, for women with poor childhood health, their general interest in romantic alternatives became more strongly predictive of whether they experienced Extra-Pair Sexual Interest as hormones approached periovulatory-phase levels (estrogen × women's non-exclusivity: $\gamma = .12$, $p = .044$; progesterone × women's non-exclusivity: $\gamma = –.12$, $p = .050$). Their interest in romantic alternatives strongly predicted their estrous Extra-Pair Sexual Interest, regardless of whether their partner's interest in others was controlled (controlled: $\gamma = .59$, $p = .0001$; uncontrolled: $\gamma = .51$, $p = .00004$). Figure 14 plots effects of women's and partner's interest in romantic alternatives on the In-Pair versus Extra-Pair Sexual Interests of women with poor childhood health, to juxtapose effects described here and above (Section 3.4.3.3) on estrous sexual interest for dishonest/non-exclusive primary partners.

Figure 13. Marginal effects of women's interest in romantic alternatives on Extra-Pair Sexual Interest during estrus and extended sexuality, for women with poor and good childhood health

Figure caption. When women are more highly interested in romantic alternatives, those with *poor childhood health* (left graph) exhibit increased Extra-Pair Sexual Interest during *estrus* (solid pink lines), whereas those with *good childhood health* (right graph) experience increased Extra-Pair Sexual Interest during *extended sexuality* (dashed turquoise lines).

Figure 14. Effects of women's and partner's interest in romantic alternatives on women's In-Pair vs. Extra-Pair Sexual Interests during estrus, for women with poor childhood health

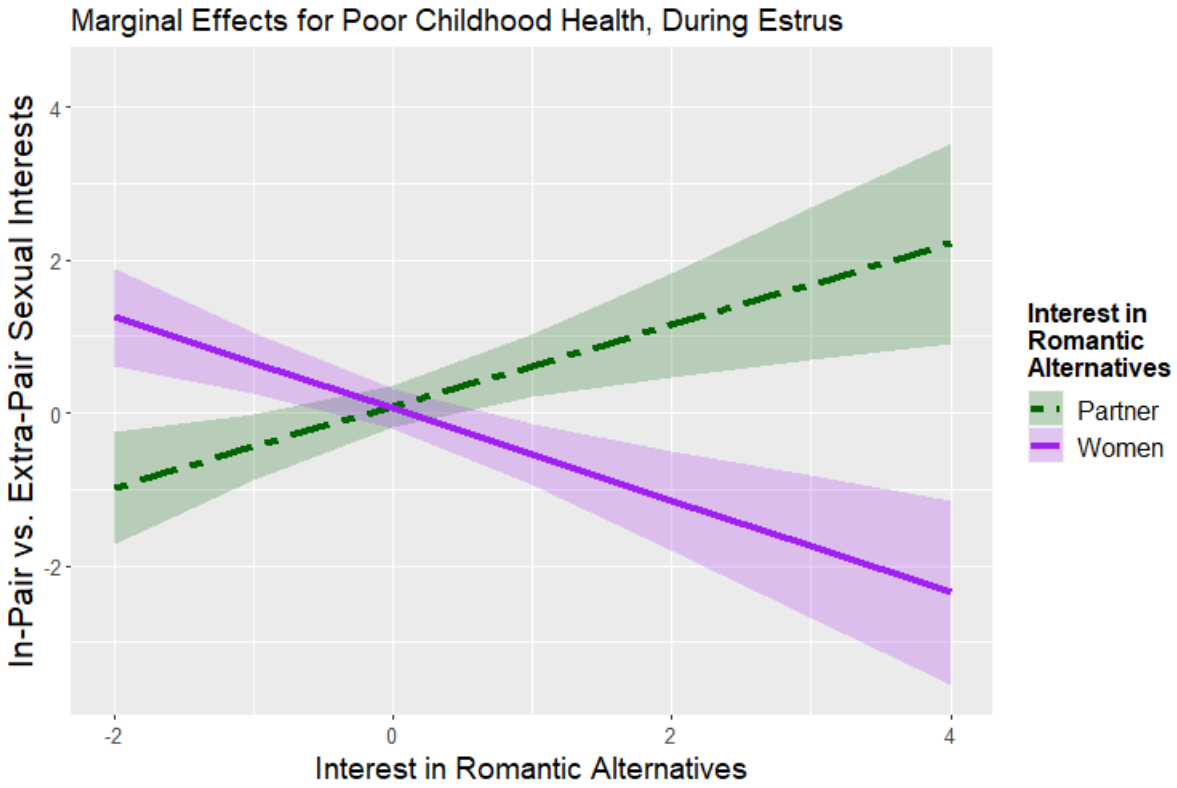


Figure caption. When primary partners are more interested in romantic alternatives, and women are relatively less interested, women with poor childhood health become more sexually interested in these partners versus other men during estrus. But women who are more highly interested in romantic alternatives experience increased sexual interest in extra-pair men relative to their partner during estrus.

3.4.5.3 Loving attachment

Primary analyses did not reveal significant 3-way interaction effects between childhood health, hormone levels, and total or discrepancy in loving attachment on Extra-Pair Sexual Interest (p's > .6). However, analyses involving women's or partner's loving attachment found 3-way interaction effects with progesterone in predicted directions falling

just outside of statistical significance (3-way interaction with women's attachment: $\gamma = .05$, $p = .148$; with partner's attachment: $\gamma = .07$, $p = .057$). At mean levels of childhood health, total loving attachment significantly moderated associations between hormone levels and women's Extra-Pair Sexual Interest (which may be strongly driven high childhood adversity; see Section 3.4.4.1) (estrogen × total attachment: $\gamma = –.10$, $p = .005$; progesterone × total attachment: $\gamma = .08$, $p = .023$). See Appendix Table A12c. Women's loving attachment independently and separately moderated hormonal associations, while partner's loving attachment separately but not independently moderated hormonal associations. Simple effects analyses showed that significant interactions between hormone levels and women's or partner's loving attachment were observed for women with good childhood health (p's = .017–.0006) but not for women with poor childhood health (p's > .10).

Because analyses presented above found that childhood adversity strongly moderated loving attachment × hormone interaction effects on Extra-Pair Sexual Interest, I next ran exploratory analyses partialling out effects of childhood adversity (Appendix Table A13). Other relationship qualities were dropped from analysis to reduce the number of terms and simplify models. (See https://osf.io/p3tyv/ for analyses on women's sexual interests, simultaneously testing interactions of the two childhood predictors with other relationship qualities.) In these analyses, 3-way interactions between total loving attachment, progesterone, and childhood experiences were significant and ran in opposing directions for (poor) childhood health and adversity (3-way interaction with health: $\gamma = .10$, $p = .006$; with adversity: $\gamma = .05$, $p = .036$). As before, interactions with the discrepancy in loving attachment were not significant (p's > .15).

For women with good childhood health, total loving attachment more strongly suppressed Extra-Pair Sexual Interest as progesterone levels decreased ($\gamma = .11$, $p = .002$). During estrus, total loving attachment was strongly negatively predictive of these women's Extra-Pair Sexual Interest ($\gamma = –.42$, $p = .0008$). Associations were negative but nonsignificant during extended sexuality ($\gamma = –.14$, $p = .250$). But for women with poor childhood health, total loving attachment had less suppressive impacts on Extra-Pair Sexual Interest as progesterone levels fell, though this interaction fell short of significant ($\gamma = –.10$, $p = .096$). Total loving attachment significantly and negatively predicted these women's Extra-Pair Sexual Interest during extended sexuality ($\gamma = –.32$, $p = .045$), but the association was nonsignificant during estrus ($\gamma = –.11$, $p = .506$). Women's and their partner's loving attachment both separately, but not uniquely, contributed to these interaction effects on Extra-Pair Sexual Interest (women's attachment × health × progesterone: $\gamma = .10$, $p = .010$; partner's attachment × health × progesterone: $\gamma = .11$, $p = .002$).

3.5 Moderation by partner mate value

3.5.1 Partner attractiveness

In the analyses above examining effects of relationship qualities, interactions between partner attractiveness, childhood adversity, and hormones tended to independently contribute to changes in women's sexual interests (see Tables 3, 5, 7; Appendix A5.1). In general, interactions between hormones and partner attractiveness with (poorer) childhood health were in the same directions as with childhood adversity but were nonsignificant.

As estrogen increased and progesterone decreased, partner sexual attractiveness became more strongly positively associated with women's In-Pair versus Extra-Pair Sexual Interests with increasing experiences of childhood adversity (3-way interaction with estrogen: $\gamma = .09$, $p = .049$; with progesterone: $\gamma = -.10$, $p = .051$). The 3-way interaction with estrogen was stronger in the prediction of In-Pair Sexual Interest ($\gamma = .13$, $p = .016$), whereas the 3-way interaction with progesterone more strongly predicted Extra-Pair Sexual Interest but did not reach statistical significance ($\gamma = .07$, $p = .115$). Follow-up analyses on the components of Extra-Pair Sexual Interest revealed significant 3-way interactions with progesterone in predicting women's extra-pair attraction ($\gamma = .13$, $p = .014$), but not their interest in having sex with an attractive hypothetical stranger ($\gamma = -.02$, $p = .684$). Significant 3-way interactions were observed for both the absolute and relative strength of women's extra-pair attraction ($p = .036$, .024, respectively). Three-way interactions involving estrogen on the components of In-Pair Sexual Interest were marginally significant for both woman-initiated sex and in-pair sexual attraction ($p = .058$, .072, respectively). See Appendix Table A19 and OSF (https://osf.io/ud6hm/).

Simple slopes analyses showed that for women from adverse childhood backgrounds, partner attractiveness predicted In-Pair Sexual Interest positively ($\gamma = .37$, $p = .030$) and Extra-Pair Sexual Interest negatively ($\gamma = -.39$, $p = .013$) during estrus. Effects of partner attractiveness were negligible during extended sexuality. For women from secure childhoods, their partner's sexual attractiveness did not significantly influence their estrous sexual desires (descriptively, the association between partner attractiveness and In-Pair Sexual Interest was negative in direction). Interestingly, partner sexual attractiveness positively predicted these

women's In-Pair relative to Extra-Pair Sexual Interests during extended sexuality ($\gamma = .33$, $p = .019$).

When effects of relationship qualities were not controlled, however, partner attractiveness interactions weakened considerably and became nonsignificant.

3.5.2 Partner attractiveness relative to women's

Our re-analyses of a large, daily diary dataset—using the original authors' analytic criteria (Arslan et al., 2021)—found significant moderation of conception risk effects by partner attractiveness relative to women's (a preregistered difference score) (Gangestad & Dinh, 2021). In analyses of the current dataset, I examined whether interactions with the difference in partner's attractiveness relative to women's predicted women's sexual interests. See Appendix A5.1, Tables A15, A17.

The interaction between childhood adversity, progesterone, and partner's versus women's attractiveness was negative and significant in predicting women's In-Pair Sexual Interest ($\gamma = –.08$, $p = .012$). See Table 9. When controlling for relationship qualities, both estrogen and progesterone's interaction effects strengthened and were significant (3-way interaction with estrogen: $\gamma = .13$, $p = .008$; with progesterone: $\gamma = –.12$, $p = .014$). Partner's sexual attractiveness, relative to women's, positively predicted In-Pair Sexual Interest during *estrus* for women from high childhood adversity backgrounds ($\gamma = .22$, $p = .009$; controlling for relationship qualities: $\gamma = .29$, $p = .020$). In contrast, women from secure childhoods experienced increased In-Pair Sexual Interest during *extended sexuality* when partner's sexual attractiveness, relative to women's, was higher ($\gamma = .41$, $p = .0009$; controlling for relationship qualities: $\gamma = .51$, $p = .0003$). See Figure 15.

Analyses on In-Pair versus Extra-Pair Sexual Interests found significant or marginally significant interactions between childhood adversity, partner's versus women's attractiveness, and progesterone levels ($\gamma = -.05$, $p = .065$; controlling for relationship qualities: $\gamma = -.09$, $p = .046$; 3-way interaction with estrogen: $\gamma = .10$, $p = .019$). However, this was primarily driven by effects on women's In-Pair Sexual Interest. No significant interactions involving partner's versus women's attractiveness were detected for Extra-Pair Sexual Interest. (Analyses showed a marginally significant interaction between estrogen, childhood adversity, and partner's versus women's attractiveness [$p = .058$], but no interaction remained close to significant when relationship qualities were controlled [p's > .6].)

Table 9. Moderation effects of partner attractiveness vs. women's attractiveness on In-Pair Sexual Interest

	In-Pair Sexual Interest			
	γ	SE	*t*-value	*p*-value
ln(E) ww	.05	.04	1.51	.133
ln(P) ww	-.02	.04	-0.46	.648
Adversity	.14	.06	2.48	**.014**
M vs. F Attractiveness	.19	.05	3.92	**.0001**
ln(E) ww * Adversity	.01	.03	0.32	.747
ln(P) ww * Adversity	.03	.04	0.65	.519
Adversity * M vs. F Attractiveness	-.10	.05	-2.16	**.032**
ln(E) ww * M vs. F Attractiveness	.03	.03	0.87	.387
ln(P) ww * M vs. F Attractiveness	.02	.04	0.42	.678
ln(E) ww * Adversity * M vs. F Attractiveness	.05	.03	1.51	.132
ln(P) ww * Adversity * M vs. F Attractiveness	-.08	.03	-2.56	**.012**

Notes. Estimates for intercept, menses, and between-woman estrogen and progesterone are not shown. Dependent variables and hormone measures are standardized. Childhood adversity, partner attractiveness, and women's attractiveness are factor scores.
ln(E) ww = within-woman estrogen; ln(P) ww = within-woman progesterone.
M vs. F Attractiveness = Partner Attractiveness – Women's Attractiveness.
p's **< .05** are **bolded**.

Figure 15. Marginal effects of partner attractiveness relative to women's attractiveness on women's In-Pair Sexual Interest during estrus and extended sexuality, for women with high and low childhood adversity

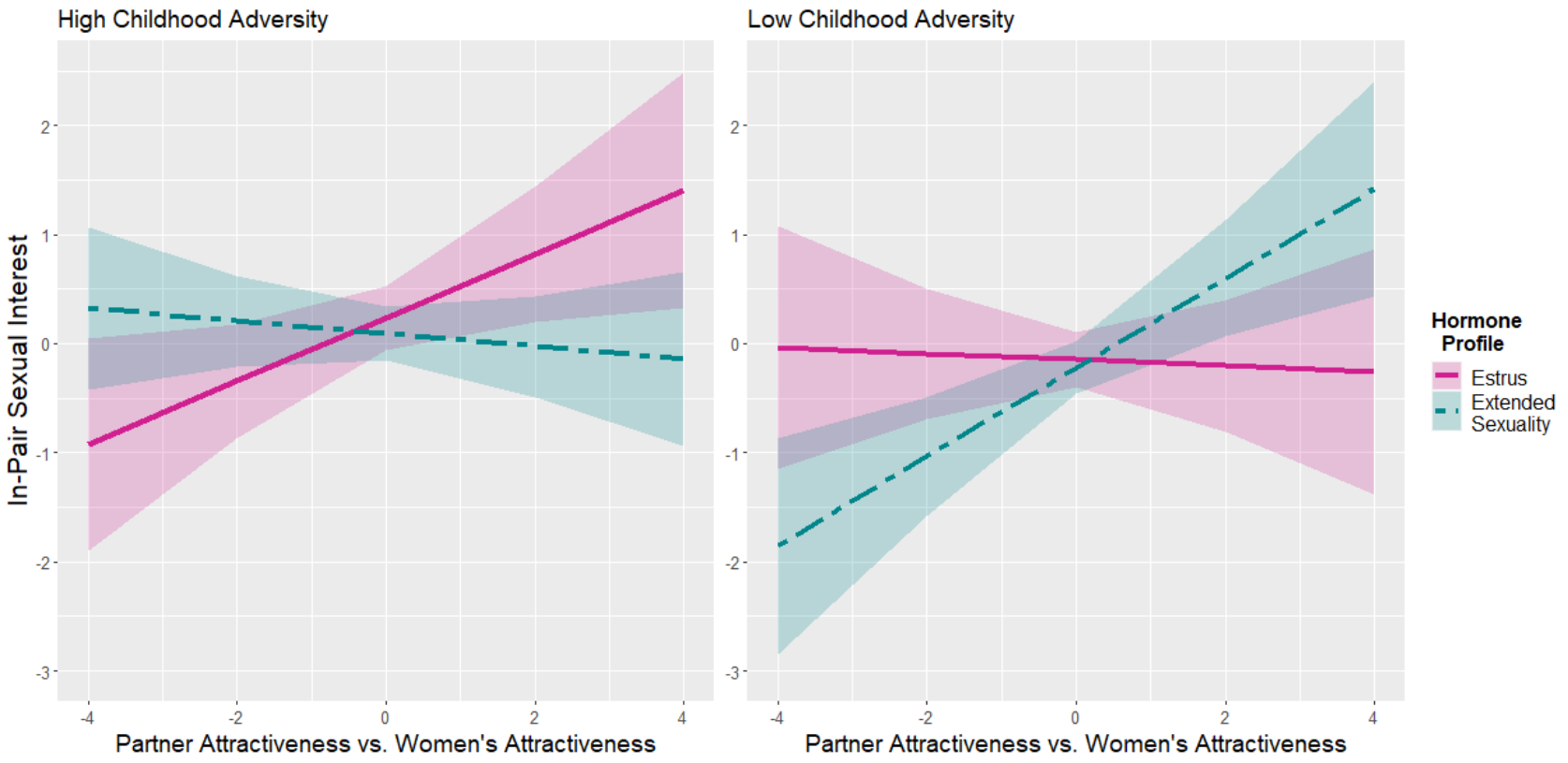


Figure caption. Partner sexual attractiveness relative to women's positively predicts women's In-Pair Sexual Interest during *estrus* (solid pink lines) for women with *high childhood adversity* (left graph) and during *extended sexuality* (dashed turquoise lines) for women with *low childhood adversity* (right graph).

3.5.3 Partner masculinity, strength, and social potency

Next, I followed up with analyses examining interactions with specific partner features.

The negative interaction between childhood adversity, partner behavioral masculinity, and progesterone was significant in predicting women's In-Pair versus Extra-Pair Sexual Interests ($\gamma = -.08$, $p = .005$). The 3-way interaction involving estrogen was positive but short of significant ($\gamma = .05$, $p = .069$). For women with high childhood adversity, partner's behavioral masculinity more positively predicted their In-Pair relative to their Extra-Pair Sexual Interests as progesterone levels decreased ($\gamma = -.13$, $p = .002$). Partner behavioral masculinity did not significantly moderate hormonal associations for women with low childhood adversity (p's > .4). See Appendix A5.2.1 for results on In-Pair and Extra-Pair Sexual Interest separately.

Appendix sections A5.2.2–A5.2.3 also reports results on moderation by partner strength/bodily attractiveness and social potency.

3.6 Oxytocin change

Colleagues and I predicted that women's oxytocin secretion in response to thoughts about their partner's supportiveness (or lack of supportiveness) correspond with involvement in a highly valued but vulnerable relationship. Hence, women's oxytocin increases are expected to associate with higher sexual interest in their partner relative to other men, especially during extended sexuality. Relationship qualities, reflecting women's and partner's involvement in the pair bond, may predict oxytocin responses. Moreover, these associations may be further moderated by childhood experiences.

3.6.1 Associations of oxytocin change with women's sexual interests

Associations between women's oxytocin responses and their sexual interests did not differ as a function of variations in childhood health. The following results therefore focus on analyses involving childhood adversity.

3.6.1.1 In-Pair versus Extra-Pair Sexual Interests

The 2-way interaction between childhood adversity and oxytocin change was negative and highly significant ($\gamma = -.29$, $p = .000003$). As childhood experiences of adversity increased, women's oxytocin response became more negatively associated with their in-pair, relative to their extra-pair, sexual interests (Figure 16). Three-way interactions between childhood adversity, oxytocin change, and within-woman changes in ovarian hormone levels were not statistically significant (p's $\geq .15$). See Table 10.

Figure 16. Associations between oxytocin responses and In-Pair vs. Extra-Pair Sexual Interests for women with high and low childhood adversity

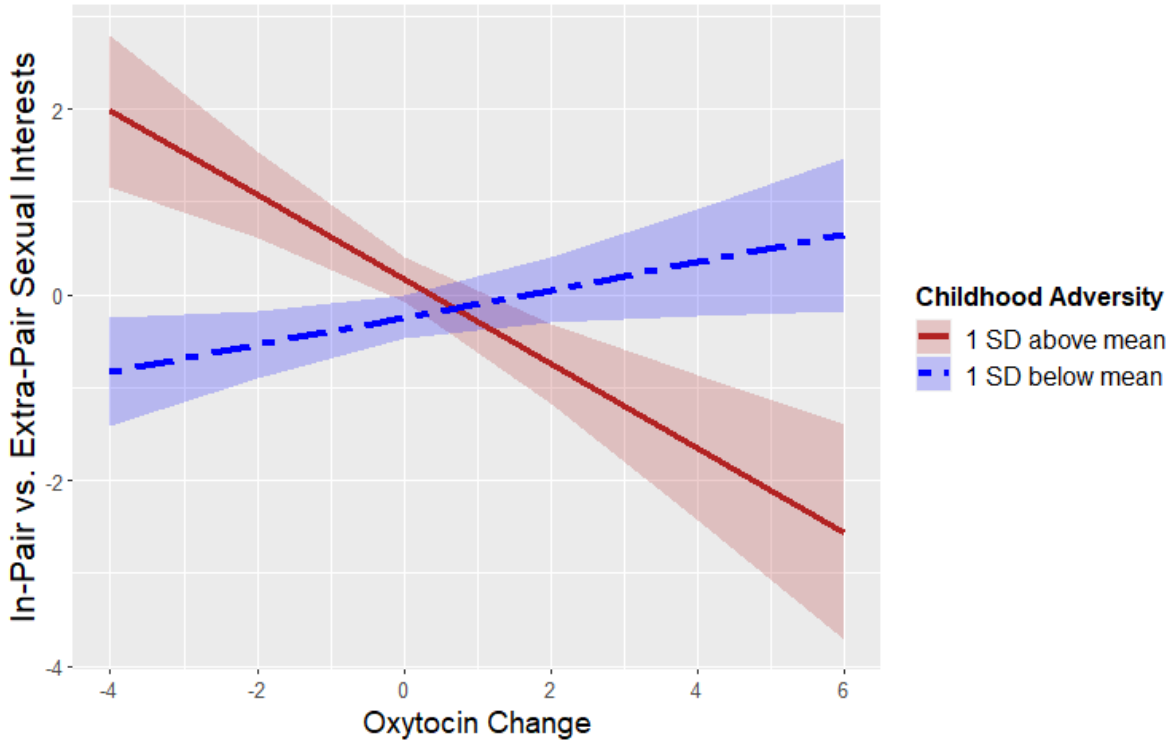


Table 10. Associations between women's oxytocin responses and In-Pair vs. Extra-Pair Sexual Interests

	In-Pair vs. Extra-Pair Sexual Interests			
	γ	SE	*t*-value	*p*-value
ln(E) ww	-.04	.05	-0.69	.492
ln(P) ww	.02	.04	0.49	.624
OT change	-.13	.06	-2.41	**.017**
Adversity	.21	.08	2.44	**.016**
Adversity * OT change	-.29	.06	-4.80	**.000003**
ln(E) ww * Adversity	-.07	.05	-1.50	.136
ln(E) ww * OT change	-.12	.07	-1.69	*.093*
ln(P) ww * Adversity	.02	.04	0.54	.590
ln(P) ww * OT change	-.05	.05	-0.89	.377
ln(E) ww * Adversity * OT change	-.10	.07	-1.45	.148
ln(P) ww * Adversity * OT change	-.03	.05	-0.63	.528

Notes. Estimates for intercept, menses, and between-woman estrogen and progesterone are not shown. Dependent variable and hormone measures are standardized, except for OT change.

OT change = oxytocin change residuals.
ln(E) ww = within-woman estrogen.
ln(P) ww = within-woman progesterone.
p's **< .05** are **bolded**; *p*'s < *.10* are *italicized.*

3.6.1.2 In-Pair Sexual Interest

With fewer experiences of childhood adversity, women's oxytocin response was increasingly more positively associated with their In-Pair Sexual Interest (2-way interaction: $\gamma = -.32$, $p = .0000003$). This effect was further qualified by a highly significant negative 3-way interaction with progesterone levels ($\gamma = -.17$, $p = .001$). See Table 11. Differences in associations of women's oxytocin response with their In-Pair Sexual Interest as a function of childhood adversity were more apparent during extended sexuality (adversity × oxytocin change: $\gamma = -.54$, $p = .00003$). For women with high childhood adversity, oxytocin change

became more negatively associated with In-Pair Sexual Interest as progesterone approached luteal phase levels ($\gamma = -.25$, $p = .003$). Increases in oxytocin levels were strongly negatively associated with their In-Pair Sexual Interest during extended sexuality ($\gamma = -.87$, $p = .0001$), but not during estrus ($\gamma = -.06$, $p = .77$). For women with low childhood adversity, increases in oxytocin were positively associated with sexual interest in their partner independent of hormone levels ($\gamma = .17$, $p = .017$), though nonsignificantly more positively associated at higher progesterone levels (oxytocin change × progesterone: $\gamma = .09$, $p = .197$). See Figure 17.

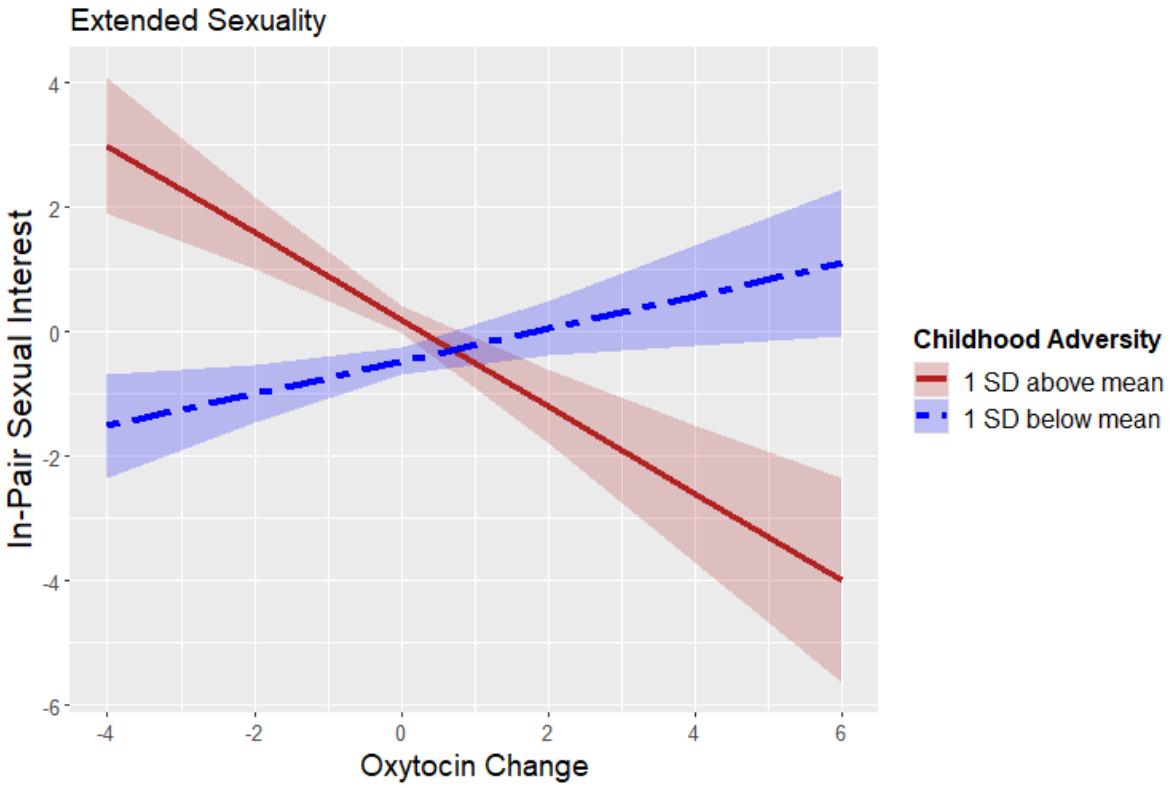
Table 11. Associations between women's oxytocin responses and In-Pair Sexual Interest

	In-Pair Sexual Interest			
	γ	SE	*t*-value	*p*-value
ln(E) ww	.05	.06	0.98	.331
ln(P) ww	-.05	.05	-1.09	.279
OT change	-.15	.06	-2.65	**.009**
Adversity	.29	.07	4.13	**.0001**
Adversity * OT change	-.32	.06	-5.29	**.0000003**
ln(E) ww * Adversity	.01	.05	0.11	.917
ln(E) ww * OT change	.10	.07	1.41	.161
ln(P) ww * Adversity	.04	.04	1.00	.318
ln(P) ww * OT change	-.08	.05	-1.46	.147
ln(E) ww * Adversity * OT change	.06	.07	0.78	.437
ln(P) ww * Adversity * OT change	-.17	.05	-3.24	**.001**

Notes. Estimates for intercept, menses, and between-woman estrogen and progesterone are not shown. Dependent variable and hormone measures are standardized, except for OT change.

OT change = oxytocin change residuals.
ln(E) ww = within-woman estrogen.
ln(P) ww = within-woman progesterone.
p's **< .05** are **bolded**; *p*'s < *.10* are *italicized.*

Figure 17. Associations between oxytocin responses and In-Pair Sexual Interest during extended sexuality for women with high and low childhood adversity



3.6.1.3 Extra-Pair Sexual Interest

At mean within-woman estrogen and progesterone levels, the interaction between oxytocin change and childhood adversity was significant: With more experiences with childhood adversity, increases in oxytocin levels corresponded more with higher Extra-Pair Sexual Interest ($\gamma = .11$, $p = .046$). Three-way interactions between childhood adversity, oxytocin change, and ovarian hormones were also significant (3-way interaction with estrogen: $\gamma = .20$, $p = .003$; with progesterone: $\gamma = –.11$, $p = .026$). See Table 12.

Larger differences in effects of oxytocin change as a function of childhood experiences were observed during estrus ($\gamma = .41$, $p = .0006$) than during extended sexuality

(γ = –.20, *p* = .077). As estrogen levels increased and progesterone levels decreased, oxytocin change became more positively associated with Extra-Pair Sexual Interest for women with high childhood adversity (estrogen × oxytocin change: γ = .47, *p* = .00009; progesterone × oxytocin change: γ = –.15, *p* = .043). Higher oxytocin responses were strongly positively associated with these women's interest in other men during estrus (γ = .77, *p* = .0001) and negatively associated during extended sexuality (γ = –.46, *p* = .018). For women from secure childhood backgrounds, oxytocin change was not significantly associated with Extra-Pair Sexual Interest (γ = –.06, *p* = .284), nor was the association significantly moderated by hormone levels (*p*'s > .15). See Figure 18.

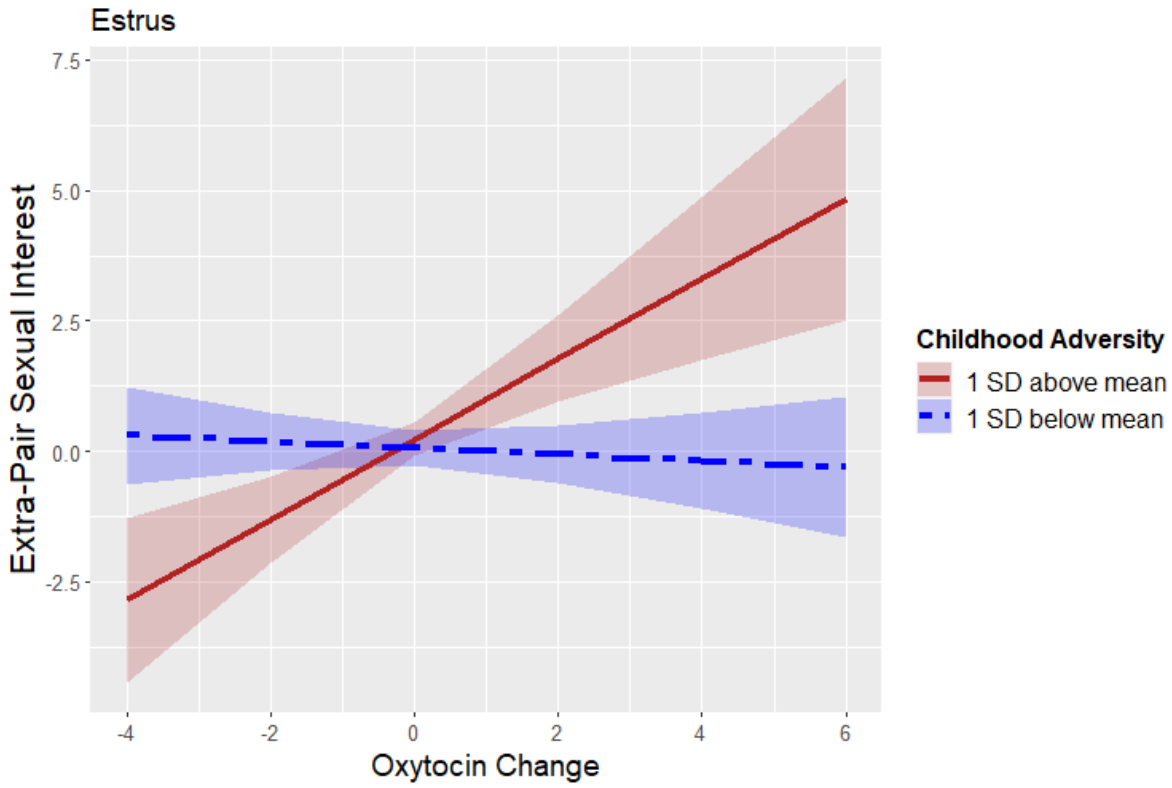
Table 12. Associations between women's oxytocin responses and Extra-Pair Sexual Interest

	Extra-Pair Sexual Interest			
	γ	SE	*t*-value	*p*-value
ln(E) ww	.10	.05	2.09	**.038**
ln(P) ww	-.08	.04	-1.98	*.053*
OT change	.05	.05	0.91	.364
Adversity	-.01	.09	-0.14	.891
Adversity * OT change	.11	.05	2.01	**.046**
ln(E) ww * Adversity	.09	.04	2.24	**.027**
ln(E) ww * OT change	.27	.06	4.37	**.00002**
ln(P) ww * Adversity	.0001	.04	0.00	.999
ln(P) ww * OT change	-.04	.05	-0.88	.382
ln(E) ww * Adversity * OT change	.20	.07	3.04	**.003**
ln(P) ww * Adversity * OT change	-.11	.05	-2.26	**.026**

Notes. Estimates for intercept, menses, and between-woman estrogen and progesterone are not shown. Dependent variable and hormone measures are standardized, except for OT change.

OT change = oxytocin change residuals.
ln(E) ww = within-woman estrogen.
ln(P) ww = within-woman progesterone.
p's **< .05** are **bolded**; *p*'s < *.10* are *italicized.*

Figure 18. Associations between oxytocin change and Extra-Pair Sexual Interest during estrus, for high and low childhood adversity



3.6.2 Relationship quality predictors of oxytocin change: Moderation by childhood adversity

Significant interactions between childhood adversity, ovarian hormone levels, and relationship qualities on oxytocin change were exclusive to loving attachment, romantic passion, and dishonesty/interest in romantic alternatives. Therefore, I omitted interactions with emotional support to simplify analyses. See summary Table 13. For complete results, see Appendix A6.

Table 13. Estimates for highest-order interactions between childhood adversity, hormones, and relationship qualities on women's oxytocin change residuals

Oxytocin Change

	γ	SE	*t*-value	*p*-value
ln(E) ww * Adversity * Passion total	.02	.11	0.19	.849
ln(E) ww * Adversity * Passion discrepancy	-.08	.14	-0.61	.541
ln(P) ww * Adversity * Passion total	-.23	.09	-2.54	**.012**
ln(P) ww * Adversity * Passion discrepancy	.28	.13	2.14	**.034**
ln(E) ww * Adversity * Attachment total	.08	.10	0.82	.414
ln(E) ww * Adversity * Attachment discrepancy	.27	.13	2.09	**.038**
ln(P) ww * Adversity * Attachment total	.16	.07	2.30	**.023**
ln(P) ww * Adversity * Attachment discrepancy	-.14	.11	-1.28	.202
ln(E) ww * Adversity * Non-exclusivity total	.25	.11	2.31	**.022**
ln(E) ww * Adversity * Non-exclusivity discrep.	.28	.14	1.93	*.055*
ln(P) ww * Adversity * Non-exclusivity total	-.24	.09	-2.82	**.005**
ln(P) ww * Adversity * Non-exclusivity discrep.	-.13	.06	-2.21	**.028**

Notes. Relationship qualities and hormone measures are standardized. Childhood adversity is a factor score.

ln(E) ww = within-woman estrogen
ln(P) ww = within-woman progesterone
p's **< .05** are **bolded**
p's < *.10* are *italicized*

3.6.2.1 Loving attachment

In general (at average within-woman estrogen and progesterone levels), total loving attachment more positively predicted oxytocin changes when women had fewer experiences with childhood adversity ($\gamma = -.25$, $p = .004$). This difference became significantly stronger as progesterone levels decreased (3-way interaction: $\gamma = .16$ $p = .023$; adversity × total attachment during estrus: $\gamma = -.34$, $p = .021$). This was largely because total loving attachment more negatively predicted high childhood adversity women's oxytocin response as progesterone fell to periovulatory phase levels ($\gamma = .37$, $p = .001$). See Figure 20.

Discrepancies in loving attachment did not differentially predict oxytocin responses across childhood experiences in general. Rather, when estrogen levels became more characteristic of the luteal phase, oxytocin responses were more positively influenced by discrepancies in loving attachment for women with lower childhood adversity (3-way interaction: $\gamma = .27$, $p = .038$).

The negative effect of total loving attachment during estrus for women with high childhood adversity was not significantly driven by unique effects of women's or their partner's loving attachment. For women with secure childhoods, the positive effects of the total and discrepancy in loving attachment during extended sexuality appeared to be a result of women's higher loving attachment, over and above their partner's ($\gamma = 1.36$, $p = .005$; estrogen × women's attachment: $\gamma = -.70$, $p = .010$). Their partner's loving attachment had the opposite effect but was nonsignificant ($\gamma = -.52$, $p = .271$; estrogen × partner's attachment: $\gamma = .29$, $p = .288$). See Figure 19.

Figure 19. Marginal effects of women's and partner's loving attachment on oxytocin change during estrus and extended sexuality, for women with low childhood adversity

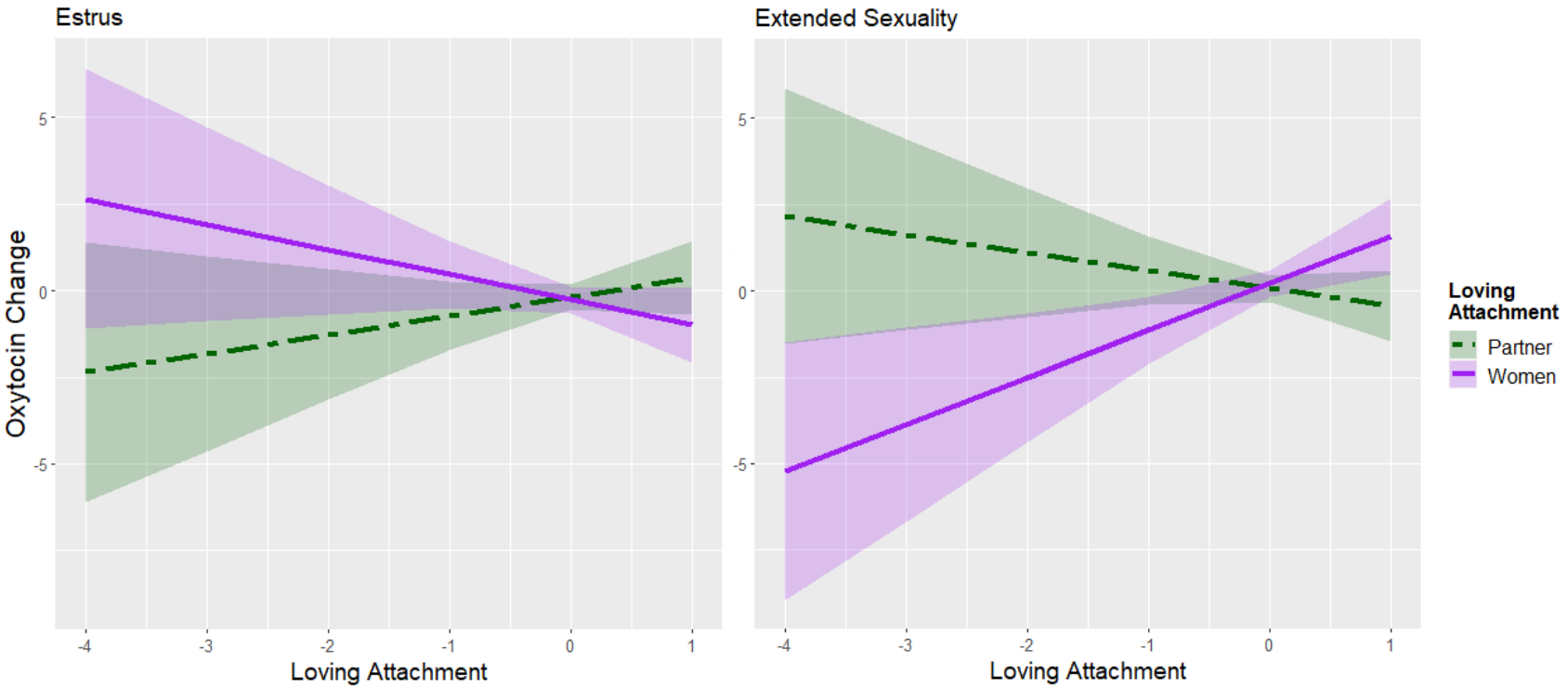


Figure caption. Higher discrepancies in women's and partner's loving attachment predict greater oxytocin change during *extended sexuality* (right graph) for women with low childhood adversity: Women experience larger increases in oxytocin levels when their partner is relatively less attached than women are. Women who are relatively less attached displayed drops in oxytocin levels.

Figure 20. Marginal effects of total loving attachment on oxytocin change during estrus and extended sexuality, for women with high childhood adversity

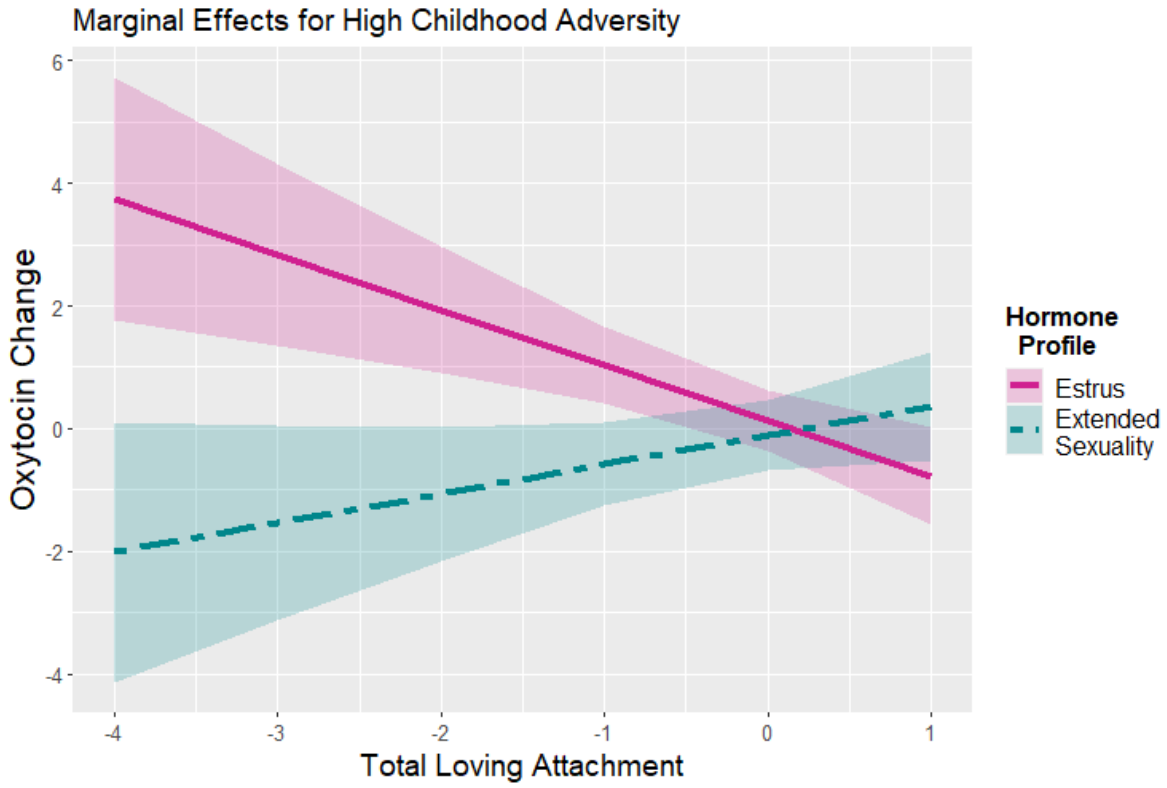


Figure caption. Total loving attachment is negatively associated with oxytocin change during *estrus* (solid pink line) for women with high childhood adversity, with those in more weakly attached relationships exhibiting larger oxytocin increases.

3.6.2.2 Romantic passion

Women's oxytocin responses were also significantly predicted by 3-way childhood adversity × progesterone interactions with both the total and discrepancy in the couple's romantic passion (total: $\gamma = -.23$, $p = .012$; discrepancy: $\gamma = .28$, $p = .034$). These interactions were driven by independent effects of women's and their partner's romantic passion in opposite directions—negative and more robust for the 3-way interaction with partner's romantic passion ($\gamma = -.48$, $p = .014$) and positive but not statistically significant for

women's passion ($\gamma = .31$, $p = .112$). For women with secure childhoods, discrepancies in women's versus their partner's romantic passion predicted greater oxytocin increases as progesterone levels fell. This was because women's higher levels of romantic passion—and lack of romantic passion from their partner—were associated with greater oxytocin increases (progesterone × women's passion: $\gamma = –.56$, $p = .045$; progesterone × partner's passion: $\gamma = .55$, $p = .017$) (Figure 22). For women with high childhood adversity, the total but not the difference in romantic passion became more positively predictive of oxytocin responses as progesterone levels decreased ($\gamma = –.36$, $p = .012$) (Figure 21).

Figure 21. Marginal effects of total romantic passion on oxytocin change during estrus and extended sexuality, for women with high childhood adversity

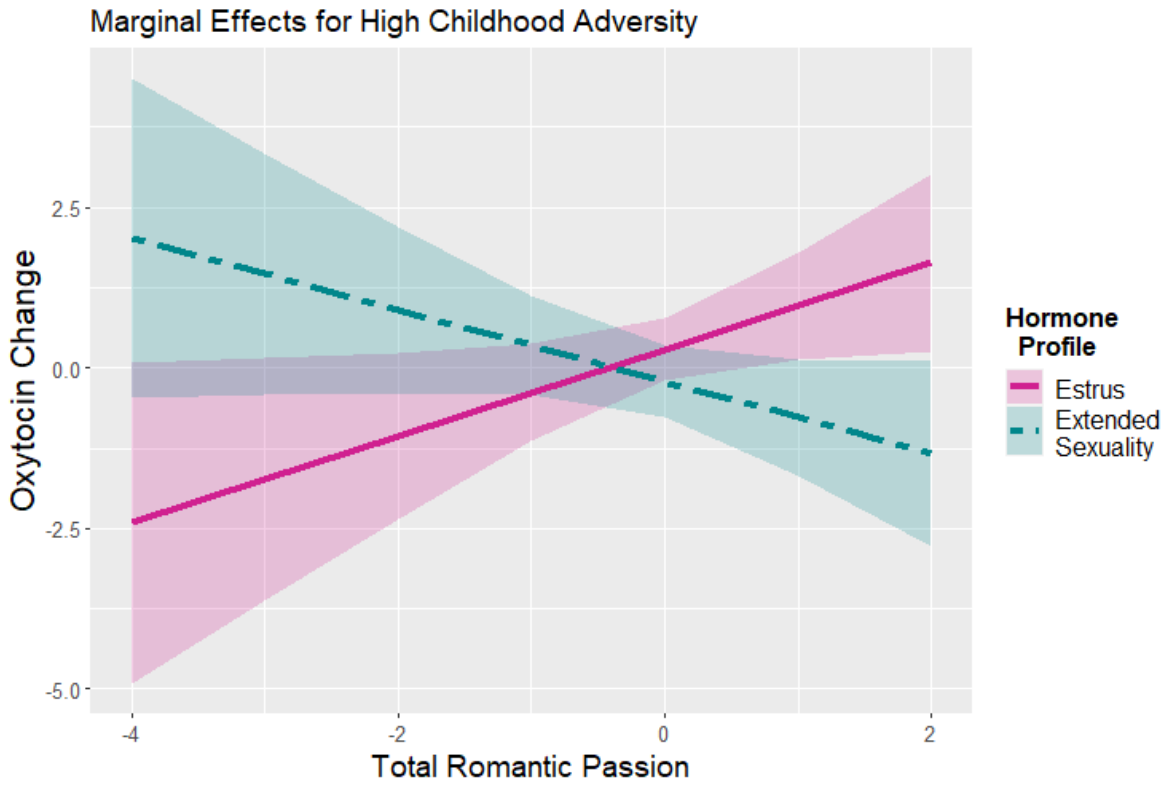


Figure caption. For women with high childhood adversity, total romantic passion is positively associated with oxytocin change during *estrus* (solid pink line) and negatively associated during *extended sexuality* (dashed turquoise line).

Figure 22. Marginal effects of women's and partner's romantic passion on oxytocin change during estrus and extended sexuality, for women with low childhood adversity

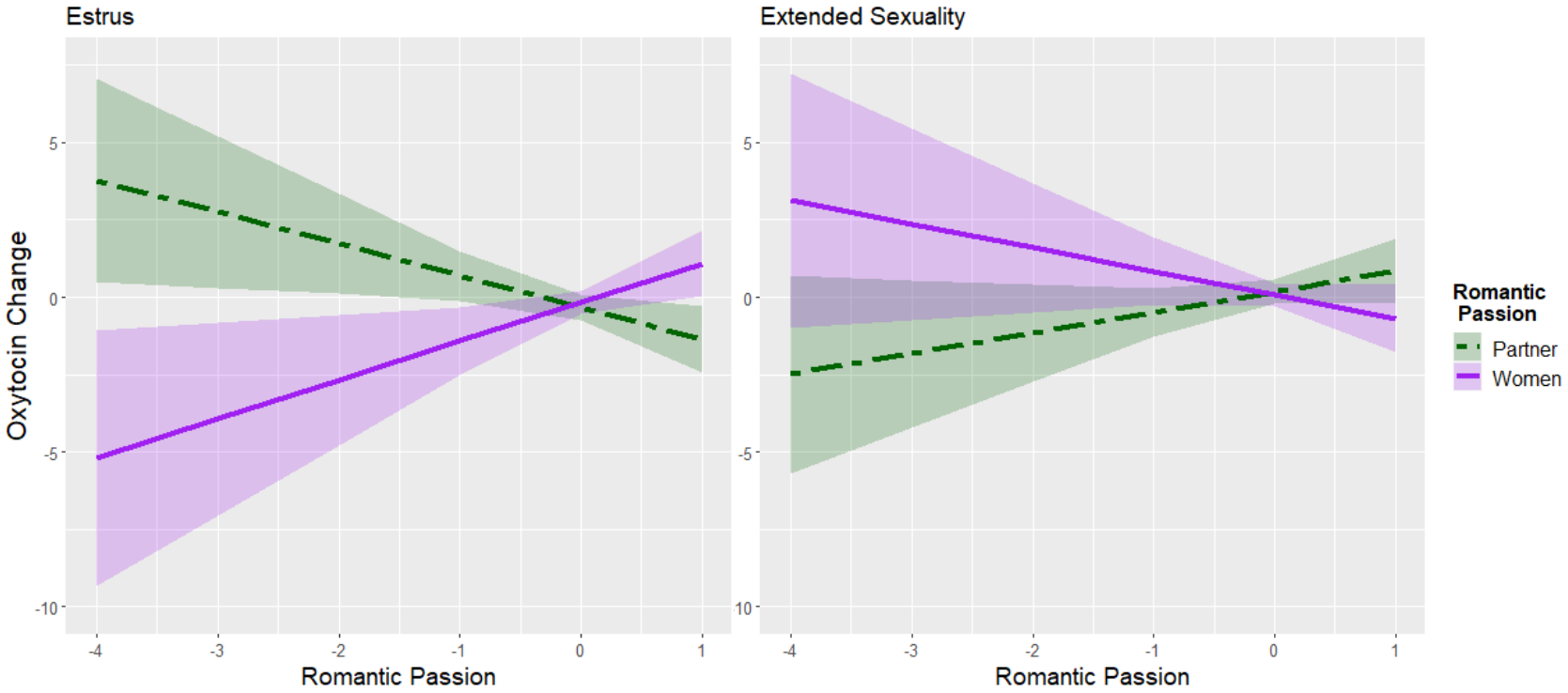


Figure caption. Higher discrepancies in women's and partner's romantic passion predict greater oxytocin change during *estrus* (left graph) for women with low childhood adversity: Women experience larger increases in oxytocin levels when their partner is relatively less passionate than women are. Women who are relatively less passionate displayed drops in oxytocin levels.

3.6.2.3 Dishonesty and interest in romantic alternatives

Significant 3-way childhood adversity interactions with estrogen and progesterone, with both the total and discrepancy in dishonesty/interest in romantic alternatives, emerged. These moderation effects were driven by women's interest in romantic alternatives, independent of their partner's. Significant effects were observed primarily for women with more secure childhood backgrounds. As estrogen increased and progesterone decreased for women with secure childhoods, their interest in romantic alternatives more negatively predicted their oxytocin response (estrogen × women's non-exclusivity: $\gamma = -.35$, $p = .019$; progesterone × women's non-exclusivity: $\gamma = .33$, $p = .001$). This interaction was driven by significant effects of women's interest in romantic alternatives in opposite directions during estrus and during extended sexuality: Greater interest in others predicted decreases in oxytocin levels during estrus ($\gamma = -.63$, $p = .005$) and increases in oxytocin levels during extended sexuality ($\gamma = .73$, $p = .003$). See Figure 23. Simple effects analyses with women's interest in romantic alternatives centered at one standard deviation above and below the mean revealed that effects were driven by those with higher, but not those with lower, interest in mate alternatives.

Figure 23. Marginal effects of women's interest in romantic alternatives on oxytocin change during estrus and extended sexuality, for women with low childhood adversity

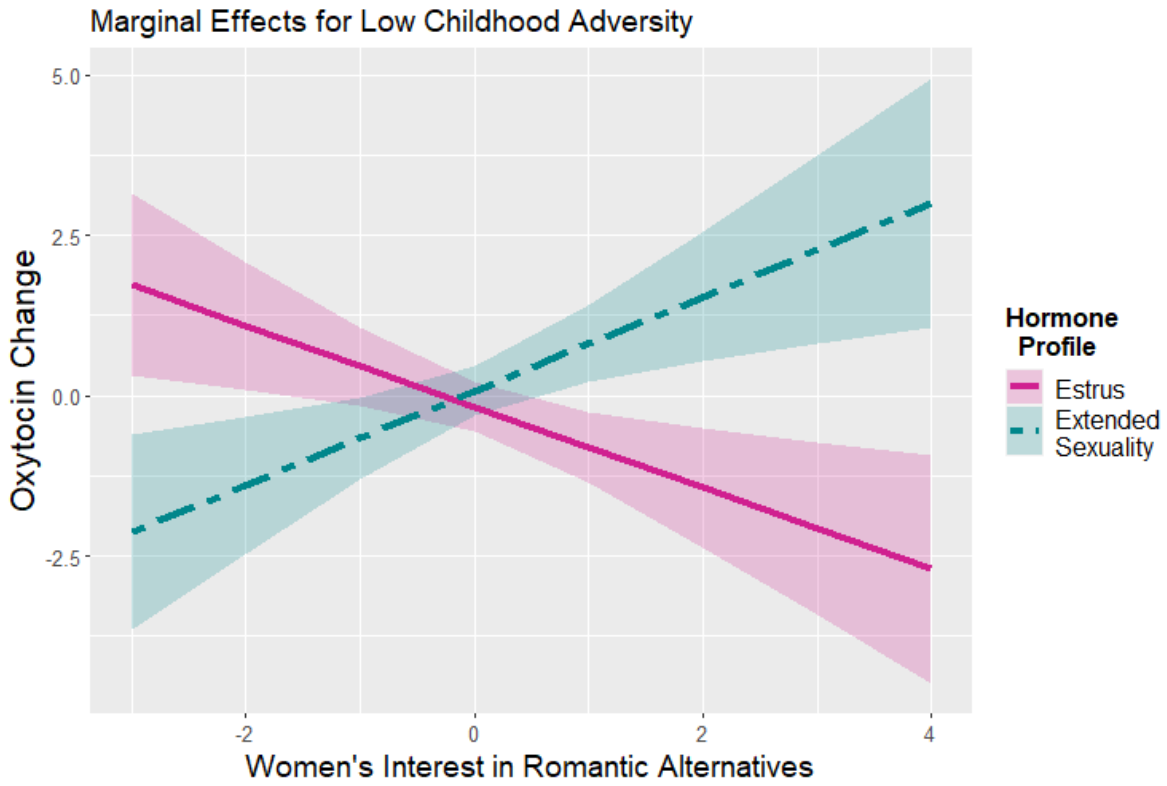


Figure caption. Women with low childhood adversity who are interested in romantic alternatives show decreased oxytocin levels during estrus (solid pink line) and increased levels during extended sexuality (dashed turquoise line).

3.6.3 Relationship quality predictors of oxytocin change: Moderation by childhood health

Loving attachment was the sole relationship quality that significantly moderated childhood health effects on women's oxytocin change. To simplify models, the other three relationship qualities were removed.

As progesterone decreased to periovulatory phase levels, total loving attachment predicted greater oxytocin increases for women with better childhood health (3-way

interaction: $\gamma = -.16$, $p = .024$). See Table 14. This was largely because total loving attachment more negatively predicted oxytocin responses for women with poorer childhood health, especially during estrus (health × attachment: $\gamma = .43$, $p = .003$). Women with poor childhood health in highly attached relationships tended to show decreases in oxytocin levels; but they tended to show increases in oxytocin levels in weakly attached relationships (Figure 24).

Figure 24. Marginal effects of total loving attachment on oxytocin change for women with poor and good childhood health

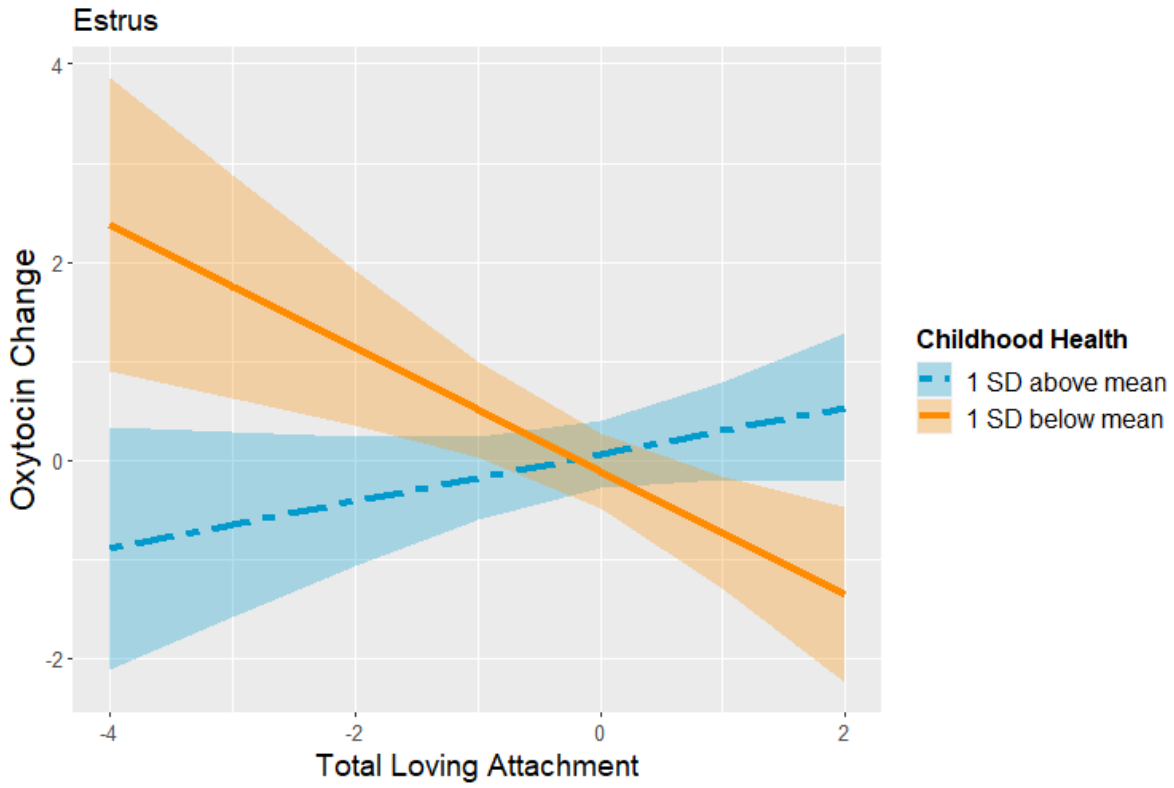


Table 14. Multilevel analysis on oxytocin change as a function of childhood health, hormone levels, total and discrepancy in loving attachment, and their interactions

Oxytocin Change

	γ	SE	*t*-value	*p*-value
(Intercept)	.06	.07	0.79	.433
Menses	-.50	.30	-1.67	*.097*
ln(E) mean	-.18	.08	-2.21	**.030**
ln(P) mean	.06	.08	0.68	.497
ln(E) ww	-.07	.07	-1.02	.311
ln(P) ww	-.003	.06	-0.05	.963
Health	.04	.07	0.62	.535
Loving Attachment total	.02	.07	0.27	.787
Loving Attachment discrepancy	.04	.07	0.61	.546
ln(E) ww * Health	.05	.07	0.70	.483
ln(P) ww * Health	.02	.08	0.30	.764
Health * Loving Attachment total	.15	.09	1.75	*.084*
ln(E) ww * Loving Attachment total	-.09	.06	-1.56	.120
ln(P) ww * Loving Attachment total	.12	.05	2.23	**.027**
Health * Loving Attachment discrepancy	-.06	.07	-0.83	.409
ln(E) ww * Loving Attachment discrepancy	-.01	.08	-0.07	.946
ln(P) ww * Loving Attachment discrepancy	-.04	.08	-0.45	.653
ln(E) ww * Health * Loving Attachment total	.12	.09	1.34	.181
ln(P) ww * Health * Loving Attachment total	-.16	.07	-2.28	**.024**
ln(E) ww * Health * Loving Attachment discrepancy	.03	.09	0.34	.735
ln(P) ww * Health * Loving Attachment discrepancy	.11	.10	1.18	.242

Notes. All predictors are standardized, except for menses (1 = menstruating; 0 = not menstruating).

ln(E) ww = within-woman estrogen
ln(P) ww = within-woman progesterone
p's **< .05** are **bolded**
p's < *.10* are *italicized*

3.7 Mate preferences

In separate analyses on the three preferences tasks, which did not examine effects of childhood experiences, women's In-Pair versus Extra-Pair Sexual Interests significantly moderated progesterone's association with mate preferences. Hence, I examined whether these interactions are further moderated by, or independent of, effects of childhood experiences on mate preferences. In general, analyses found little evidence for hormone-dependent shifts in mate preferences as a function of childhood health. Therefore, the following sections focus on interactions with childhood adversity. See https://osf.io/p3tyv/ for analyses with health as the childhood predictor variable.

Analyses found evidence that estrous increases in sexual preferences for muscular and socially dominant men, when women were less sexually interested in their partner relative to other men, strongly depended on childhood experiences of adversity. See summary Table 15. Interactions involving childhood adversity × In-Pair versus Extra-Pair Sexual Interests did not incrementally predict women's interest in attractive bodily features and, thus, were dropped from analyses.

Table 15. Summary results of multilevel analyses examining interactions between childhood adversity, hormones, and In-Pair vs. Extra-Pair Sexual Interests (if applicable) on women's mate preferences

		Effect * Adversity [a]		**High Adversity** [b]		**Low Adversity** [c]	
DV	**Effect**	γ	*p*-value	γ	*p*-value	γ	*p*-value
Interest in Bodily Features	ln(E) ww	.01	.720	*.07*	*.080*	.05	.197
	ln(P) ww	**–.06**	**.029**	**–.09**	**.014**	.03	.507
Bodily Attractiveness (Photo Rating)	ln(E) ww * Muscularity * IP vs. EP Interests [d]	–.03	.335	–.03	.291	.02	.456
	ln(P) ww * Muscularity * IP vs. EP Interests [d]	**.13**	**.008**	**.13**	**.0006**	–.01	.737
ST vs. LT Attractiveness (Video Rating)	ln(E) ww * Dominance * IP vs. EP Interests [d]	–.02	.335	–.01	.661	.02	.256
	ln(P) ww * Dominance * IP vs. EP Interests [d]	**.06**	**.001**	**.08**	**.001**	–.03	.128
ST vs. LT Attractiveness (Video Rating)	ln(E) ww * Muscularity * IP vs. EP Interests [e]	.004	.767	.01	.585	.004	.840
	ln(P) ww * Muscularity * IP vs. EP Interests [e]	**.07**	**.016**	**.14**	**.0002**	–.002	.945

[a] Higher-order interaction between childhood adversity and effect of interest.

[b] Simple effects estimates for women with high childhood adversity (centered at 1 *SD* above the mean).

[c] Simple effects estimates for women with low childhood adversity (centered at 1 *SD* below the mean).

[d] Interactions with total variation in In-Pair (IP) vs. Extra-Pair (EP) Sexual Interests.
(Significant interactions remain robust when substituting total levels with between-woman IP vs. EP Sexual Interests.)

[e] Interactions with between-woman (mean levels of) In-Pair vs. Extra-Pair Sexual Interests.
(Interactions with total IP vs. EP Sexual Interests are not nominally significant [4-way progesterone interaction: $\gamma = .04$, $p = .115$], except for the simple 3-way interaction with progesterone for women with high childhood adversity, $\gamma = .08$, $p = .019$.)

Effects with $p <$ **.05** are **bolded**; effects with $p <$ *.10* are *italicized.*

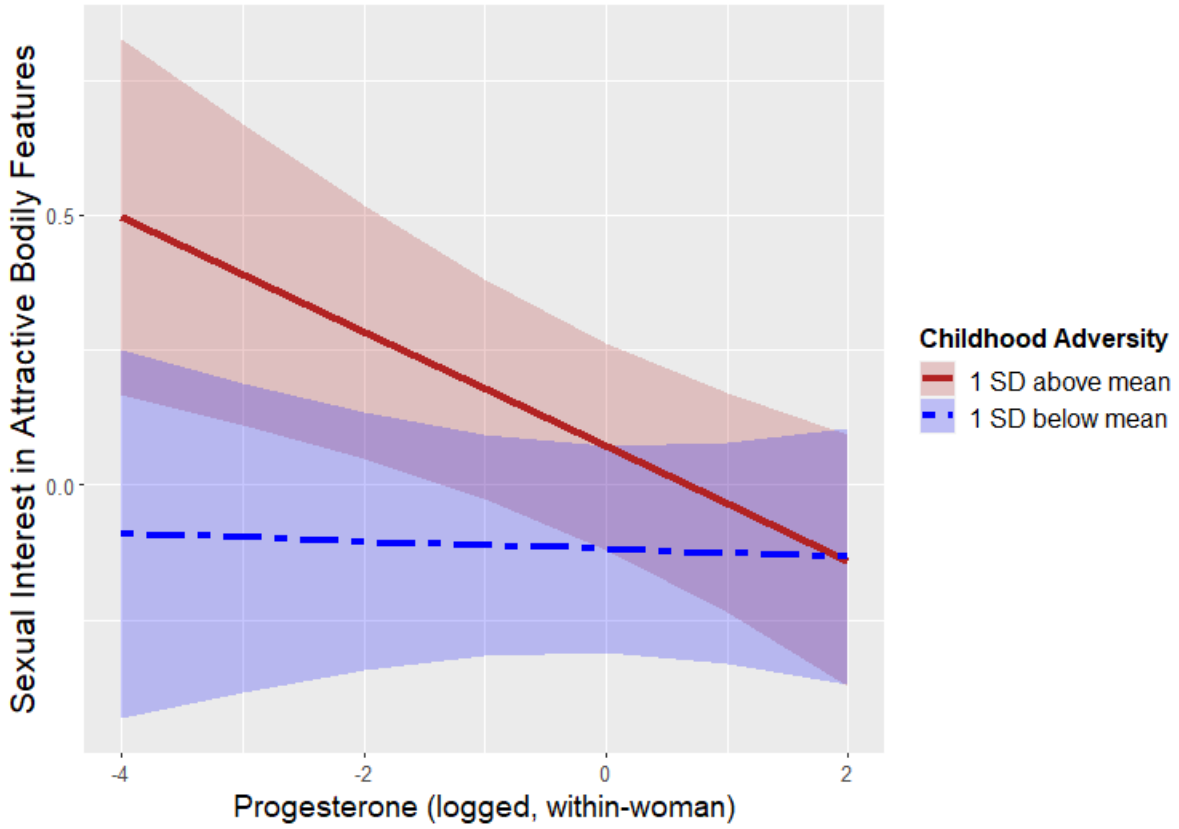
3.7.1 Sexual interest in attractive bodily features

First, analyses examined whether effects of estrogen and progesterone on women's sexual arousal to and interest in attractive bodily features differ as a function of childhood experiences. Independent of women's In-Pair versus Extra-Pair Sexual Interests, the negative interaction between progesterone and childhood adversity was significant ($\gamma = -.06$, $p = .029$). Women's In-Pair versus Extra-Pair Sexual Interests also uniquely moderated progesterone's association with their interest in attractive bodily features but did not significantly interact with childhood adversity.

Simple slopes analyses showed that women from adverse backgrounds experienced increased sexual arousal to attractive bodily features as progesterone levels decreased ($\gamma = -.10$, $p = .014$). Progesterone's effect was nonsignificant for women from secure backgrounds ($\gamma = .03$, $p = .507$). See Figure 25. Childhood adversity positively predicted women's interest in and arousal to seeing an attractive person's body during the follicular phase (progesterone 1 *SD* below the mean), $\gamma = .15$, $p = .047$, but not during the luteal phase (progesterone 1 *SD* above the mean), $\gamma = .02$, $p = .752$.

See Appendix A7.1 for full results, including on childhood adversity interactions with mean hormone levels (A7.1.1) and analyses excluding effects of In-Pair versus Extra-Pair Sexual Interests (A7.2, Table A35; also see: https://osf.io/5t2mb/).

Figure 25. Marginal effects of progesterone on sexual interest in attractive bodily features, for women with high and low childhood adversity



3.7.2 Shifts in preferences for muscular male bodies

Analyses next asked whether women with high childhood adversity, relative to women with secure childhoods, display stronger within-woman increases in preferences for muscular male bodies in the body-rating task at high conception risk hormone profiles.

Consistent with predictions, women with more adverse childhood experiences showed stronger increases in preferences for muscularity as progesterone levels decreased—particularly when they were less sexually interested in their partner relative to extra-pair men (4-way interaction: $\gamma = .13$, $p = .008$). The interaction with estrogen levels was nonsignificant ($\gamma = –.03$, $p = .335$). Increased mate preferences for bodily muscularity as a function of the

positive interaction between In-Pair versus Extra-Pair Sexual Interests and progesterone levels were highly significant for women from adverse backgrounds (3-way interaction: γ = .13, p = .0006), while women from secure backgrounds showed no significant change (3-way interaction: γ = –.01, p = .737).

When women with high childhood adversity experienced high extra-pair relative to in-pair sexual interest (1 *SD* below the mean in IP vs. EP interest), their preferences for bodily muscularity grew stronger as progesterone decreased to periovulatory phase levels (muscularity × progesterone: γ = –.06, p = .002). But when they were highly sexually interested in their partner compared to other men (1 *SD* above the mean), their preferences for muscularity weakened as progesterone levels fell (muscularity × progesterone: γ = .09, p = .00001). Women's interest in their partner and their interest in extra-pair men had moderating effects of equivalent magnitude in opposite directions, though more robust effects of In-Pair Sexual Interest emerged in the separate analyses (4-way interaction with IP interest: γ = .04, p = .008; 4-way interaction with EP interest: γ = –.04, p = .081).

Analyses examining whether moderation by In-Pair vs. Extra-Pair Sexual Interests was driven by within-woman changes in sexual interests or by between-woman differences in mean levels of sexual interests (i.e., separating out within-woman and woman-specific mean levels of IP vs. EP Sexual Interests) found significant effects of both.

The presented analyses focus on within-woman changes in mate preferences (i.e., scaled by woman-specific standard deviations in ratings). Results for analyses on raw attractiveness ratings were similar, though effect sizes are slightly stronger with larger standard errors due to between-woman differences in scale usage. See Appendix A7.1.2 for

results of analyses on both. Section A7.2.1 of the Appendix also reports results of the body rating task, without inclusion of interactions with In-Pair versus Extra-Pair Sexual Interests.

3.7.3 Preferences for video stimuli of socially dominant and muscular men

During a targeted periovulatory and luteal session, women watched and rated video clips of men on their attractiveness as a short-term, sexual partner and as a long-term relationship partner. The following analyses examined whether hormone-dependent changes in women's mate preferences for socially dominant and muscular men, as a function of childhood adversity, were stronger when women experienced more sexual interest in other men than in their partner. (See Appendix A7.1.3 for results on preferences by mating context. See A7.2.2 for results excluding interactions with In-Pair versus Extra-Pair Sexual Interests.)

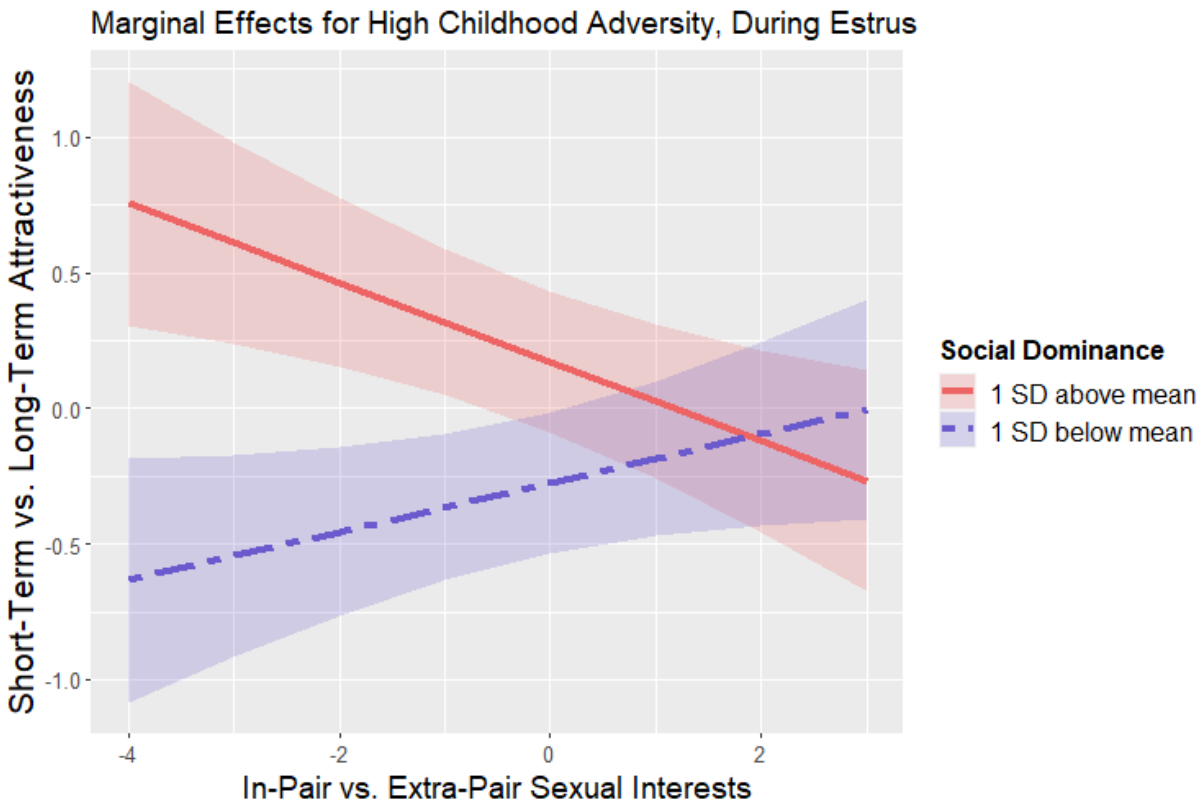
3.7.3.1 Preferences for socially dominant men

Indeed, when women had lower In-Pair versus Extra-Pair Sexual Interests, those who grew up with more experiences of adversity showed stronger within-woman increases in short-term versus long-term preferences for socially dominant men as progesterone fell to periovulatory phase levels (4-way interaction: $\gamma = .06$, $p = .001$). For women with high childhood adversity, the interaction between progesterone and In-Pair versus Extra-Pair Sexual Interests strongly predicted changes in preferences for more socially dominant men as short-term relative to long-term partners (3-way interaction: $\gamma = .08$, $p = .001$). See Figure 26. The interaction ran in the opposite direction for women with low childhood adversity but did not reach statistical significance ($\gamma = –.03$, $p = .128$).

To probe these moderation effects, simple effects were estimated for women with high childhood adversity, with In-Pair versus Extra-Pair Sexual Interests centered at 1 *SD*

below and above the mean.[2] When women were highly interested in other men compared to their partner during times of the cycle with lower progesterone levels, they also more strongly preferred socially dominant men as short-term relative to long-term partners (dominance × progesterone interaction: $\gamma = -.06$, $p = .004$). But women who strongly desired their partner over other men when progesterone levels were lower exhibited weaker preferences for social dominance in short-term versus long-term mates ($\gamma = .09$, $p = .007$).

Figure 26. Marginal effects of In-Pair vs. Extra-Pair Sexual Interests on short-term vs. long-term attractiveness ratings of men who are high or low on social dominance, for women with high childhood adversity during estrus



[2] These results were more strongly driven by moderating effects of women's Extra-Pair Sexual Interest than their In-Pair Sexual Interest. See https://osf.io/5t2mb/.

Separate follow-up analyses were performed on men's short-term attractiveness and long-term attractiveness as the criterion variable. The interaction between childhood adversity, progesterone, and In-Pair versus Extra-Pair Sexual Interests significantly predicted women's preferences for more socially dominant men as short-term *and* long-term partners, in opposite directions (short-term: $\gamma = .04$, $p = .002$; long-term: $\gamma = –.04$, $p = .010$). Women from adverse childhoods rated more socially dominant men as increasingly more attractive as short-term sexual partners (3-way interaction: $\gamma = .05$, $p = .001$) and increasingly less attractive as long-term relationship partners (3-way interaction: $\gamma = –.06$, $p = .010$) when they experienced more extra-pair relative to in-pair sexual interest during times of their cycle with lower progesterone levels.

Finally, I examined whether between-woman differences or within-woman changes in In-Pair versus Extra-Pair Sexual Interests moderated childhood adversity's effects on shifts in mate preferences. Both components significantly contributed to moderation of effects on women's short- versus long-term mate preferences for social dominance (and both significantly or near-significantly contributed to effects on short-term preferences and long-term preferences separately). Notably, between-woman differences in In-Pair versus Extra-Pair Sexual Interests had stronger effects on shifts in short-term mate preferences and short-term relative to long-term mate preferences of women with high childhood adversity. See OSF (https://osf.io/5t2mb/) for results.

3.7.3.2 Preferences for muscular men

Total variation in In-Pair versus Extra-Pair Sexual Interests did not significantly moderate hormone-dependent changes in women's short-term versus long-term preferences for muscular men as a function of childhood adversity (4-way interaction with progesterone:

$\gamma = .04$, $p = .115$)—though total variation in Extra-Pair (but not In-Pair) Sexual Interest did, $\gamma = -.05$, $p = .028$ (see https://osf.io/5t2mb/). Separate examination of between-woman differences and within-woman changes in In-Pair versus Extra-Pair Sexual Interests revealed a significant interaction of the between-woman component with childhood adversity × progesterone on women's short-term versus long-term mate preferences for muscularity ($\gamma = .07$, $p = .016$). In separate analyses of the contexts of mate attractiveness, this interaction was significant in predicting men's short-term attractiveness ($\gamma = .05$, $p = .013$) and marginally significant in predicting their long-term attractiveness ($\gamma = -.05$, $p = .062$).

Consistent with analyses on preferences for social dominance, women with high childhood adversity displayed significant changes in mate preferences as progesterone declined to periovulatory phase levels, as a function of their sexual interests: Those who had higher mean levels of sexual interest in extra-pair men relative to their partner increasingly preferred muscular men as short-term partners but less as long-term partners (short-term: $\gamma = .10$, $p = .00007$; long-term: $\gamma = -.10$, $p = .005$; short-term vs. long-term: $\gamma = .14$, $p = .0002$). Women with low childhood adversity did not exhibit shifts in preferences for muscularity (p's > .8).

4 Discussion

In this longitudinal study of 213 romantically involved women, results provide evidence that childhood health and experiences with adversity may shift women's priorities in their relationships. Data revealed that childhood experiences moderated hormone-dependent changes across the cycle in how relationship qualities affected women's sexual interests in primary partners and extra-pair men. Evidence also emerged that women with more experiences of childhood adversity display more pronounced increases in estrous mate preferences for male features putatively associated with genetic quality ancestrally, particularly when women are more sexually interested in extra-pair men relative to their partner. Although findings provided support for a number of hypotheses, results were sometimes mixed and do not constitute definitive evidence for specific moderation effects of childhood health and adversity. Overall, the findings collectively imply that childhood experiences can have effects on women's relationships and sexuality. Understanding the specifics for how and why requires additional research and theory development.

4.1 Mating strategies characterized by the value and expectations of partner investment

Of the relationship qualities assessed in the current study, most showed evidence of differentially affecting changes in women's sexual interests across ovarian hormone profiles, as a function of childhood experiences. Effects of specific relationship qualities differed for childhood health and childhood adversity, suggesting differences in mating strategies that are not reflective of a unidimensional life history strategy. But there were some important similarities. In general, results suggested that the extended sexual interests of women with poor childhood health and high childhood adversity are less aimed towards maintaining or

bolstering partner investment. And when conceptive, these women's sexual interests may reflect greater investments in current reproduction, relative to women with better childhood health and security.

4.1.1 Extended sexuality: Insights into mating strategies

The Pair-Bond Theory of Extended Sexuality proposes that women should experience higher sexual interest in their primary partner during the non-conceptive luteal phase when they benefit from maintaining or bolstering paternity confidence (Gangestad et al., 2022). As such, the circumstances in which women experience extended sexual interests may provide insight into differences in mating strategies and the value placed on different aspects of romantic relationships. In light this, results suggest that women who grew up with poor health and high adversity place greater importance on bond formation and less importance on maintaining partner investment in more strongly bonded, supportive relationships, compared to women who grew up with better health and security.

For women with poor childhood health or high childhood adversity, total loving attachment or supportiveness in the relationship *negatively* predicted women's sexual interest in their partner during extended sexuality. Those in strongly attached, supportive relationships displayed decreased in-pair sexual interest as estrogen and/or progesterone levels became more reflective of extended sexuality. Notably, those in weakly attached, unsupportive relationships experienced more pronounced increases in extended sexual interest in their partner. Women experiencing poorer childhood conditions appear to bolster formation of romantic bonds that are weak but not prioritize maintaining them once they have formed. Furthermore, evidence implied that women from adverse backgrounds are more likely to hold onto unstable relationships in which continued partner investment is unreliable.

When their partner expressed greater interest in romantic alternatives, women with high childhood adversity focused their extended sexual interests away from other men. By contrast, women from secure childhoods looked to other men, potentially to mate switch. Experiences of childhood security also appeared to increase the value of maintaining investment from high-quality partners. Women's extended in-pair sexual interest was positively associated with the total amount of relationship involvement from both partners, supporting the idea that extended sexuality serves to maintain paternity confidence and partner investment when women from secure backgrounds are in highly valued relationships.

Instead of seeking to maintain high-investing relationships via regular sex across the cycle to assure paternity, the extended sexual interests of women with poor childhood health or high childhood adversity appeared to prioritize relationship formation or stabilization functions. Women prioritizing current reproduction and increased reproductive output may especially benefit from entering and forming a pair bond. Consistent with predictions, women from adverse backgrounds showed increased sexual interest in their partner when total romantic passion in the relationship was high. Relationships with high total romantic and sexual passion are more likely those in which both partners are relatively interested in expressing their involvement in a pair bond that has not quite solidified.

In relationships with high discrepancies in romantic passion, by contrast, one partner is interested in expressing their involvement, while the other is relatively disinterested. Discrepancies in romantic passion did not affect the sexual interests of women with high childhood adversity. When women have lower expectations for partner investment, they may also expect low marginal returns from tactics during extended sexuality to bolster partner investment. In contrast, women from secure childhoods were more likely to experience

increased sexual interest in their partner during extended sexuality when their partner's romantic passion lagged behind their own.

4.1.2 Mating strategies promoting offspring quantity versus quality

In analyses not accounting for interactions with childhood experiences, total loving attachment moderated hormone-dependent changes in women's sexual interests (Dinh et al., 2023). In strongly bonded relationships, in which total loving attachment is high, women were more likely to experience increases in sexual interest for their partner at estrous hormone profiles. This finding, plausibly reflective of adaptive regulation of fertility, was unexpectedly *not* moderated by childhood adversity or health.

Reproducing within a committed pair-bond is arguably fitness-enhancing for women seeking to invest highly in offspring quality *and also* for women seeking to increase lifetime fertility (Dinh & Gangestad, 2023). Greater investments into offspring quantity may be more effectively achieved by reproducing within long-term pair bonds, in which male partners provision offspring and contribute to women's rate of fertility. Indeed, results showed that total loving attachment was descriptively, but nonsignificantly, more positively associated with the in-pair conceptive sexual interests of women with poor childhood health or high childhood adversity. But these women appeared to invest relatively less in maintaining or bolstering partner emotional support and intimacy, and perhaps other forms of investment important to offspring quality. Women may receive higher marginal benefits from investing in other fitness-enhancing activities when non-conceptive (especially when environmental conditions are risky or mortality risk is high due to greater susceptibility to illness), than from investing in relationship maintenance—perhaps until the pair bond is at risk of dissolution.

By contrast, women who grew up with secure childhood conditions may especially value and expect emotional support and intimacy. These relationship qualities are likely predictive of a partner's willingness to support women during motherhood, including to invest in the quality and direct care of offspring. Data show that women with good childhood health were less likely to have conceptive sexual interest in partners who were less supportive than women were of them. Moreover, women from secure backgrounds who were in emotionally supportive relationships became more sexually interested in their partner relative to other men during estrus. But when their partner was relatively less supportive, women showed increased sexual interest in other men during extended sexuality. Plausibly, extended sexuality allows these women to evaluate alternative partners for possible mate-switching without the risk of conception.

4.1.3 Adaptive fertility regulation in contexts of reduced or uncertain partner support

Analyses not accounting for interactions with childhood experiences found that women who were more romantically passionate than their partner tended to experience heightened sexual interest in their partner relative to other men during extended sexuality (Dinh et al., 2023). This effect was more strongly driven by women from secure childhoods. Women's elevated sexual interest in their partner during extended sexuality can serve to bolster partner interest in the relationship, without affecting the risk of conception. Notably, discrepancies in women's passion relative to their partner's also negatively predicted the in-pair sexual interest of women from secure childhoods during estrus—plausibly to avoid conception when continued partner investment is uncertain.

Women who grew up with good childhood health, who may better afford to delay reproduction than those with greater health-related mortality risks, were also unwilling to

have conceptive sex when partner investment was reduced or uncertain. As estrogen levels rose and progesterone levels declined, they became less likely to experience sexual interest in partners who expressed more interest in other women. Women who grew up with poorer childhood health, who may face greater fitness costs of delaying reproduction, were instead more willing to have conceptive sex with less assurance of reliable partner investment. When their partner was interested in romantic alternatives, women became *more* likely to experience increased sexual interest in their partner during estrus. These results imply that women with poor childhood health are relatively more willing to risk conception, compared to women with good childhood health, when their partner may leave the relationship. A potential confound is that men who are not exclusively sexually and romantically interested in their female partner may be more likely to have higher value on the mating market. Partner attractiveness and specific partner features did not significantly moderate hormonal associations with women's sexual interests for those with poor health, however (but did for women born of lower weight and with more birth complications). Nonetheless, partner attractiveness and assessed features may not fully capture partner mate value.

Furthermore, women with childhood experiences of adversity or poor health appeared more willing to risk loss of partner investment, if acting upon estrous desires for extra-pair men. As estrogen rose and/or progesterone fell to estrous levels, women with high childhood adversity became more sexually interested other men relative to primary partners who were less sexually attractive, less behaviorally masculine, and less physically strong and muscular. Women with high childhood adversity appeared more willing to risk losing partner investment for conceptive benefits when relationship commitment had not been strongly established. They were more likely to exhibit increases in conceptive extra-pair sexual

interests when relationships were relatively new or weakly attached, but less likely to as relationship duration lengthened and attachment bonds grew stronger.

Independent of childhood experiences with adversity, women with poor childhood health in strongly attached relationships were less likely to suppress estrous desires for extra-pair men, compared to women with good childhood health. Women with poor childhood health did not show hormone-dependent changes across the cycle in mate preferences or extra-pair sexual interest as a function of partner attractiveness or masculinity. But when they were generally interested in alternative partners, they tended to express extra-pair sexual interest during estrus, but not extended sexuality. This may imply that women with poor childhood health are relatively more willing to conceive with an extra-pair partner and risk primary partner investment, than to evaluate alternative mates during extended sexuality prior to having conceptive sex or switching partners.

4.2 Differences in mating strategies as a function of childhood health versus adversity

Diverging effects of relationship qualities on women's estrous and extended sexuality may provide insight into how childhood conditions of health and social adversity differentially affect optimal strategies related to mating and reproduction. Notable differences that emerged potentially concern the value of continued partner investment over time and at different stages of relationship involvement.

4.2.1 Mating strategies at different stages of relationship involvement

High levels of passionate love tend to characterize valued but tenuous or uncertain relationships in which bonds have not yet solidified (Fisher et al., 2006; Frank, 1988). When involved in highly passionate relationships, the strategies of women with high childhood

adversity and women with poor childhood health diverged. Women from adverse backgrounds prioritized their relationship over potential mate alternatives, focusing their extended sexual interests on their primary partner. Women who grew up with poor health showed increased conceptive sexual interest in other men, despite still being in the stages of bond formation with their primary partner.

Once bonds solidify, passionate love tends to transition into companionate love (Fletcher et al., 2015; Durante et al., 2016). Results indicate that women from adverse backgrounds and women with poor childhood health also respond differently after this transition. Effects of loving attachment on changes in women's extra-pair interests went in opposite directions for higher childhood adversity and poorer childhood health. When progesterone was at conceptive levels, total loving attachment's suppressive impact on conceptive interests for extra-pair men was more strongly driven by women with high childhood adversity, relative to women with secure childhoods. In contrast, total loving attachment had a strongly suppressive effect on estrous extra-pair sexual interests for women with good childhood health but had no significant effect for women with poor childhood health.

When women are interested in romantic alternatives, their sexual interests can facilitate mate switching or acquisition of genetic or direct benefits from outside the current pair bond. Effects of women's non-exclusivity fell in line with predictions for differences in childhood health: When women were interested in romantic alternatives, those with poor childhood health showed increased extra-pair sexual interest during estrus, while those with good childhood health showed greater interest during extended sexuality. When women with poor childhood health were conceptive, their partner's interest in romantic alternatives also

strongly positively predicted their in-pair relative to extra-pair sexual interest. Different patterns were observed across childhood experiences of adversity. For women with high childhood adversity, their interest in other potential partners were not associated with their estrous desires. But when their partner was highly interested in romantic alternatives, and women were less interested, their sexual desires for extra-pair men declined during extended sexuality. Speculatively, this serves a relationship preservation function. Women from adverse backgrounds may focus their extended sexual interests on retaining their partner when other women pose threats to the relationship.

Taken together, results suggest that the mating strategies of women with poor childhood health compared to women with high childhood adversity differ regarding the value placed upon retaining a romantic relationship, relative to the value of current reproduction. Women who grew up in adverse social environments appear to prioritize forming and retaining relationships, even those in which their partner is not exclusively romantically or sexually interested in them. Once in strongly attached relationships, they appeared highly unwilling to risk loss of partner investment, by strongly suppressing their conceptive sexual interests in other men. Perhaps women from adverse backgrounds have low expectations of long-term partner investment, but especially value continued investment once they find a partner willing to commit to a relationship. In contrast, women with poor childhood health seem to value continued partner investment relatively less. Their patterns of sexual interests imply that they prioritize current reproduction, even at greater risk of losing partner investment. Retaining long-term partner investment may be relatively less beneficial when poor childhood health portends reduced lifespan for women or their offspring.

4.2.2 The role of kin support in mating strategies

These diverging patterns potentially illuminate some of the many important factors involved in women's reproductive decision-making. One major difference in childhood conditions affecting optimal strategies may be the availability of kin support. Energetic and alloparental support from maternal kin can importantly subsidize female reproduction, especially when male partner investment is lacking or unreliable (Hill & Hurtado, 2009; Wells, 2012; Ellison, 2017). Women from adverse family backgrounds, relative to women from supportive families or women facing different childhood health conditions, may adopt different mating strategies because of the lack of familial support available to them.

Women who grew up in adverse social environments lacking in parental support may come to have low baseline expectations for male partner investment. As a result, they may place higher value on sire genetic quality and heritable traits of dominance and be relatively more willing to have conceptive sex (with in-pair or extra-pair partners) with less assurance of commitment. But once women find a relationship partner willing to invest in a long-term relationship, retaining the relationship may be more fitness-enhancing than reproducing outside a committed pair bond. Even if certain forms of partner investment—such as emotional support and direct care of offspring—may be relatively less important, women with low kin support may especially value retaining long-term pair bonds because continued partner provisioning is important for increasing female rate of reproduction. These reasons may explain the findings that women with high childhood adversity are more likely to have conceptive extra-pair sexual interest at early stages of their relationship and when total loving attachment is low, but highly unlikely to have extra-pair interests during estrus when involved in long-term and strongly attached relationships.

If poor childhood health is associated with faster life history trajectories, women may similarly benefit from mating strategies that increase the rate of reproduction. In the current sample, childhood health and adversity are uncorrelated. The patterns of effects observed in this study as a function of variations in childhood health may be reflective of greater investments into current reproduction, without being associated with constraints of low kin support.

Compared to women with poorer childhood health, the mating strategies of women with good childhood health may be reflective of greater investments into future reproduction. And compared to women from adverse backgrounds, women from secure backgrounds may expect and value high-quality investment from male partners. Women with more favorable health and childhood conditions may especially value long-term partnerships with men who are willing and able to invest in rearing high-quality offspring. Optimal strategies of investing in quality over quantity of offspring allow women to delay reproduction until conditions are auspicious, including to mate switch to find a more suitable partner. When women can also rely on high-investing kin to support reproduction, mating strategies can shift towards greater risk-taking ability for conceptive benefits. This may explain the finding that when women were not exclusively interested in their partner, those who grew up with supportive families displayed increased conceptive sexual interests for extra-pair men.[3] This result contrasts with the finding that better childhood health, not correlated with family support, was associated with increased extra-pair interest during extended sexuality when

[3] Follow-up analyses using the childhood components as predictors found that positive effects of women's non-exclusivity on increased estrous extra-pair interests of women from secure childhoods were driven by women who grew up in stable households with warm, supportive parents. See https://osf.io/p3tyv/.

women were interested in romantic alternatives and could likely benefit from switching partners.

If these assumptions are correct, mating strategies that facilitate investments into current versus future reproduction and quantity versus quality of offspring also importantly depend on the value and expectations of partner investment and the availability of strong kin support. Associations with kin support may importantly distinguish variations in mating and reproductive strategies as a function of childhood adversity, compared to childhood health. Because of human life history features (e.g., altricial infants, long periods of juvenile dependency, stacked offspring), women's reproduction entails substantial energetic and temporal costs (Kaplan et al., 2000; Reiches et al., 2009). Nutritional support, at the very least, is crucial for successful reproduction and a higher rate of fertility. Without supportive kin, reliance on male partners becomes more necessary for reproductive success ancestrally. Mating strategies characterized by low expectation and value of high-quality partner investment but increased reliance on partners to support higher fertility may predispose women to stay in poor-quality relationships, including relationships with partners who are not exclusively romantically interested in them. In contrast, strong kin support—perhaps especially when male access to resources is poor or unreliable—allows women more sexual freedom (Hrdy, 2000; Scelza, 2013; Starkweather & Hames, 2012; Schacht & Kramer, 2019). Additional research is needed to disentangle and elucidate effects of specific childhood, social, and environmental conditions on women's mating and reproductive strategies.

4.3 Oxytocin responses and mating strategies

According to the Identify and Invest and Tend and Befriend models, higher oxytocin levels may be associated with relationships in distress; oxytocin release may function to coordinate adaptive responses to protect valuable relationships (Grebe et al., 2017; Taylor et al., 2010). Patterns for women with secure childhoods were consistent with these models. Higher discrepancies in women's loving attachment and romantic passion relative to their partner's predicted increases in oxytocin levels following a relationship thought-listing task. These women's oxytocin response was also positively associated with their sexual interest in their partner. When women are more passionate and attached to their partner than he is to them, women's increased oxytocin responses and in-pair sexual interest may function to garner partner interest in the relationship.

Unexpectedly, women from secure childhoods who were highly interested in romantic alternatives showed decreased oxytocin levels during estrus and increased levels during extended sexuality. Because these women also experience increased extra-pair sexual interest during estrus, decreases in oxytocin levels may function to orient their attention away from their primary partner during this time in their cycle. Speculatively, increases in oxytocin levels during extended sexuality may help foster paternity assurance behaviors.

What constitutes a valuable but vulnerable relationship—or a relationship demanding more psychological resources—may be very different for women with poorer childhood conditions. Consistent with higher benefits of relationship formation, greater increases in oxytocin levels were observed for women with poor childhood health who were in weakly attached relationships, particularly during estrus. However, their oxytocin responses were not associated with their sexual interests. For women with high childhood adversity, oxytocin

responses were negatively associated with total loving attachment and positively associated with total romantic passion, especially during the follicular phase. Increases in oxytocin levels were observed during estrus when women were in less attached but highly passionate relationships.

Women from adverse backgrounds may especially value bond formation, showing increased oxytocin levels when strong bonds have not yet been forged. However, their associated sexual interests differed from those of women from secure backgrounds. Their oxytocin responses were positively associated with their extra-pair sexual interest during estrus. This may be consistent with findings that women from adverse backgrounds are more likely to experience heightened extra-pair sexual interests when involved in weakly attached or relatively new relationships. Although conditions of childhood adversity may increase the value of investments in bond formation, the costs of relationship dissolution (relative to potential conceptive benefits of extra-pair sex) may be lower in weakly attached bonds. During extended sexuality, however, oxytocin responses were negatively associated with both in-pair and extra-pair sexual interests.

Previous research finds that childhood adversity is associated with altered oxytocin profiles and responses (e.g, Donadon et al., 2018; Ellis et al., 2021; Johnson & Buisman-Pijlman, 2016). However, causal pathways are unknown and patterns of results are not straightforward. More research is needed to elucidate the functions of oxytocin release, including whether altered oxytocin profiles for those with adverse childhood experiences reflect adaptive responses.

4.4 Mate preferences

In risky or adverse environments in which the value and/or expectation of male partner investment are low, women may especially benefit from conceiving offspring with men possessing indicators of heritable fitness or traits facilitating dominance. Therefore, women who grew up with poorer childhood conditions are predicted to prefer male traits associated with higher genetic quality or dominance more strongly during estrus. Suggestive evidence emerged supporting moderation by childhood adversity, but not health. Findings across analyses and mate preferences tasks were consistently in directions supporting the hypothesis for women with higher childhood adversity, though effects were not consistently robust.

4.4.1 Moderation by partner attractiveness

In support of the hypothesis, women from adverse backgrounds who were in relationships with more sexually attractive partners became increasingly sexually interested in him during estrus. Their heightened estrous sexual interest was especially strong when their partner's mate value exceeded their own. But partner's absolute mate value predicted changes in women's sexual interests, as a function of childhood adversity, only when relationship qualities were controlled. Women with high childhood adversity displayed increased in-pair sexual interest in sexually attractive partners during estrus, independent of characteristics of their relationship. When their primary partner was less sexually attractive, they experienced elevated estrous sexual attraction to other men. But they were not more likely to express interest in having sex with an attractive hypothetical stranger.

Tests of partner attractiveness relative to women's attractiveness provided the most robust support for adverse childhood experiences strengthening women's estrous desires for

in-pair partners with indicators of high genetic quality. Effects were highly significant regardless of whether relationship qualities were controlled. These findings are consistent with certain patterns in our reanalyses of Arlsan et al.'s (2021) large daily diary dataset. In particular, relativized measures of partner attractiveness—including partner mate value relative to women's mate value—produced stronger, more robust support for partner sexual attractiveness moderation effects on women's sexual interests (Gangestad & Dinh, 2021).

Moreover, if the increased fitness value of sire genetic quality depends on a low likelihood of male investment, women from adverse backgrounds in highly committed relationships may benefit considerably less from avoiding conception with unattractive partners or from conceiving with more attractive extra-pair men. Women's mate value and other qualities of their relationship may affect or reflect the probability of reliable, long-term partner investment. Perhaps controlling for these qualities allows partner attractiveness moderation effects to emerge—effects that are partly a function of women's expectations for partner investment. For instance, differences in partner relationship involvement may obscure whether women with high childhood adversity benefit from having increased sexual interest in extra-pair men relative to their partner during estrus.

By contrast, women from secure childhood backgrounds did not show increased in-pair sexual interest or decreased extra-pair interest during estrus when their partner was sexually attractive or more attractive relative to themselves. Descriptively, associations during estrus were negative in direction. Interestingly, results indicated that partner attractiveness, and partner's attractiveness relative to women's, were positively associated with the *extended* in-pair sexual interest of women from secure childhoods. When partner mate value exceeds women's mate value, the pair bond may be high value but relatively risky

for women. Women from secure backgrounds may show higher sexual interest in these partners during extended sexuality to shore up partner investment in the relationship. Lack of periovulatory increases in within-pair sexual motivation, or perhaps even a decline, may function to regulate fertility and help women avoid conception in a relatively risky relationship—especially when independent of relationship qualities. These patterns contrast with the ostensibly riskier strategy exhibited by women from adverse backgrounds. Even though partners with higher value on the mating market may be less likely to commit to long-term investment, women with high childhood adversity were more likely to experience heightened conceptive sexual interest in partners that can purportedly provide genetic benefits to offspring.

4.4.2 Moderation by partner features

Published findings of the current dataset documented that women with less sexually attractive partners were more likely to experience increased extra-pair sexual interest when progesterone was at estrous levels; but these moderated shifts in sexual interests were not explained by specific partner features (Dinh et al., 2022). Relatedly, although partner attractiveness moderation effects on women's interest in extra-pair men appear to be robust, studies have not consistently replicated shifts in women's conceptive mate preferences (Gangestad et al., 2022). One possibility is that shifts in mate preferences are further moderated.

Preferences for male muscularity, behavioral masculinity, and dominance may be especially fitness-enhancing for women who grew up in risky, high-adversity, or relatively disadvantaged environments. Offspring may benefit more from heritable traits facilitating dominance in such environments. Male partner sexual attractiveness is usually assumed to be

an indicator of high genetic quality. But women's subjective ratings of partner mate value may also reflect qualities that women prioritize in a sexual partner, which may differ across childhood experiences. In the current study, results support the hypothesis that women from adverse backgrounds especially prefer male traits facilitating dominance when conceptive. As hormone profiles approached periovulatory phase levels, women with higher childhood adversity showed increased sexual interest in behaviorally masculine partners, relative to extra-pair men. Higher childhood adversity was also associated with increased estrous extra-pair sexual interest when primary partners lacked physical strength and bodily masculinity. In contrast, women from secure childhood backgrounds displayed increased sexual interest in primary partners with higher social potency, which may reflect sire choice for valuable romantic partners or conceptive preferences for heritable qualities facilitating prestige, as opposed to dominance. There were complexities to these findings, however.

At estrous hormone profiles, women with higher childhood adversity strongly preferred behaviorally masculine partners over extra-pair men. But moderation effects were short of significant in separate prediction of women's sexual interest in their partner and in other men. Follow-up analyses revealed that this was because effects were stronger and more robust for women's higher frequency of initiating sex with behaviorally masculine partners, and for their increased extra-pair attraction when partners were less behaviorally masculine, than for their in-pair attraction or interest in sex with a hypothetical stranger. This pattern was consistent across analyses (showing significant interaction effects with partner attractiveness, behavioral masculinity, strength/bodily attractiveness factor, and separately on the factor's components: strength, bodily masculinity, bodily attractiveness). And when

effects were significant, they were generally significant for both the absolute strength and relative frequency of extra-pair attraction.

If findings reflect true effects, one possibility may be that hypothetical scenarios may not be as relevant in capturing the sexual interests of women with high childhood adversity. When women's expectations of reliable partner investment are low, and marginal fitness benefits of prioritizing current reproduction are high, women may benefit more from assessing current options than waiting around for a hypothetical new partner (which fantasies of imagined partners may get at more). Another possibility is that women from adverse backgrounds may experience increased estrous attraction to extra-pair men but not always benefit from acting on their attraction, especially when they depend on partner support for increased fertility and reproductive success.

In addition, effects of partner strength and bodily attractiveness/masculinity on women's extra-pair sexual interests only emerged when relationship qualities were controlled. Possibly, qualities of relationship involvement are more important for adaptive regulation of fertility and extended sexuality. Higher fitness value of heritable traits for offspring for women from adverse backgrounds may depend on the likelihood and availability of partner investment. Controlling for these potent moderators of women's sexual interests may allow for partner strength/muscularity effects to emerge. However, the lack of robustness when relationship qualities are not controlled places limitations on interpretations on findings.

The hypothesis that women with higher childhood adversity would display increased preferences for physically and behaviorally masculine and dominant men during estrus was predicted *a priori*. The finding that women with secure childhoods experienced increased

sexual interest in socially influential partners relative to extra-pair men at periovulatory phase hormone profiles was not predicted, however. Women from different childhood backgrounds may differentially value male traits for men's ability to contribute direct (e.g., material, social) benefits versus indirect genetic benefits to offspring. Given the mixed and complex nature of findings, it is also possible that the stronger partner social potency moderation effects for women from secure childhoods reflect false positives.

4.4.3 Preferences for dominant sires

Results of the body-rating task and video-rating task suggested that women with higher childhood adversity especially prefer men with traits facilitating dominance as short-term sexual partners when they could potentially conceive during their cycle—particularly when they were more interested in other men than in their partner. Those who were highly sexually interested in extra-pair men relative to their partner strongly preferred muscular and socially dominant men as sexual partners when progesterone levels were low relative to estrogen levels, characteristic of estrus. But muscularity and behavioral dominance became less sexually attractive at these conceptive hormone profiles when women with high childhood adversity were more sexually interested in their partner than in other men. By contrast, women from secure childhood backgrounds did not show notable shifts in mate preferences.

Additional analyses asked whether these moderated preferences shifts are exhibited by women who are generally more interested in extra-pair men, or when women experience greater extra-pair interest during conceptive parts of the cycle, relative to other parts of the cycle. Results indicated stronger moderating effects of between-woman differences than within-woman changes in extra-pair relative to in-pair sexual interests. Women from adverse

backgrounds who were generally more interested in other men than in their partner displayed stronger increases in estrous preferences for muscular and socially dominant men as sexual partners, across both tasks. During times of the cycle with lower progesterone levels, within-woman changes in real-life experiences of sexual interests were also associated with high childhood adversity women's mate preferences for socially dominant behavior and for bodily muscularity assessed via photograph ratings, but not video ratings.

The findings that preference shifts for women with higher childhood adversity depend on their in-pair relative to extra-pair interests are perhaps unsurprising, in light of the observation that women from adverse backgrounds who are in strongly attached romantic relationships are highly unlikely to experience interest in extra-pair men during estrus. If these women expect a low likelihood of kin support and male investment from alternative romantic partners, they may especially benefit from suppressing conceptive extra-pair interests that can jeopardize a highly valued pair bond. Circumstances such as this, in which women benefit from suppressing extra-pair desires, may also favor dampening estrous preferences for sexually attractive male features. Experiencing increased attraction to muscular or socially dominant men may similarly risk withdrawal of partner investment, especially during times of the cycle when attraction can potentially lead to conception outside of the pair bond.

Women's increased sexual interest in attractive bodily features during estrus, as a function of higher childhood adversity, was not moderated by their in-pair relative to extra-pair sexual interests. If women from adverse backgrounds especially value sire genetic quality, regardless of whether preferred sires are primary partners or other men, it makes sense that their general interest in attractive bodily features would not be moderated by their

interest in extra-pair men. Indeed, women from adverse backgrounds who had attractive primary partners exhibited increased in-pair relative to extra-pair sexual interest when conceptive. As such, their elevated sexual interest in attractive bodily features during estrus may be directed towards their partner. Exploratory analyses testing this possibility found that partner attractiveness indeed moderated the interaction between childhood adversity and estrogen (but not progesterone) levels. Women with high childhood adversity who were in relationships with more attractive partners reported heightened sexual arousal to and interest in seeing attractive bodily features when estrogen levels were elevated (see Appendix section A7.3).

Overall, results provide evidence that hormone-dependent changes in women's mate preferences across the cycle are moderated by childhood adversity and whether women experience sexual interest in other men relative to their partner. Women from adverse backgrounds may benefit from increased short-term mate preferences for dominant traits when evaluating other men, if they have higher extra-pair sexual interests. But if women benefit more from reproducing with a primary partner, it may be more fitness-enhancing to focus their sexual interests on their partner, preferring other attractive men less or preferring attractive primary partners more.

4.4.4 Mate preferences of women with poor childhood health

Previous research has documented higher general mate preferences for male masculinity or physical attractiveness in environments with higher pathogen prevalence (DeBruine et al. 2010, 2011; Gangestad & Buss, 1993; Tybur & Gangestad, 2011). However, the robustness of these associations has recently been questioned by a large-scale replication (Walter et al., 2020). The current study failed to find convincing evidence that childhood

health moderated changes in women's mate preferences across the cycle. Hormone-associated sexual interests in attractive, high mate value partners relative to other men were descriptively and sometimes significantly in the predicted directions, but higher-order interactions were not robust.

Follow-up analyses on the components of childhood health revealed significant partner attractiveness and partner strength/muscularity moderation effects on the extra-pair sexual interests of women who experienced birth complications, but not women who were susceptible to infectious childhood illness (see: https://osf.io/ud6hm/). Additional research is needed to examine the robustness of this finding and to explore possible differences in mate preferences as a function of different aspects of childhood health.

4.5 Limitations and future directions

Very little research has been conducted on possible differences in hormone-mediated cycle shifts in women's sexual interests, as a function of childhood conditions. The current study is the first to explore the topic to this scope and depth. As a result, hypotheses were formed primarily based on theory and logical assumptions, with limited existing empirical research to guide specific predictions. Not all predictions were supported, and findings emerged that were not predicted *a priori*.

For instance, the observation that experiences of childhood adversity suppress conceptive extra-pair sexual interests when women are in more strongly attached relationships directly contradicted predictions. Also unexpected was the finding that women's interest in romantic alternatives robustly predicted their conceptive extra-pair sexual interests when they had secure childhoods, but not when they had adverse childhoods.

These findings, along with others, guided the explanation that the availability of kin support plays a key role in women's mating strategies—including risk-taking for conceptive benefits and how much to prioritize protecting relationships with committed partners. Indeed, cooperative breeding and caloric support—whether from kin or male partners—was likely crucial for female reproductive success across human evolutionary history. Family environments constitute a major component of measures of childhood adversity in life history-inspired research within evolutionary psychology. Viewing family dynamics as indicators of energetic and social support for reproduction, rather than solely as proxies for mortality-driven or general environmental harshness and unpredictability, may fruitfully guide theory development and empirical inquiries. Relatedly, future research may benefit from examining effects of other childhood experiences potentially more related to mortality risk, including health and gestational or birth experiences.

In addition, there are limitations that potentially affected model fit and power in the current analyses. The multilevel regression models assume linear fit. Models constrain effects to be linear across the entire range of the variables examined; if effects are not linear across the full range of predictor variables, marginal effects estimates towards the ends of the continuum can be distorted. Lack of observations at the ends of a continuum, as well as assumptions of linearity, can result in estimated slopes that extrapolate beyond what the data can speak to. For instance, linearity constrains the rate of change in women's experiences of extra-pair sexual interest, as a function of the emotional support by progesterone interaction, to be constant across the childhood adversity continuum. If this rate of change is not linear, simple effects estimated at one standard deviation above and below the mean in childhood adversity may be distorted, especially in regions that may be thinly populated. Notably,

however, childhood adversity was only weakly to moderately correlated with certain relationship qualities (i.e., negatively with emotional support and loving attachment and positively with partner's non-exclusivity). The lack of strong associations, as well as visual inspections of bivariate distributions, suggest that marginal effects at high and low levels of childhood adversity are not merely extrapolations into regions with few actual datapoints. The sample distribution of experiences with childhood adversity was positively skewed, as expected, but not exceedingly so. Childhood health was more strongly skewed but was uncorrelated with relationship qualities. Nonetheless, linear modeling may not accurately capture true population effects, even if sample characteristics did not strongly negatively impact model fit.

This study's sample and number of observations are large, designed to provide highly powered tests of the main study's primary hypotheses (not including moderation by childhood conditions). However, the sample size required to adequately capture variation in childhood adversity, health, relationship qualities, and male partner features to test higher-order interaction effects could be larger than our current sample (Blake & Gangestad, 2020). Although our sample may be more diverse and experiences with childhood adversity more common relative to a more affluent or homogenous sample, our recruitment methods of advertising on a university campus nonetheless limits the range of variation in childhood experiences. These issues may have partly contributed to the complexities observed in study results. Highly powered tests of hypotheses regarding adverse childhood conditions would benefit from samples drawn from a population with more diverse demographics or from a targeted population (e.g., those born of low birth weight, those growing up in household environments known to be associated with instability or adversity).

Furthermore, a freezer malfunction reduced the number of observations by about 38% for analyses involving oxytocin. Assays of oxytocin were obtained for only 141 participants. Despite the reduction in sample size, associations of sexual interests with women's oxytocin responses were highly robust. Interactions between childhood conditions and relationship qualities also differentially predicted oxytocin responses across the cycle, though the significance of these patterns are unclear. Given theoretical interest in how childhood adversity might differentially modulate oxytocin release and its impacts on social behavior, future research should continue to investigate effects within the contexts of romantic and familial relationships.

Additionally, an underlying assumption of hypotheses regarding childhood adversity in this dissertation is that the proposed mating strategies are adaptive in environments with high levels of inequality in socially competitive outcomes. When there are high discrepancies in income-generating social capital of competitors, women who cannot expect to rely on male partners or kin to support offspring have suppressed marginal returns for investing in offspring quality; thus, women have increased gains for investing in offspring quantity. The study population was gathered from a relatively unequal society. However, the hypothesized importance of inequality was not directly tested in this study. Research across populations varying in inequality is needed to provide more direct tests of hypotheses.

Finally, I analyzed data and wrote this dissertation with the aim of gaining deeper insight into variations in women’s mating and reproductive strategies. Findings were complex, with a number of variables that importantly moderated associations. Highly powered replications and extensions of this research are needed.

4.6 Summary of findings and interpretations

The current study finds evidence for hormone-dependent changes across the cycle in women's sexual interests, mate preferences, and oxytocin responses, moderated by childhood health and experiences with adversity. Results are consistent with the overarching hypothesis that women who grew up with poor childhood health or high childhood adversity place less value on maintaining or bolstering partner investment and more value on current reproduction, in comparison to women with better childhood health and security.

Because male provisioning can contribute to faster rate of offspring production, women prioritizing current reproduction and higher offspring quantity may especially benefit from pair-bond formation. Findings indicated that women with poor childhood health and high childhood adversity experienced increased in-pair sexual interest during extended sexuality when total relationship involvement, loving attachment, and/or supportiveness/trust from both partners were lower and, for women with high childhood adversity, when total romantic passion was higher. In strongly attached, supportive relationships with lower levels of passion, these women exhibited little sexual interest in their partner when they were non-conceptive. These results are consistent with women placing greater investment in strengthening weak or tenuous bonds but less investment in maintaining bonds once they have formed.

By contrast, women with better childhood health and security may especially value partner emotional support and involvement for their importance in a cooperative partnership for fostering offspring quality. Results indicated that women were less likely to have conceptive sexual interest in their partner and more likely to have extra-pair interest during extended sexuality when discrepancies in women's and their partner's supportiveness and

interest in romantic alternatives reflected a relative lack of partner emotional support and involvement in the relationship. And when women's romantic passion surpassed their partner's, reflecting a relationship that is vulnerable but of high value to women, women also experienced suppressed sexual interest for their partner during estrus but elevated interest during extended sexuality. In contrast, the mating and fertility regulation strategies for women with poorer childhood conditions appear to be less sensitive to discrepancies in emotional support and involvement.

Adaptive mating and reproductive strategies may be modulated by the availability of kin support. The estrous sexuality of women with poor childhood health, not associated with constraints of low support from kin, implied greater willingness to presently conceive at higher risk of losing partner investment. Without investments from kin to subsidize offspring production, however, partner provisioning becomes more crucial for higher fertility. Hence, women from unsupportive, adverse backgrounds may benefit relatively more from remaining in long-term relationships. Results suggested that they sought to solidify tenuous bonds in passionate relationships via increased in-pair interest during extended sexuality, they strongly suppressed conceptive extra-pair sexual interests in highly attached bonds, and they sought to retain unstable relationships in which their partner showed more interest in other women, via in-pair extended sexuality. By contrast, when women grew up with secure childhoods and supportive families, their extended sexual interests were consistent with motivations for mate-switching, rather than mate retention when their partner was interested in other women. Moreover, their own interest in romantic alternatives predicted increased estrous desires for extra-pair men. Strong support from high-investing kin may allow women greater risk-taking ability when sexual interest in extra-pair men can provide conceptive benefits.

Results on women's oxytocin responses following a relationship thought-listing task may also be consistent with different strategies of investment in romantic relationships, as a function of childhood conditions. When women from secure backgrounds were more romantically attached or passionate than their partner, thoughts about their partner's supportiveness or lack of support elicited higher levels of oxytocin secretion. Their oxytocin release was associated with recent increases in within-pair sexual interest, perhaps reflecting motivations to garner partner investment when women are in vulnerable but valued relationships. Relationship qualities that influenced the extended in-pair sexual interests of women with poor childhood health or high childhood adversity also predicted their oxytocin responses in the same direction: Total romantic passion positively predicted oxytocin change, while total loving attachment negatively predicted it. For women with high childhood adversity, their oxytocin responses were strongly positively associated with extra-pair sexual interest during estrus but negatively associated during extended sexuality.

Findings provided support for the hypothesis that women from adverse backgrounds place higher relative value on sire genetic quality or heritable dominance, relative to women from secure backgrounds. Patterns of sexual interests implied that women from supportive, low-adversity backgrounds prioritize securing valued partner investment over genetic benefits for offspring. When in relationships with more sexually attractive partners, women with secure childhoods experienced increased in-pair sexual interest when non-conceptive—consistent with extended sexuality functioning to bolster partner interest in pair-bonds that are high-value but relatively risky for women. They did not show evidence for hormone-dependent shifts in mate preferences or arousal to attractive bodily features. In contrast, women from adverse, unsupportive backgrounds appear to especially value heritable genetic

contributions for offspring. When paired with less sexually attractive, less behaviorally masculine, and less strong and muscular partners, these women showed decreased in-pair sexual interest and increased extra-pair attraction during estrus. And when women from adverse backgrounds were more sexually interested in extra-pair men than their partner, they more strongly preferred muscular and socially dominant men as sexual partners during estrus. More adverse childhood experiences also predicted heightened estrous arousal to seeing attractive bodily features, in general and when women had more sexually attractive partners.

The current study is an initial step to illuminating the nuances and complexities of how childhood health and experiences with adversity might influence women's mating and reproductive strategies. Results offer suggestive support for hypotheses on strategies of investment in pair bonds and strategies for adaptive fertility regulation. Evidence emerged implicating the potential importance of kin support to women's mating and reproductive strategies, that were not predicted *a priori*. Future replications and extensions to this research are needed.

5 Appendix

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Table List

Table notes

All estimates for multilevel regression analyses are with predictors mean-centered.
Exceptions include:
Menses (dummy-coded, 0 = not menstruating)
Partner attractiveness vs. women's attractiveness (a difference score, 0 = no difference)
Oxytocin change (standardized residual change scores, 0 = no change)

For simple effects analyses, follow-up analyses, and robustness analyses not included in this manuscript, see dissertation project page on Open Science Forum: https://osf.io/57pm3/.

A1. Methods: Luteinizing hormone testing and hormone assays

Luteinizing hormone (LH) testing

At the conclusion of each study session, women's next session was scheduled based on their current cycle day and typical cycle length. If the next session was a targeted periovulatory phase day, women were provided a set of Pregmate luteinizing hormone (LH) strips to use on the two days leading up to the session. Women were instructed to dip the LH strips in urine on scheduled days, record the results, and return the strips and recorded results at their next lab session for us to confirm. We also tested the urine sample from the day of the targeted periovulatory session (as well as when lab sessions [e.g., a first session] fell on a potential periovulatory day). If none of the LH tests were positive, women were instructed to follow the same procedures for testing their urine on the four days following the session.

A positive LH surge was detected for 105 participants (49%), or 102 (56%) of the 181 women who completed at least two sessions, or 89 (64%) of 140 women who completed all four sessions with an intact relationship. Reasons that an LH surge was not detected included: participation for less than a full cycle for some women; anovulatory cycles (up to 30% in young populations; e.g., Roney & Simmons, 2013); lack of follow-up assessments after Session 4; less than perfect compliance with instructions to use LH strips. Because assessing hormonal associations were among the primary aims of the current study, analyses could examine effects of hormone levels, even in absence of complete detection of LH surges.

Hormone assays

Estrogens and progesterone are excreted into urine in their metabolized form; thus, we analyzed for the major metabolites using antibodies for estrogen conjugates (E1C, capturing several metabolites) and pregnanediol-glucuronide (PdG) (O'Connor et al., 2014); see also Roos et al., 2015). Reagents and protocols were provided by the Clinical Endocrinology Laboratory at the University of California at Davis. Intraassay coefficients of variation (CV), determined as the mean CV of duplicate determinations, were 2.5% for E1C and 4.4% for PdG. For E1C, interassay CVs were 14.1% for a high control and 18.5% for a low control. For PdG, interassay CVs were 10.4% for a high control and 12.9% for a low control. As E1C should reflect accumulated metabolites of estrogens, we refer to E1C as estrogen (E). As PdG should reflect accumulated metabolites of progesterone, we refer to PdG as progesterone (P). Immunoreactive testosterone (T) was assayed following a deconjugation procedure that employed enzymatic hydrolysis using beta-glucuronidase (*Helix pomatia*, EMD Millipore #347420-1MU with ≤2% arylsulfatase activity, see Emery Thompson et al. 2012). For T, interassay CVs were 13.5% for a low control and 11.4% for a high control. All hormone levels were corrected for urinary specific gravity.

A2. Moderation by relationship length

Table A1. Changes in Extra-Pair Sexual Interest, as a function of interactions between relationship length, hormones, and childhood adversity

Extra-Pair Sexual Interest				
	γ	SE	t-value	p-value
Intercept	-0.003	0.06	-0.05	0.963
Menses	-0.07	0.10	-0.71	0.475
ln(E) mean	-0.03	0.07	-0.46	0.649
ln(P) mean	0.12	0.07	1.70	*0.090*
ln(E) ww	0.01	0.03	0.46	0.648
Relationship Length	0.14	0.06	2.19	**0.030**
Adversity	0.17	0.07	2.55	**0.012**
ln(P) ww	-0.05	0.03	-1.99	**0.048**
ln(E) ww * Relationship Length	-0.05	0.03	-1.81	*0.070*
ln(E) ww * Adversity	-0.003	0.03	-0.10	0.922
Relationship Length * Adversity	-0.10	0.07	-1.48	0.141
Relationship Length * ln(P) ww	-0.01	0.03	-0.22	0.824
Adversity * ln(P) ww	-0.01	0.03	-0.27	0.791
ln(E) ww * Relationship Length * Adversity	-0.07	0.03	-2.67	**0.008**
Relationship Length * Adversity * ln(P) ww	0.08	0.03	2.68	**0.008**

A3. Moderation by relationship involvement

A3.1. Effects of relationship involvement on sexual interests as a function of childhood adversity

Table A2. Results for multilevel analysis on In-Pair vs. Extra-Pair Sexual Interests

In-Pair vs. Extra-Pair Sexual Interests				
	γ	SE	t-value	p-value
ln(E) ww	0.01	0.03	0.29	0.774
Adversity	0.05	0.06	0.71	0.476
Rel. Involvement Total	0.46	0.06	7.70	**1.37E-12**
Rel. Involvement Discrepancy	0.13	0.06	2.33	**0.021**
ln(P) ww	-0.003	0.03	-0.09	0.926
ln(E) ww * Adversity	0.01	0.04	0.26	0.794
ln(E) ww * Rel. Involvement Total	0.05	0.03	1.35	0.177
Adversity * Rel. Involvement Total	-0.17	0.05	-3.30	**0.001**
ln(E) ww * Rel. Involvement Discrepancy	-0.002	0.03	-0.06	0.951
Adversity * Rel. Involvement Discrepancy	-0.10	0.06	-1.79	*0.075*
Adversity * ln(P) ww	-0.02	0.04	-0.57	0.569
Rel. Involvement Total * ln(P) ww	-0.05	0.03	-1.63	0.105
Rel. Involvement Discrepancy * ln(P) ww	-0.04	0.03	-1.06	0.289
ln(E) ww * Adversity * Rel. Involvement Total	0.01	0.02	0.33	0.742
ln(E) ww * Adversity * Rel. Involvement Discrepancy	-0.01	0.04	-0.14	0.887
Adversity * Rel. Involvement Total * ln(P) ww	-0.06	0.02	-2.61	**0.010**
Adversity * Rel. Involvement Discrepancy * ln(P) ww	-0.02	0.03	-0.82	0.415

Table A3. Results for multilevel analysis on In-Pair Sexual Interest

In-Pair Sexual Interest				
	γ	SE	t-value	p-value
ln(E) ww	0.04	0.04	1.02	0.306
Adversity	0.15	0.06	2.42	**0.017**
Rel. Involvement Total	0.26	0.06	4.54	**0.00001**
Rel. Involvement Discrepancy	0.05	0.05	0.91	0.363
ln(P) ww	-0.05	0.04	-1.14	0.257
ln(E) ww * Adversity	0.05	0.04	1.17	0.241
ln(E) ww * Rel. Involvement Total	0.08	0.04	2.22	**0.027**
Adversity * Rel. Involvement Total	-0.15	0.05	-3.11	**0.002**
ln(E) ww * Rel. Involvement Discrepancy	-0.004	0.04	-0.10	0.919
Adversity * Rel. Involvement Discrepancy	-0.09	0.05	-1.68	*0.095*
Adversity * ln(P) ww	-0.04	0.05	-0.94	0.349
Rel. Involvement Total * ln(P) ww	-0.01	0.04	-0.23	0.820
Rel. Involvement Discrepancy * ln(P) ww	-0.02	0.04	-0.52	0.603
ln(E) ww * Adversity * Rel. Involvement Total	0.01	0.03	0.25	0.801
ln(E) ww * Adversity * Rel. Involvement Discrepancy	0.01	0.04	0.26	0.795
Adversity * Rel. Involvement Total * ln(P) ww	-0.09	0.03	-3.19	**0.002**
Adversity * Rel. Involvement Discrepancy * ln(P) ww	-0.04	0.04	-1.09	0.279

Note. Analyses also control for effects of menses and between-woman hormone levels.

A3.2. Effects of relationship involvement on In-Pair and Extra-Pair Sexual Interests as a function of childhood health

Table A4. Results for multilevel analysis on In-Pair vs. Extra-Pair Sexual Interests, as a function of interactions between childhood health, hormones, and relationship involvement

In-Pair vs. Extra-Pair Sexual Interests				
	γ	SE	*t*-value	*p*-value
Intercept	0.02	0.06	0.37	0.714
Menses	-0.13	0.11	-1.12	0.262
ln(E) mean	-0.02	0.06	-0.39	0.695
ln(P) mean	-0.09	0.06	-1.34	0.181
ln(E) ww	0.01	0.03	0.27	0.786
Health	-0.01	0.06	-0.09	0.929
Rel. Involvement Total	0.37	0.06	5.95	**1.59E-08**
Rel. Involvement Discrepancy	0.12	0.06	2.06	**0.041**
ln(P) ww	0.01	0.03	0.28	0.781
ln(E) ww * Health	-0.001	0.04	-0.01	0.989
ln(E) ww * Rel. Involvement Total	0.05	0.03	1.51	0.133
Health * Rel. Involvement Total	0.07	0.08	0.88	0.380
ln(E) ww * Rel. Involvement Discrepancy	0.02	0.03	0.52	0.604
Health * Rel. Involvement Discrepancy	-0.06	0.08	-0.81	0.420
Health * ln(P) ww	0.002	0.04	0.05	0.961
Rel. Involvement Total * ln(P) ww	-0.06	0.03	-1.94	*0.054*
Rel. Involvement Discrepancy * ln(P) ww	-0.08	0.04	-2.13	**0.034**
ln(E) ww * Health * Rel. Involvement Total	-0.07	0.04	-1.65	*0.0996*
ln(E) ww * Health * Rel. Involvement Discrepancy	-0.02	0.05	-0.47	0.636
Health * Rel. Involvement Total * ln(P) ww	0.01	0.04	0.18	0.855
Health * Rel. Involvement Discrepancy * ln(P) ww	0.10	0.05	1.99	**0.048**

A.3.2.1. In-Pair Sexual Interest

For In-Pair Sexual Interest, 3-way interactions in the model testing the total and discrepancy in relationship involvement did not reach nominal levels of significance (p's ≥ .12). In the model testing separate effects of women's and partner's relationship involvement, the 3-way interaction between childhood health, women's involvement, and progesterone was marginally significant ($\gamma = .22$, $p = .078$). Although 3-way interactions were not robust following inclusion of random slopes, simple 2-way interactions between progesterone and

women's involvement were significant and negative for women with poor childhood health ($\gamma = -.34$, $p = .044$), with significant differences as a function of the interaction between childhood health and total relationship involvement observed during extended sexuality ($\gamma = .26$, $p = .022$). Descriptively, the relationship involvement of women with poor childhood health became more positively associated with In-Pair Sexual Interest as hormones approached periovulatory levels, whereas total relationship involvement was positively related to In-Pair Sexual Interest across the cycle for women with good childhood health.

Table A5. Results for multilevel analysis on In-Pair Sexual Interest, as a function of interactions between childhood health, hormones, and relationship involvement

In-Pair Sexual Interest				
	γ	SE	t-value	p-value
Intercept	0.03	0.06	0.58	0.565
Menses	-0.15	0.12	-1.22	0.223
ln(E) mean	-0.08	0.06	-1.41	0.161
ln(P) mean	-0.03	0.06	-0.42	0.672
ln(E) ww	0.03	0.04	0.91	0.363
Health	-0.04	0.06	-0.68	0.501
Rel. Involvement Total	0.13	0.06	2.25	**0.026**
Rel. Involvement Discrepancy	0.03	0.06	0.61	0.545
ln(P) ww	-0.02	0.04	-0.56	0.574
ln(E) ww * Health	-0.01	0.04	-0.25	0.801
ln(E) ww * Rel. Involvement Total	0.08	0.04	2.26	**0.024**
Health * Rel. Involvement Total	0.13	0.07	1.83	*0.069*
ln(E) ww * Rel. Involvement Discrepancy	0.01	0.04	0.28	0.783
Health * Rel. Involvement Discrepancy	0.04	0.08	0.49	0.628
Health * ln(P) ww	-0.02	0.04	-0.56	0.574
Rel. Involvement Total * ln(P) ww	-0.05	0.04	-1.32	0.190
Rel. Involvement Discrepancy * ln(P) ww	-0.05	0.04	-1.23	0.219
ln(E) ww * Health * Rel. Involvement Total	-0.06	0.05	-1.19	0.234
ln(E) ww * Health * Rel. Involvement Discrepancy	0.01	0.05	0.28	0.783
Health * Rel. Involvement Total * ln(P) ww	0.07	0.05	1.48	0.143
Health * Rel. Involvement Discrepancy * ln(P) ww	0.09	0.06	1.57	0.118

A.3.2.2. Extra-Pair Sexual Interest

The 3-way interaction of childhood health, progesterone, and total relationship involvement on women's Extra-Pair Sexual Interest was significant and positive ($\gamma = .06$, $p < .050$). For women with good childhood health, total relationship involvement's negative association with Extra-Pair Sexual Interest became stronger as progesterone levels decreased ($\gamma = .10$, $p = .002$). In contrast, total relationship involvement's negative association with Extra-Pair Sexual Interest did not significantly differ across hormone profiles for women with poor childhood health.

Although the 3-way interaction of progesterone with differences in involvement was not quite significant ($\gamma = –.06$, $p = .122$), analyses on separate effects of women's and partner's relationship involvement found a significant positive 3-way interaction with partner's involvement ($\gamma = .17$, $p = .045$) and a 3-way interaction with women's involvement in the opposite direction that did not reach statistical significance ($\gamma = –.10$, $p = .282$). In general, simple 2-way interactions were observed for women with poor childhood health but not for women with good childhood health. For women with poor childhood health, a greater discrepancy in partner's involvement over women's significantly predicted increasingly greater Extra-Pair Sexual Interest as progesterone levels decreased (involvement difference × progesterone: $\gamma = .12$, $p = .043$). During estrus for those with poor childhood health, the total and discrepancy in women's and partner's relationship involvement negatively predicted Extra-Pair Sexual Interest (total: $\gamma = –.44$, $p = .003$; discrepancy: $\gamma = –.45$, $p = .002$). Hormonal interactions with the discrepancy in relationship involvement for women with poor childhood health were driven by independent effects of women's and partner's involvement in opposite directions. As progesterone decreased towards follicular-phase levels, lower

female involvement and higher male involvement became increasingly more positively associated with women's Extra-Pair Sexual Interest (women's involvement × progesterone: γ = .23, p = .072; partner's involvement × progesterone: γ = –.26, p = .030). Indeed, over and above the other's involvement, partner's involvement positively predicted (γ = .70, p = .022)—while women's involvement negatively predicted (γ = –1.15, p = .0003)—women's Extra-Pair Sexual Interest during estrus.

Table A6. Results for multilevel analysis on Extra-Pair Sexual Interest, as a function of interactions between childhood health, hormones, and relationship involvement

Extra-Pair Sexual Interest				
	γ	SE	t-value	p-value
Intercept	0.01	0.06	0.10	0.919
Menses	0.02	0.10	0.19	0.850
ln(E) mean	-0.05	0.07	-0.81	0.420
ln(P) mean	0.10	0.07	1.50	0.135
ln(E) ww	0.02	0.03	0.72	0.472
Health	-0.03	0.06	-0.51	0.610
Rel. Involvement Total	-0.40	0.06	-6.25	**3.52E-09**
Rel. Involvement Discrepancy	-0.14	0.06	-2.33	**0.021**
ln(P) ww	-0.04	0.03	-1.32	0.189
ln(E) ww * Health	-0.01	0.03	-0.41	0.685
ln(E) ww * Rel. Involvement Total	0.005	0.03	0.16	0.873
Health * Rel. Involvement Total	0.03	0.08	0.42	0.674
ln(E) ww * Rel. Involvement Discrepancy	-0.02	0.03	-0.59	0.554
Health * Rel. Involvement Discrepancy	0.13	0.08	1.56	0.120
Health * ln(P) ww	-0.02	0.03	-0.59	0.553
Rel. Involvement Total * ln(P) ww	0.03	0.03	1.30	0.194
Rel. Involvement Discrepancy * ln(P) ww	0.06	0.03	1.85	*0.065*
ln(E) ww * Health * Rel. Involvement Total	0.04	0.04	1.06	0.291
ln(E) ww * Health * Rel. Involvement Discrepancy	0.04	0.04	1.04	0.299
Health * Rel. Involvement Total * ln(P) ww	0.06	0.03	1.97	**0.0497**
Health * Rel. Involvement Discrepancy * ln(P) ww	-0.06	0.04	-1.55	0.122

A4. Moderation by relationship qualities

A4.1. In-Pair vs. Extra-Pair Sexual Interests

Table A7. Results for multilevel analysis on In-Pair vs. Extra-Pair Sexual Interest, as a function of interactions between childhood adversity, hormones, and relationship qualities

In-Pair vs. Extra-Pair Sexual Interests				
	γ	SE	t-value	p-value
ln(E) ww	0.01	0.04	0.17	0.867
Adversity	0.02	0.06	0.31	0.760
Supportiveness total	0.09	0.08	1.14	0.256
Supportiveness discrepancy	-0.08	0.07	-1.17	0.246
ln(P) ww	0.04	0.04	1.02	0.308
Romantic Passion total	0.10	0.06	1.49	0.140
Romantic Passion discrepancy	0.09	0.06	1.41	0.162
Loving Attachment total	0.12	0.08	1.55	0.123
Loving Attachment discrepancy	0.01	0.07	0.12	0.906
Interest in Others total	-0.13	0.07	-1.97	*0.050*
Interest in Others discrepancy	-0.13	0.06	-2.00	**0.047**
ln(E) ww * Adversity	0.04	0.04	0.96	0.335
ln(E) ww * Supportiveness total	0.02	0.05	0.41	0.685
Adversity * Supportiveness total	0.003	0.08	0.04	0.970
ln(E) ww * Supportiveness discrepancy	0.03	0.05	0.75	0.452
Adversity * Supportiveness discrepancy	0.09	0.08	1.03	0.304
ln(P) ww * Adversity	-0.04	0.05	-0.88	0.378
ln(P) ww * Supportiveness total	0.01	0.05	0.31	0.757
ln(P) ww * Supportiveness discrepancy	-0.03	0.05	-0.74	0.460
ln(E) ww * Romantic Passion total	-0.06	0.04	-1.46	0.146
Adversity * Romantic Passion total	0.02	0.07	0.31	0.760
ln(E) ww * Romantic Passion discrepancy	-0.07	0.04	-1.76	*0.080*
Adversity * Romantic Passion discrepancy	-0.06	0.07	-0.80	0.428
ln(P) ww * Romantic Passion total	0.05	0.04	1.25	0.212
ln(P) ww * Romantic Passion discrepancy	0.002	0.04	0.05	0.959
ln(E) ww * Loving Attachment total	0.17	0.05	3.51	**0.0005**
Adversity * Loving Attachment total	-0.002	0.06	-0.03	0.976
ln(E) ww * Loving Attachment discrepancy	-0.004	0.05	-0.09	0.930
Adversity * Loving Attachment discrepancy	-0.11	0.09	-1.25	0.215
ln(P) ww * Loving Attachment total	-0.08	0.05	-1.72	*0.086*
ln(P) ww * Loving Attachment discrepancy	-0.07	0.04	-1.52	0.130
ln(E) ww * Interest in Others total	-0.003	0.04	-0.06	0.949
Adversity * Interest in Others total	0.06	0.07	0.97	0.331
ln(E) ww * Interest in Others discrepancy	-0.12	0.04	-2.78	**0.006**
Adversity * Interest in Others discrepancy	0.05	0.06	0.77	0.441
ln(P) ww * Interest in Others total	0.02	0.04	0.39	0.700
ln(P) ww * Interest in Others discrepancy	-0.003	0.04	-0.08	0.934
ln(E) ww * Adversity * Supportiveness total	-0.12	0.05	-2.41	**0.017**
ln(E) ww * Adversity * Supportiveness discrepancy	-0.09	0.06	-1.60	0.110
ln(P) ww * Adversity * Supportiveness total	0.16	0.05	3.09	**0.002**
ln(P) ww * Adversity * Supportiveness discrepancy	0.12	0.06	2.22	**0.027**
ln(E) ww * Adversity * Romantic Passion total	-0.12	0.05	-2.23	**0.026**
ln(E) ww * Adversity * Romantic Passion discrepancy	0.10	0.05	1.97	**0.049**
ln(P) ww * Adversity * Romantic Passion total	0.10	0.05	1.97	**< 0.050**
ln(P) ww * Adversity * Romantic Passion discrepancy	-0.09	0.06	-1.56	0.120
ln(E) ww * Adversity * Loving Attachment total	0.04	0.04	0.94	0.350
ln(E) ww * Adversity * Loving Attachment discrepancy	0.005	0.06	0.08	0.938
ln(P) ww * Adversity * Loving Attachment total	-0.10	0.03	-3.03	**0.003**
ln(P) ww * Adversity * Loving Attachment discrepancy	-0.04	0.06	-0.65	0.519
ln(E) ww * Adversity * Interest in Others total	-0.02	0.05	-0.41	0.683
ln(E) ww * Adversity * Interest in Others discrepancy	0.03	0.06	0.53	0.599
ln(P) ww * Adversity * Interest in Others total	-0.02	0.05	-0.36	0.721
ln(P) ww * Adversity * Interest in Others discrepancy	-0.08	0.04	-1.86	*0.064*

Table A8. Results for multilevel analysis on In-Pair vs. Extra-Pair Sexual Interest, as a function of interactions between childhood health, hormones, and relationship qualities

In-Pair vs. Extra-Pair Sexual Interests				
	γ	SE	t-value	p-value
ln(E) ww	0.01	0.03	0.34	0.737
Health	0.01	0.06	0.15	0.878
Supportiveness total	0.11	0.07	1.49	0.138
Supportiveness discrepancy	-0.10	0.08	-1.27	0.205
ln(P) ww	0.02	0.03	0.44	0.660
Romantic Passion total	0.08	0.07	1.15	0.250
Romantic Passion discrepancy	0.10	0.06	1.65	0.102
Loving Attachment total	0.05	0.07	0.70	0.486
Loving Attachment discrepancy	-0.04	0.07	-0.64	0.523
Interest in Others total	-0.11	0.06	-1.73	*0.086*
Interest in Others discrepancy	-0.14	0.06	-2.27	**0.025**
ln(E) ww * Health	-0.03	0.04	-0.84	0.402
ln(E) ww * Supportiveness total	0.00	0.05	0.03	0.976
Health * Supportiveness total	-0.04	0.08	-0.51	0.613
ln(E) ww * Supportiveness discrepancy	0.02	0.05	0.53	0.600
Health * Supportiveness discrepancy	0.09	0.10	0.92	0.358
ln(P) ww * Health	-0.01	0.04	-0.29	0.771
ln(P) ww * Supportiveness total	-0.01	0.04	-0.23	0.821
ln(P) ww * Supportiveness discrepancy	-0.05	0.05	-1.06	0.290
ln(E) ww * Romantic Passion total	-0.01	0.04	-0.31	0.758
Health * Romantic Passion total	0.15	0.09	1.67	*0.098*
ln(E) ww * Romantic Passion discrepancy	-0.12	0.04	-3.32	**0.001**
Health * Romantic Passion discrepancy	0.03	0.08	0.43	0.665
ln(P) ww * Romantic Passion total	0.08	0.04	2.06	**0.040**
ln(P) ww * Romantic Passion discrepancy	0.07	0.04	1.92	*0.056*
ln(E) ww * Loving Attachment total	0.12	0.04	2.99	**0.003**
Health * Loving Attachment total	-0.02	0.08	-0.19	0.846
ln(E) ww * Loving Attachment discrepancy	0.02	0.04	0.38	0.701
Health * Loving Attachment discrepancy	-0.01	0.09	-0.10	0.918
ln(P) ww * Loving Attachment total	-0.12	0.04	-3.04	**0.002**
ln(P) ww * Loving Attachment discrepancy	-0.08	0.04	-1.89	*0.060*
ln(E) ww * Interest in Others total	0.01	0.04	0.14	0.887
Health * Interest in Others total	-0.04	0.07	-0.56	0.575
ln(E) ww * Interest in Others discrepancy	-0.11	0.04	-2.80	**0.005**
Health * Interest in Others discrepancy	0.10	0.08	1.19	0.238
ln(P) ww * Interest in Others total	-0.02	0.04	-0.47	0.639
ln(P) ww * Interest in Others discrepancy	0.07	0.04	1.95	*0.052*
ln(E) ww * Health * Supportiveness total	0.03	0.06	0.52	0.607
ln(E) ww * Health * Supportiveness discrepancy	0.05	0.06	0.85	0.394
ln(P) ww * Health * Supportiveness total	0.15	0.05	2.95	**0.003**
ln(P) ww * Health * Supportiveness discrepancy	0.15	0.06	2.54	**0.012**
ln(E) ww * Health * Romantic Passion total	0.07	0.06	1.15	0.252
ln(E) ww * Health * Romantic Passion discrepancy	0.01	0.05	0.18	0.860
ln(P) ww * Health * Romantic Passion total	-0.11	0.05	-2.11	**0.036**
ln(P) ww * Health * Romantic Passion discrepancy	-0.08	0.06	-1.47	0.141
ln(E) ww * Health * Loving Attachment total	-0.03	0.06	-0.45	0.650
ln(E) ww * Health * Loving Attachment discrepancy	0.06	0.06	0.87	0.386
ln(P) ww * Health * Loving Attachment total	0.09	0.05	1.72	*0.086*
ln(P) ww * Health * Loving Attachment discrepancy	-0.01	0.06	-0.19	0.846
ln(E) ww * Health * Interest in Others total	0.07	0.05	1.33	0.185
ln(E) ww * Health * Interest in Others discrepancy	0.05	0.06	0.96	0.339
ln(P) ww * Health * Interest in Others total	0.05	0.05	1.00	0.319
ln(P) ww * Health * Interest in Others discrepancy	-0.18	0.05	-3.28	**0.001**

A4.2. In-Pair Sexual Interest as a function of childhood adversity: Model estimates separated by relationship quality

Table A9a. Estimates involving interactions with romantic passion

In-Pair Sexual Interest				
	γ	SE	t-value	p-value
ln(E) ww	0.01	0.04	0.35	0.729
Adversity	0.11	0.06	1.79	*0.075*
ln(P) ww	-0.003	0.04	-0.08	0.935
Romantic Passion total	0.15	0.06	2.34	**0.021**
Romantic Passion discrepancy	0.11	0.06	1.81	*0.072*
ln(E) ww * Adversity	0.04	0.05	0.75	0.455
ln(P) ww * Adversity	-0.02	0.05	-0.40	0.690
ln(E) ww * Romantic Passion total	-0.07	0.05	-1.43	0.155
Adversity * Romantic Passion total	-0.01	0.07	-0.16	0.877
ln(E) ww * Romantic Passion discrepancy	-0.03	0.04	-0.57	0.568
Adversity * Romantic Passion discrepancy	-0.02	0.07	-0.29	0.771
ln(P) ww * Romantic Passion total	0.07	0.04	1.58	0.115
ln(P) ww * Romantic Passion discrepancy	-0.02	0.04	-0.54	0.587
ln(E) ww * Adversity * Romantic Passion total	-0.13	0.06	-2.05	**0.041**
ln(E) ww * Adversity * Romantic Passion discrepancy	0.07	0.05	1.24	0.215
ln(P) ww * Adversity * Romantic Passion total	0.16	0.05	2.96	**0.003**
ln(P) ww * Adversity * Romantic Passion discrepancy	-0.11	0.06	-1.73	*0.084*

Table A9b. Estimates involving interactions with loving attachment

In-Pair Sexual Interest				
	γ	SE	t-value	p-value
ln(E) ww	0.01	0.04	0.35	0.729
Adversity	0.11	0.06	1.79	*0.075*
ln(P) ww	-0.003	0.04	-0.08	0.935
Loving Attachment total	0.08	0.07	1.06	0.291
Loving Attachment discrepancy	-0.01	0.06	-0.16	0.872
ln(E) ww * Adversity	0.04	0.05	0.75	0.455
ln(P) ww * Adversity	-0.02	0.05	-0.40	0.690
ln(E) ww * Loving Attachment total	0.15	0.05	2.77	**0.006**
Adversity * Loving Attachment total	-0.10	0.06	-1.73	*0.087*
ln(E) ww * Loving Attachment discrepancy	-0.05	0.05	-0.92	0.358
Adversity * Loving Attachment discrepancy	-0.09	0.09	-1.11	0.271
ln(P) ww * Loving Attachment total	-0.12	0.06	-2.24	**0.026**
ln(P) ww * Loving Attachment discrepancy	0.01	0.05	0.14	0.889
ln(E) ww * Adversity * Loving Attachment total	0.05	0.05	0.92	0.358
ln(E) ww * Adversity * Loving Attachment discrepancy	0.002	0.07	0.02	0.982
ln(P) ww * Adversity * Loving Attachment total	-0.07	0.04	-1.85	*0.065*
ln(P) ww * Adversity * Loving Attachment discrepancy	-0.05	0.07	-0.70	0.487

A4.3. In-Pair Sexual Interest as a function of childhood health: Model estimates separated by relationship quality

Table A10a. Estimates involving interactions with loving attachment

In-Pair Sexual Interest				
	γ	SE	t-value	p-value
ln(E) ww	0.02	0.04	0.49	0.622
Health	0.01	0.06	0.24	0.812
ln(P) ww	-0.02	0.04	-0.47	0.640
Loving Attachment total	-0.06	0.07	-0.96	0.339
Loving Attachment discrepancy	-0.06	0.07	-0.88	0.379
ln(E) ww * Health	-0.05	0.05	-1.18	0.240
ln(P) ww * Health	-0.01	0.05	-0.25	0.803
ln(E) ww * Loving Attachment total	0.07	0.04	1.65	0.100
Health * Loving Attachment total	0.06	0.08	0.75	0.453
ln(E) ww * Loving Attachment discrepancy	-0.002	0.05	-0.04	0.969
Health * Loving Attachment discrepancy	0.01	0.08	0.14	0.890
ln(P) ww * Loving Attachment total	-0.09	0.04	-2.17	**0.030**
ln(P) ww * Loving Attachment discrepancy	-0.06	0.05	-1.33	0.184
ln(E) ww * Health * Loving Attachment total	-0.05	0.07	-0.75	0.455
ln(E) ww * Health * Loving Attachment discrepancy	0.11	0.07	1.52	0.130
ln(P) ww * Health * Loving Attachment total	0.15	0.06	2.53	**0.012**
ln(P) ww * Health * Loving Attachment discrepancy	0.01	0.07	0.14	0.892

Table A10b. Estimates involving interactions with emotional support

In-Pair Sexual Interest				
	γ	SE	t-value	p-value
ln(E) ww	0.02	0.04	0.49	0.622
Health	0.01	0.06	0.24	0.812
Supportiveness total	-0.08	0.07	-1.12	0.263
Supportiveness discrepancy	-0.11	0.08	-1.46	0.147
ln(P) ww	-0.02	0.04	-0.47	0.640
ln(E) ww * Health	-0.05	0.05	-1.18	0.240
ln(E) ww * Supportiveness total	0.04	0.05	0.77	0.445
Health * Supportiveness total	-0.05	0.08	-0.65	0.519
ln(E) ww * Supportiveness discrepancy	-0.04	0.05	-0.75	0.455
Health * Supportiveness discrepancy	0.06	0.09	0.62	0.538
ln(P) ww * Health	-0.01	0.05	-0.25	0.803
ln(P) ww * Supportiveness total	-0.05	0.05	-1.01	0.315
ln(P) ww * Supportiveness discrepancy	-0.06	0.05	-1.14	0.255
ln(E) ww * Health * Supportiveness total	0.03	0.07	0.50	0.621
ln(E) ww * Health * Supportiveness discrepancy	0.10	0.07	1.45	0.149
ln(P) ww * Health * Supportiveness total	0.20	0.06	3.45	**0.001**
ln(P) ww * Health * Supportiveness discrepancy	0.18	0.07	2.57	**0.010**

Table A10c. Estimates involving interactions with interest in romantic alternatives

In-Pair Sexual Interest				
	γ	SE	t-value	p-value
ln(E) ww	0.02	0.04	0.49	0.622
Health	0.01	0.06	0.24	0.812
ln(P) ww	-0.02	0.04	-0.47	0.640
Interest in Others total	0.003	0.06	0.05	0.962
Interest in Others discrepancy	0.001	0.06	0.01	0.992
ln(E) ww * Health	-0.05	0.05	-1.18	0.240
ln(P) ww * Health	-0.01	0.05	-0.25	0.803
ln(E) ww * Interest in Others total	-0.01	0.05	-0.12	0.908
Health * Interest in Others total	-0.09	0.07	-1.27	0.207
ln(E) ww * Interest in Others discrepancy	-0.09	0.04	-2.10	**0.037**
Health * Interest in Others discrepancy	0.02	0.08	0.21	0.833
ln(P) ww * Interest in Others total	-0.02	0.05	-0.53	0.594
ln(P) ww * Interest in Others discrepancy	0.08	0.04	1.86	*0.064*
ln(E) ww * Health * Interest in Others total	-0.01	0.06	-0.26	0.799
ln(E) ww * Health * Interest in Others discrepancy	0.06	0.06	0.98	0.325
ln(P) ww * Health * Interest in Others total	0.11	0.06	1.97	**0.049**
ln(P) ww * Health * Interest in Others discrepancy	-0.15	0.06	-2.44	**0.015**

A4.4. Extra-Pair Sexual Interest as a function of childhood adversity: Model estimates separated by relationship quality

Table A11a. Estimates involving interactions with loving attachment

Extra-Pair Sexual Interest				
	γ	SE	t-value	p-value
ln(E) ww	0.004	0.03	0.13	0.899
Adversity	0.08	0.07	1.20	0.234
ln(P) ww	-0.06	0.03	-1.81	*0.071*
Loving Attachment total	-0.10	0.08	-1.15	0.252
Loving Attachment discrepancy	-0.02	0.07	-0.29	0.770
ln(E) ww * Adversity	-0.03	0.04	-0.66	0.509
ln(P) ww * Adversity	0.04	0.04	0.96	0.337
ln(E) ww * Loving Attachment total	-0.10	0.04	-2.30	**0.022**
Adversity * Loving Attachment total	-0.09	0.06	-1.51	0.133
ln(E) ww * Loving Attachment discrepancy	-0.04	0.04	-1.00	0.316
Adversity * Loving Attachment discrepancy	0.07	0.10	0.78	0.438
ln(P) ww * Loving Attachment total	0.001	0.04	0.02	0.984
ln(P) ww * Loving Attachment discrepancy	0.10	0.04	2.68	**0.008**
ln(E) ww * Adversity * Loving Attachment total	-0.02	0.04	-0.40	0.692
ln(E) ww * Adversity * Loving Attachment discrepancy	-0.01	0.06	-0.10	0.920
ln(P) ww * Adversity * Loving Attachment total	0.08	0.03	2.66	**0.008**
ln(P) ww * Adversity * Loving Attachment discrepancy	0.01	0.05	0.18	0.858

Table A11b. Estimates involving interactions with emotional support

Extra-Pair Sexual Interest				
	γ	SE	t-value	p-value
ln(E) ww	0.004	0.03	0.13	0.899
Adversity	0.08	0.07	1.20	0.234
Supportiveness total	-0.17	0.08	-2.08	**0.039**
Supportiveness discrepancy	0.07	0.08	0.91	0.365
ln(P) ww	-0.06	0.03	-1.81	*0.071*
ln(E) ww * Adversity	-0.03	0.04	-0.66	0.509
ln(E) ww * Supportiveness total	0.03	0.05	0.62	0.538
Adversity * Supportiveness total	0.04	0.08	0.47	0.643
ln(E) ww * Supportiveness discrepancy	-0.06	0.04	-1.44	0.150
Adversity * Supportiveness discrepancy	-0.10	0.09	-1.09	0.278
ln(P) ww * Adversity	0.04	0.04	0.96	0.337
ln(P) ww * Supportiveness total	-0.04	0.04	-0.92	0.359
ln(P) ww * Supportiveness discrepancy	0.004	0.04	0.09	0.926
ln(E) ww * Adversity * Supportiveness total	0.09	0.05	1.86	*0.063*
ln(E) ww * Adversity * Supportiveness discrepancy	0.04	0.05	0.80	0.426
ln(P) ww * Adversity * Supportiveness total	-0.15	0.05	-3.26	**0.001**
ln(P) ww * Adversity * Supportiveness discrepancy	-0.10	0.05	-1.94	*0.054*

Table A11c. Estimates involving interactions with interest in romantic alternatives

Extra-Pair Sexual Interest				
	γ	SE	t-value	p-value
ln(E) ww	0.004	0.03	0.13	0.899
Adversity	0.08	0.07	1.20	0.234
ln(P) ww	-0.06	0.03	-1.81	*0.071*
Interest in Others total	0.20	0.07	2.89	**0.004**
Interest in Others discrepancy	0.18	0.07	2.67	**0.008**
ln(E) ww * Adversity	-0.03	0.04	-0.66	0.509
ln(P) ww * Adversity	0.04	0.04	0.96	0.337
ln(E) ww * Interest in Others total	-0.02	0.04	-0.43	0.669
Adversity * Interest in Others total	-0.14	0.07	-1.94	*0.054*
ln(E) ww * Interest in Others discrepancy	0.04	0.04	1.07	0.285
Adversity * Interest in Others discrepancy	-0.04	0.07	-0.60	0.548
ln(P) ww * Interest in Others total	-0.03	0.04	-0.78	0.433
ln(P) ww * Interest in Others discrepancy	0.08	0.03	2.24	**0.026**
ln(E) ww * Adversity * Interest in Others total	0.001	0.05	0.01	0.989
ln(E) ww * Adversity * Interest in Others discrepancy	-0.08	0.05	-1.56	0.120
ln(P) ww * Adversity * Interest in Others total	0.08	0.05	1.82	*0.070*
ln(P) ww * Adversity * Interest in Others discrepancy	0.10	0.04	2.69	**0.007**

A4.5. Extra-Pair Sexual Interest as a function of childhood health: Model estimates separated by relationship quality

Table A12a. Estimates involving interactions with romantic passion

Extra-Pair Sexual Interest				
	γ	SE	t-value	p-value
ln(E) ww	0.001	0.03	0.03	0.976
Health	0.0002	0.07	0.00	0.998
ln(P) ww	-0.04	0.03	-1.32	0.188
Romantic Passion total	0.04	0.08	0.47	0.641
Romantic Passion discrepancy	-0.01	0.07	-0.11	0.911
ln(E) ww * Health	0.00	0.04	-0.10	0.920
ln(P) ww * Health	0.01	0.04	0.21	0.835
ln(E) ww * Romantic Passion total	0.01	0.04	0.38	0.706
Health * Romantic Passion total	-0.14	0.10	-1.47	0.143
ln(E) ww * Romantic Passion discrepancy	0.10	0.03	3.19	**0.002**
Health * Romantic Passion discrepancy	0.03	0.08	0.40	0.693
ln(P) ww * Romantic Passion total	-0.06	0.03	-1.83	*0.068*
ln(P) ww * Romantic Passion discrepancy	-0.06	0.03	-1.76	*0.080*
ln(E) ww * Health * Romantic Passion total	-0.08	0.05	-1.58	0.115
ln(E) ww * Health * Romantic Passion discrepancy	0.00	0.04	0.03	0.979
ln(P) ww * Health * Romantic Passion total	0.10	0.05	2.22	**0.027**
ln(P) ww * Health * Romantic Passion discrepancy	0.02	0.05	0.48	0.629

Table A12b. Estimates involving interactions with interest in romantic alternatives

Extra-Pair Sexual Interest				
	γ	SE	t-value	p-value
ln(E) ww	0.001	0.03	0.03	0.976
Health	0.0002	0.07	0.00	0.998
ln(P) ww	-0.04	0.03	-1.32	0.188
Interest in Others total	0.16	0.07	2.33	**0.021**
Interest in Others discrepancy	0.21	0.07	3.09	**0.002**
ln(E) ww * Health	0.00	0.04	-0.10	0.920
ln(P) ww * Health	0.01	0.04	0.21	0.835
ln(E) ww * Interest in Others total	-0.01	0.04	-0.38	0.707
Health * Interest in Others total	-0.03	0.08	-0.32	0.748
ln(E) ww * Interest in Others discrepancy	0.07	0.03	1.96	*0.050*
Health * Interest in Others discrepancy	-0.12	0.09	-1.39	0.167
ln(P) ww * Interest in Others total	0.00	0.04	0.09	0.931
ln(P) ww * Interest in Others discrepancy	-0.03	0.03	-0.87	0.384
ln(E) ww * Health * Interest in Others total	-0.12	0.05	-2.49	**0.013**
ln(E) ww * Health * Interest in Others discrepancy	-0.02	0.05	-0.35	0.726
ln(P) ww * Health * Interest in Others total	0.04	0.04	0.84	0.401
ln(P) ww * Health * Interest in Others discrepancy	0.11	0.05	2.32	**0.021**

Table A12c. Estimates involving interactions with loving attachment

Extra-Pair Sexual Interest				
	γ	SE	t-value	p-value
ln(E) ww	0.001	0.03	0.03	0.976
Health	0.0002	0.07	0.00	0.998
ln(P) ww	-0.04	0.03	-1.32	0.188
Loving Attachment total	-0.13	0.07	-1.76	*0.080*
Loving Attachment discrepancy	0.01	0.07	0.10	0.921
ln(E) ww * Health	0.00	0.04	-0.10	0.920
ln(P) ww * Health	0.01	0.04	0.21	0.835
ln(E) ww * Loving Attachment total	-0.10	0.03	-2.84	**0.005**
Health * Loving Attachment total	0.08	0.09	0.88	0.381
ln(E) ww * Loving Attachment discrepancy	-0.03	0.04	-0.68	0.498
Health * Loving Attachment discrepancy	0.02	0.09	0.25	0.802
ln(P) ww * Loving Attachment total	0.08	0.03	2.28	**0.023**
ln(P) ww * Loving Attachment discrepancy	0.05	0.04	1.43	0.152
ln(E) ww * Health * Loving Attachment total	-0.01	0.05	-0.20	0.842
ln(E) ww * Health * Loving Attachment discrepancy	0.02	0.06	0.43	0.668
ln(P) ww * Health * Loving Attachment total	0.02	0.05	0.33	0.739
ln(P) ww * Health * Loving Attachment discrepancy	0.02	0.05	0.47	0.638

Table A13. Results of multilevel analysis on Extra-Pair Sexual Interest, simultaneously examining interactions of loving attachment with childhood health and adversity

Extra-Pair Sexual Interest				
	γ	SE	t-value	p-value
(Intercept)	0.01	0.06	0.15	0.885
Menses	-0.04	0.10	-0.39	0.696
ln(E) mean	-0.07	0.07	-1.06	0.290
ln(P) mean	0.13	0.07	1.84	*0.068*
ln(E) ww	0.003	0.03	0.11	0.917
Adversity	0.11	0.07	1.50	0.136
Loving Attachment total	-0.25	0.07	-3.35	**0.001**
Loving Attachment discrepancy	-0.13	0.07	-1.92	*0.056*
ln(P) ww	-0.04	0.03	-1.28	0.202
Health	0.01	0.07	0.09	0.931
ln(E) ww * Adversity	-0.02	0.04	-0.50	0.618
ln(E) ww * Loving Attachment total	-0.01	0.03	-0.20	0.839
Adversity * Loving Attachment total	-0.01	0.06	-0.18	0.859
ln(E) ww * Loving Attachment discrepancy	0.02	0.03	0.58	0.561
Adversity * Loving Attachment discrepancy	0.10	0.09	1.18	0.240
ln(P) ww * Adversity	0.03	0.03	0.81	0.418
ln(P) ww * Loving Attachment total	0.01	0.03	0.29	0.771
ln(P) ww * Loving Attachment discrepancy	0.05	0.03	1.34	0.180
ln(E) ww * Health	-0.02	0.03	-0.45	0.653
Health * Loving Attachment total	-0.03	0.09	-0.38	0.704
Health * Loving Attachment discrepancy	0.06	0.08	0.79	0.431
ln(P) ww * Health	-0.01	0.04	-0.30	0.763
ln(E) ww * Adversity * Loving Attachment total	-0.03	0.02	-1.28	0.201
ln(E) ww * Adversity * Loving Attachment discrepancy	0.01	0.04	0.37	0.712
ln(P) ww * Adversity * Loving Attachment total	0.05	0.02	2.10	**0.036**
ln(P) ww * Adversity * Loving Attachment discrepancy	-0.04	0.04	-0.89	0.375
ln(E) ww * Health * Loving Attachment total	-0.02	0.05	-0.40	0.692
ln(E) ww * Health * Loving Attachment discrepancy	0.06	0.04	1.41	0.160
ln(P) ww * Health * Loving Attachment total	0.10	0.04	2.75	**0.006**
ln(P) ww * Health * Loving Attachment discrepancy	-0.01	0.04	-0.32	0.751

A5. Moderation by partner mate value

A5.1. Moderation by partner attractiveness & partner attractiveness vs. women's attractiveness

Table A14. Partial results for multilevel analyses on In-Pair vs. Extra-Pair Sexual Interests, as a function of interactions between childhood adversity, hormones, and partner attractiveness

In-Pair vs. Extra-Pair Sexual Interests				
	γ	SE	t-value	p-value
ln(E) ww	0.01	0.04	0.17	0.867
Adversity	0.02	0.06	0.31	0.760
ln(P) ww	0.04	0.04	1.02	0.308
Partner Attractiveness	0.23	0.07	3.49	**0.0006**
ln(E) ww * Adversity	0.04	0.04	0.96	0.335
ln(P) ww * Adversity	-0.04	0.05	-0.88	0.378
ln(E) ww * Partner Attractiveness	-0.01	0.04	-0.18	0.859
Adversity * Partner Attractiveness	0.08	0.08	0.99	0.324
ln(P) ww * Partner Attractiveness	-0.02	0.04	-0.57	0.569
ln(E) ww * Adversity * Partner Attractiveness	0.09	0.05	1.98	**0.049**
ln(P) ww * Adversity * Partner Attractiveness	-0.10	0.05	-1.96	*0.051*

Table A15. Partial results for multilevel analyses on In-Pair vs. Extra-Pair Sexual Interests, as a function of interactions between childhood adversity, hormones, and partner attractiveness vs. women's attractiveness

In-Pair vs. Extra-Pair Sexual Interests				
	γ	SE	t-value	p-value
ln(E) ww	0.02	0.04	0.57	0.569
Adversity	0.01	0.06	0.16	0.874
ln(P) ww	0.04	0.04	1.13	0.259
Partner vs. Women's Attractiveness	0.22	0.05	4.31	**0.00003**
ln(E) ww * Adversity	0.05	0.04	1.26	0.210
ln(P) ww * Adversity	-0.04	0.05	-0.87	0.386
ln(E) ww * Partner vs. Women's Attractiveness	0.02	0.03	0.45	0.655
Adversity * Partner vs. Women's Attractiveness	-0.05	0.06	-0.91	0.367
ln(P) ww * Partner vs. Women's Attractiveness	0.002	0.04	0.06	0.954
ln(E) ww * Adversity * Partner vs. Women's Attractiveness	0.10	0.04	2.35	**0.019**
ln(P) ww * Adversity * Partner vs. Women's Attractiveness	-0.09	0.04	-2.00	**0.046**

Note. Analyses control for childhood adversity × hormone interactions with relationship qualities and main effects of menses and between-woman hormone levels.

Table A16. Partial results for multilevel analyses on In-Pair Sexual Interest, as a function of interactions between childhood adversity, hormones, and partner attractiveness

In-Pair Sexual Interest				
	γ	SE	t-value	p-value
ln(E) ww	0.01	0.04	0.35	0.729
Adversity	0.11	0.06	1.79	*0.075*
ln(P) ww	-0.003	0.04	-0.08	0.935
Partner Attractiveness	0.17	0.06	2.71	**0.007**
ln(E) ww * Adversity	0.04	0.05	0.75	0.455
ln(P) ww * Adversity	-0.02	0.05	-0.40	0.690
ln(E) ww * Partner Attractiveness	0.02	0.05	0.43	0.670
Adversity * Partner Attractiveness	0.01	0.08	0.13	0.896
ln(P) ww * Partner Attractiveness	0.03	0.05	0.73	0.468
ln(E) ww * Adversity * Partner Attractiveness	0.13	0.05	2.42	**0.016**
ln(P) ww * Adversity * Partner Attractiveness	-0.08	0.06	-1.30	0.195

Table A17. Partial results for multilevel analyses on In-Pair Sexual Interest, as a function of interactions between childhood adversity, hormones, and partner attractiveness vs. women's attractiveness

In-Pair Sexual Interest				
	γ	SE	t-value	p-value
ln(E) ww	0.03	0.04	0.69	0.494
Adversity	0.10	0.06	1.63	0.106
ln(P) ww	-0.01	0.04	-0.24	0.809
Partner vs. Women's Attractiveness	0.15	0.05	2.96	**0.004**
ln(E) ww * Adversity	0.05	0.05	0.96	0.338
ln(P) ww * Adversity	-0.03	0.05	-0.59	0.555
ln(E) ww * Partner vs. Women's Attractiveness	0.01	0.04	0.39	0.698
Adversity * Partner vs. Women's Attractiveness	-0.09	0.06	-1.52	0.130
ln(P) ww * Partner vs. Women's Attractiveness	0.03	0.04	0.80	0.426
ln(E) ww * Adversity * Partner vs. Women's Attractiveness	0.13	0.05	2.68	**0.008**
ln(P) ww * Adversity * Partner vs. Women's Attractiveness	-0.12	0.05	-2.47	**0.014**

Note. Analyses control for childhood adversity × hormone interactions with relationship qualities and main effects of menses and between-woman hormone levels.

TableA18. Partial results for multilevel analyses on Extra-Pair Sexual Interest, as a function of interactions between childhood adversity, hormones, and partner attractiveness

Extra-Pair Sexual Interest				
	γ	SE	*t*-value	*p*-value
ln(E) ww	0.004	0.03	0.13	0.899
Adversity	0.08	0.07	1.20	0.234
ln(P) ww	-0.06	0.03	-1.81	*0.071*
Partner Attractiveness	-0.17	0.07	-2.34	**0.021**
ln(E) ww * Adversity	-0.03	0.04	-0.66	0.509
ln(P) ww * Adversity	0.04	0.04	0.96	0.337
ln(E) ww * Partner Attractiveness	0.03	0.04	0.83	0.405
Adversity * Partner Attractiveness	-0.10	0.08	-1.24	0.217
ln(P) ww * Partner Attractiveness	0.07	0.04	1.83	*0.068*
ln(E) ww * Adversity * Partner Attractiveness	-0.01	0.04	-0.22	0.828
ln(P) ww * Adversity * Partner Attractiveness	0.07	0.05	1.58	0.115

TableA19. Partial results for multilevel analyses on extra-pair sexual attraction, as a function of interactions between childhood adversity, hormones, and partner attractiveness

Extra-Pair Sexual Attraction				
	γ	SE	*t*-value	*p*-value
ln(E) ww	-0.003	0.04	-0.09	0.931
Adversity	0.13	0.07	1.93	*0.055*
ln(P) ww	-0.04	0.04	-1.00	0.321
Partner Attractiveness	-0.16	0.07	-2.33	**0.021**
ln(E) ww * Adversity	-0.02	0.04	-0.40	0.687
ln(P) ww * Adversity	0.05	0.05	1.05	0.294
ln(E) ww * Partner Attractiveness	0.04	0.04	1.03	0.304
Adversity * Partner Attractiveness	0.04	0.08	0.52	0.601
ln(P) ww * Partner Attractiveness	0.03	0.04	0.70	0.486
ln(E) ww * Adversity * Partner Attractiveness	-0.03	0.05	-0.61	0.540
ln(P) ww * Adversity * Partner Attractiveness	0.13	0.05	2.47	**0.014**

Note. Analyses control for childhood adversity × hormone interactions with relationship qualities and main effects of menses and between-woman hormone levels.

A5.2. Moderation by partner strength, masculinity, and social potency

Table A20. Correlations between partner features

	Sexual Attractiveness	Behavioral Masculinity	Bodily Strength / Masculinity / Attractiveness	Social Potency
Sexual Attractiveness	1	.166*	.671**	.264**
Behavioral Masculinity	.166*	1	.400**	.151*
Bodily Strength Factor	.671**	.400**	1	.164*
Social Potency	.264**	.151*	.164*	1

* $p < .05$
** $p < .01$

A5.2.1. Behavioral masculinity

The negative interaction between childhood adversity, partner behavioral masculinity, and progesterone was significant in predicting women's In-Pair versus Extra-Pair Sexual Interests ($\gamma = –.08$, $p = .005$). The 3-way interaction involving estrogen was positive but short of significant ($\gamma = .05$, $p = .069$). For women with high childhood adversity, partner's behavioral masculinity more positively predicted their in-pair relative to their extra-pair sexual interest as progesterone levels decreased ($\gamma = –.13$, $p = .002$). Partner behavioral masculinity did not significantly moderate hormonal associations for women with low childhood adversity (p's > .4).

Three-way interactions involving progesterone fell short of significant in separate prediction of women's In-Pair and Extra-Pair Sexual Interests (In-Pair: $\gamma = –.06$, $p = .081$; Extra-Pair: $\gamma = .04$, $p = .088$). Follow-up analyses found significant moderation effects of both estrogen and progesterone on woman's initiation of sex and on women's extra-pair

attraction, but not on in-pair attraction or interest in sex with a hypothetical stranger. Consistent with predictions, women with high childhood adversity initiated sex more frequently with more behaviorally masculine partners as hormones approached periovulatory levels (estrogen × behavioral masculinity: $\gamma = .11$, $p = .013$; progesterone × behavioral masculinity: $\gamma = –.21$, $p = .00002$)—whereas women from secure childhoods did not (p's > .55). And when partners were less behaviorally masculine, women from adverse backgrounds became more sexually attracted to other men as estrogen and progesterone approached periovulatory phase levels (estrogen × behavioral masculinity: $\gamma = –.06$, $p = .037$; progesterone × behavioral masculinity: $\gamma = .09$, $p = .001$). No significant hormone-dependent changes in extra-pair attraction, as a function of partner behavioral masculinity, were observed for women from secure backgrounds (p's > .3).

Table A21. Moderation of childhood adversity × hormone effects on In-Pair vs. Extra-Pair Sexual Interests by partner behavioral masculinity

In-Pair vs. Extra-Pair Sexual Interests				
	γ	SE	t-value	p-value
(Intercept)	-0.02	0.06	-0.36	0.720
menses	-0.02	0.11	-0.20	0.841
ln(E) mean	0.04	0.07	0.59	0.554
ln(P) mean	-0.11	0.07	-1.58	0.117
ln(E) ww	0.02	0.03	0.55	0.584
Adversity	-0.07	0.07	-1.08	0.281
ln(P) ww	-0.01	0.03	-0.19	0.851
Partner Behavioral Masculinity	0.22	0.06	3.56	**0.0005**
ln(E) ww * Adversity	0.01	0.03	0.33	0.740
ln(P) ww * Adversity	-0.04	0.04	-1.09	0.274
ln(E) ww * Partner Behavioral Masculinity	0.01	0.03	0.33	0.740
Adversity * Partner Behavioral Masculinity	-0.20	0.06	-3.29	**0.001**
ln(P) ww * Partner Behavioral Masculinity	-0.05	0.03	-1.47	0.143
ln(E) ww * Adversity * Partner Behavioral Masculinity	0.05	0.03	1.83	*0.069*
ln(P) ww * Adversity * Partner Behavioral Masculinity	-0.08	0.03	-2.81	**0.005**

A5.2.2. Strength / bodily attractiveness

No significant moderation effects of strength/bodily attractiveness factor on its own were detected. However, when controlling for relationship qualities, moderation effects of partner strength/bodily attractiveness emerged for In-Pair versus Extra-Pair Sexual Interests—which were nominally significant for the 3-way interaction with estrogen ($\gamma = .10$, $p = .021$) but not progesterone ($\gamma = –.07$, $p = .109$). This was driven by effects on Extra-Pair Sexual Interest: positive and significant for the 3-way interaction effect with progesterone ($\gamma = .10$, $p = .018$) and negative and marginally significant for the 3-way interaction with estrogen ($\gamma = –.07$, $p = .055$). Similar to analyses using partner attractiveness, moderation effects of partner strength/bodily attractiveness were specific to extra-pair attraction and not interest in sex with a hypothetical stranger. Highly significant 3-way interactions with both estrogen and progesterone were observed for extra-pair attraction, including for absolute strength and relative frequency of extra-pair attraction (all p's < .01).

I next performed separate follow-up exploratory analyses examining effects of each component of the partner strength/bodily attractiveness factor: strength, bodily masculinity, and bodily attractiveness. Significant 3-way interaction effects involving partner strength and bodily masculinity were observed on women's Extra-Pair Sexual Interest and extra-pair attraction; moderation effects of partner bodily attractiveness were significant only for extra-pair attraction (including both the absolute strength and relative frequency of extra-pair attraction).

See OSF (https://osf.io/ud6hm/) for output of all analyses.

Table A22. Partial results of analysis on moderation of childhood adversity × hormone effects on In-Pair vs. Extra-Pair Sexual Interests by partner strength/bodily attractiveness factor

In-Pair vs. Extra-Pair Sexual Interests				
	γ	SE	t-value	p-value
ln(E) ww	-0.002	0.04	-0.05	0.963
Adversity	0.03	0.06	0.52	0.605
ln(P) ww	0.05	0.04	1.36	0.176
Partner Strength/Bodily Attractiveness	0.30	0.06	5.25	**0.000001**
ln(E) ww * Adversity	0.05	0.04	1.10	0.270
ln(P) ww * Adversity	-0.04	0.05	-0.80	0.427
ln(E) ww * Partner Strength/Bodily Attractiveness	-0.04	0.04	-1.04	0.298
Adversity * Partner Strength/Bodily Attractiveness	0.02	0.06	0.30	0.767
ln(P) ww * Partner Strength/Bodily Attractiveness	0.004	0.04	0.09	0.925
ln(E) ww * Adversity * Partner Strength/Bodily Attractiveness	0.10	0.04	2.32	**0.021**
ln(P) ww * Adversity * Partner Strength/Bodily Attractiveness	-0.07	0.05	-1.61	0.109

Note. The analysis controls for interactions with relationship qualities and main effects of menses and between-woman hormone levels.

Table A23. Partial results of analysis on moderation of childhood adversity × hormone effects on Extra-Pair Sexual Interest by partner strength/bodily attractiveness factor

Extra-Pair Sexual Interest				
	γ	SE	t-value	p-value
ln(E) ww	0.01	0.03	0.24	0.808
Adversity	0.07	0.07	1.08	0.281
ln(P) ww	-0.08	0.03	-2.54	**0.012**
Partner Strength/Bodily Attractiveness	-0.27	0.06	-4.45	**0.000**
ln(E) ww * Adversity	-0.02	0.04	-0.64	0.522
ln(P) ww * Adversity	0.02	0.04	0.54	0.588
ln(E) ww * Partner Strength/Bodily Attractiveness	0.003	0.03	0.09	0.931
Adversity * Partner Strength/Bodily Attractiveness	-0.01	0.07	-0.19	0.851
ln(P) ww * Partner Strength/Bodily Attractiveness	0.04	0.04	1.21	0.228
ln(E) ww * Adversity * Partner Strength/Bodily Attractiveness	-0.07	0.04	-1.92	*0.055*
ln(P) ww * Adversity * Partner Strength/Bodily Attractiveness	0.10	0.04	2.37	**0.018**

Note. The analysis controls for interactions with relationship qualities and main effects of menses and between-woman hormone levels.

A5.2.3. Social potency

The interaction between childhood adversity, progesterone, and partner social potency significantly predicted women's In-Pair versus Extra-Pair Sexual Interests ($\gamma = .12$, $p = .0005$). For women with low childhood adversity, as progesterone levels decreased, partner social potency more positively predicted their in-pair relative to their extra-pair sexual interests ($\gamma = -.12$, $p = .021$). The reverse was observed for women with high childhood adversity: partner social potency more positively predicted in-pair relative to extra-pair sexual interests as progesterone levels increased ($\gamma = .12$, $p = .015$). Separate analyses on In-Pair Sexual Interest and Extra-Pair Sexual Interest revealed significant 3-way interaction effects involving progesterone on both (In-Pair: $\gamma = .08$, $p = .047$; Extra-Pair: $\gamma = -.07$, $p = .015$).

Table A24. Moderation of childhood adversity × hormone effects on In-Pair vs. Extra-Pair Sexual Interests by partner social potency

In-Pair vs. Extra-Pair Sexual Interests				
	γ	SE	t-value	p-value
(Intercept)	0.01	0.06	0.18	0.859
menses	-0.06	0.11	-0.55	0.585
ln(E) mean	-0.03	0.07	-0.44	0.660
ln(P) mean	-0.12	0.07	-1.65	0.101
ln(E) ww	0.01	0.03	0.43	0.664
Adversity	-0.05	0.07	-0.66	0.508
ln(P) ww	0.005	0.03	0.15	0.884
Partner Social Potency	0.12	0.07	1.62	0.107
ln(E) ww * Adversity	-0.01	0.03	-0.32	0.748
ln(P) ww * Adversity	0.002	0.03	0.06	0.954
ln(E) ww * Partner Social Potency	0.05	0.04	1.28	0.203
Adversity * Partner Social Potency	-0.001	0.08	-0.01	0.992
ln(P) ww * Partner Social Potency	0.000	0.04	-0.002	0.998
ln(E) ww * Adversity * Partner Social Potency	-0.01	0.04	-0.25	0.800
ln(P) ww * Adversity * Partner Social Potency	0.12	0.03	3.52	**0.0005**

A6. Relationship quality predictors of oxytocin change

Results of multilevel analysis on oxytocin change, separated by relationship quality

Table A25a. Estimates involving interactions with loving attachment

Oxytocin Change				
	γ	SE	t-value	p-value
(Intercept)	-0.01	0.08	-0.08	0.940
Menses	-0.47	0.30	-1.59	0.113
ln(E) mean	-0.21	0.08	-2.54	**0.013**
ln(P) mean	0.04	0.08	0.52	0.606
ln(E) ww	-0.02	0.08	-0.31	0.758
ln(P) ww	0.01	0.07	0.13	0.896
Adversity	0.01	0.09	0.06	0.952
Loving Attachment total	0.02	0.10	0.24	0.811
Loving Attachment discrepancy	0.05	0.08	0.66	0.509
ln(E) ww * Adversity	0.06	0.08	0.68	0.498
ln(P) ww * Adversity	-0.14	0.09	-1.50	0.135
ln(E) ww * Loving Attachment total	-0.22	0.11	-2.11	**0.037**
Adversity * Loving Attachment total	-0.25	0.09	-2.92	**0.004**
ln(E) ww * Loving Attachment discrepancy	-0.04	0.12	-0.37	0.712
Adversity * Loving Attachment discrepancy	-0.04	0.10	-0.39	0.698
ln(P) ww * Loving Attachment total	0.21	0.10	2.04	**0.043**
ln(P) ww * Loving Attachment discrepancy	0.05	0.10	0.47	0.643
ln(E) ww * Adversity * Loving Attachment total	0.08	0.10	0.82	0.414
ln(E) ww * Adversity * Loving Attachment discrepancy	0.27	0.13	2.09	**0.038**
ln(P) ww * Adversity * Loving Attachment total	0.16	0.07	2.30	**0.023**
ln(P) ww * Adversity * Loving Attachment discrepancy	-0.14	0.11	-1.28	0.202

Table A25b. Estimates involving interactions with romantic passion

Oxytocin Change				
	γ	SE	t-value	p-value
ln(E) ww	-0.02	0.08	-0.31	0.758
ln(P) ww	0.01	0.07	0.13	0.896
Adversity	0.01	0.09	0.06	0.952
Romantic Passion total	0.03	0.08	0.37	0.711
Romantic Passion discrepancy	-0.04	0.08	-0.42	0.676
ln(E) ww * Adversity	0.06	0.08	0.68	0.498
ln(P) ww * Adversity	-0.14	0.09	-1.50	0.135
ln(E) ww * Romantic Passion total	0.10	0.09	1.13	0.262
Adversity * Romantic Passion total	0.00	0.09	0.04	0.971
ln(E) ww * Romantic Passion discrepancy	0.17	0.11	1.54	0.125
Adversity * Romantic Passion discrepancy	-0.18	0.11	-1.62	0.109
ln(P) ww * Romantic Passion total	-0.13	0.07	-1.74	*0.084*
ln(P) ww * Romantic Passion discrepancy	-0.10	0.10	-1.07	0.287
ln(E) ww * Adversity * Romantic Passion total	0.02	0.11	0.19	0.849
ln(E) ww * Adversity * Romantic Passion discrepancy	-0.08	0.14	-0.61	0.541
ln(P) ww * Adversity * Romantic Passion total	-0.23	0.09	-2.54	**0.012**
ln(P) ww * Adversity * Romantic Passion discrepancy	0.28	0.13	2.14	**0.034**

Table A25c. Estimates involving interactions with interest in romantic alternatives

Oxytocin Change				
	γ	SE	t-value	p-value
ln(E) ww	-0.02	0.08	-0.31	0.758
ln(P) ww	0.01	0.07	0.13	0.896
Adversity	0.01	0.09	0.06	0.952
Interest in Others total	-0.02	0.08	-0.21	0.832
Interest in Others discrepancy	-0.04	0.07	-0.57	0.573
ln(E) ww * Adversity	0.06	0.08	0.68	0.498
ln(P) ww * Adversity	-0.14	0.09	-1.50	0.135
ln(E) ww * Interest in Others total	-0.04	0.10	-0.42	0.676
Adversity * Interest in Others total	-0.05	0.08	-0.57	0.572
ln(E) ww * Interest in Others discrepancy	0.02	0.09	0.28	0.781
Adversity * Interest in Others discrepancy	-0.09	0.05	-1.65	0.105
ln(P) ww * Interest in Others total	0.12	0.08	1.60	0.112
ln(P) ww * Interest in Others discrepancy	0.04	0.07	0.62	0.535
ln(E) ww * Adversity * Interest in Others total	0.25	0.11	2.31	**0.022**
ln(E) ww * Adversity * Interest in Others discrepancy	0.28	0.14	1.93	*0.055*
ln(P) ww * Adversity * Interest in Others total	-0.24	0.09	-2.82	**0.005**
ln(P) ww * Adversity * Interest in Others discrepancy	-0.13	0.06	-2.21	**0.028**

A7. Mate preferences as a function of childhood adversity

A7.1. Analyses on mate preferences, as a function of interactions between childhood adversity, hormones, and In-Pair vs. Extra-Pair Sexual Interests

A7.1.1. Shifts in sexual interest in attractive bodily features

Table A26. Results of multilevel analysis on women's sexual interest in attractive bodily features

Sexual Interest in Attractive Bodily Features				
	γ	SE	t-value	p-value
Intercept	-0.02	0.07	-0.38	0.708
Menses	-0.13	0.09	-1.54	0.124
ln(E) mean	0.02	0.07	0.22	0.825
Adversity	0.08	0.07	1.19	0.234
ln(P) mean	0.10	0.08	1.27	0.207
ln(E) ww	0.06	0.03	2.16	**0.033**
IP vs. EP	-0.05	0.03	-1.49	0.138
ln(P) ww	-0.03	0.03	-1.27	0.208
ln(E) mean * Adversity	0.03	0.08	0.39	0.698
Adversity * ln(P) mean	-0.14	0.08	-1.76	*0.080*
Adversity * ln(E) ww	0.01	0.03	0.36	0.720
ln(E) ww * IP vs. EP	0.02	0.03	0.50	0.622
Adversity * ln(P) ww	-0.06	0.03	-2.22	**0.029**
IP vs. EP * ln(P) ww	0.08	0.03	2.48	**0.021**

A7.1.2. Shifts in preferences for muscular male bodies

Table A27. Body rating task: Multilevel analysis on sexual attractiveness ratings, scaled by within-woman standard deviations in ratings

Bodily Attractiveness				
	γ	SE	t-value	p-value
Intercept	0.001	0.04	0.04	0.972
Menses	0.004	0.01	0.52	0.606
ln(E) mean	0.01	0.03	0.45	0.653
ln(P) mean	0.001	0.03	0.03	0.973
ln(E) ww	-0.001	0.003	-0.55	0.579
Muscularity	0.74	0.03	24.59	**< 2E-16**
Adversity	0.02	0.03	0.51	0.609
IP vs. EP	-0.02	0.004	-4.71	**2.49E-06**
ln(P) ww	-0.01	0.003	-2.61	**0.009**
ln(E) ww * Muscularity	0.01	0.02	0.76	0.453
ln(E) ww * Adversity	-0.001	0.003	-0.32	0.747
Muscularity * Adversity	-0.04	0.01	-5.96	**4.31E-09**
ln(E) ww * IP vs. EP	-0.01	0.003	-2.88	**0.004**
Muscularity * IP vs. EP	-0.02	0.01	-4.16	**3.67E-05**
Adversity * IP vs. EP	-0.005	0.01	-0.89	0.375
Muscularity * ln(P) ww	0.02	0.01	1.17	0.249
Adversity * ln(P) ww	0.01	0.003	2.13	**0.033**
IP vs. EP * ln(P) ww	-0.01	0.003	-3.06	**0.002**
ln(E) ww * Muscularity * Adversity	0.002	0.02	0.13	0.897
ln(E) ww * Muscularity * IP vs. EP	0.002	0.03	0.09	0.927
ln(E) ww * Adversity * IP vs. EP	-0.01	0.003	-4.29	**1.79E-05**
Muscularity * Adversity * IP vs. EP	-0.05	0.01	-5.97	**4.40E-09**
Muscularity * Adversity * ln(P) ww	0.04	0.02	1.93	*0.059*
Muscularity * IP vs. EP * ln(P) ww	0.09	0.04	2.65	**0.012**
Adversity * IP vs. EP * ln(P) ww	0.01	0.004	3.65	**0.0003**
ln(E) ww * Muscularity * Adversity * IP vs. EP	-0.03	0.03	-0.98	0.335
Muscularity * Adversity * IP vs. EP * ln(P) ww	0.13	0.05	2.79	**0.008**

Table A28. Body rating task: Multilevel analysis on sexual attractiveness ratings, standardized across women

Bodily Attractiveness				
	γ	SE	t-value	p-value
Intercept	-0.01	0.04	-0.24	0.810
Menses	0.004	0.01	0.48	0.628
ln(E) mean	-0.01	0.02	-0.60	0.550
ln(P) mean	0.01	0.02	0.24	0.809
ln(E) ww	0.0003	0.003	0.13	0.900
Muscularity	0.76	0.03	26.07	**< 2e-16**
Adversity	-0.03	0.02	-1.09	0.277
IP vs. EP	-0.02	0.004	-4.25	**0.00002**
ln(P) ww	-0.01	0.003	-3.31	**0.001**
ln(E) ww * Muscularity	0.001	0.01	0.18	0.860
ln(E) ww * Adversity	-0.001	0.003	-0.43	0.669
Muscularity * Adversity	-0.06	0.01	-9.67	**< 2e-16**
ln(E) ww * IP vs. EP	-0.01	0.003	-2.73	**0.006**
Muscularity * IP vs. EP	-0.01	0.005	-1.39	0.166
Adversity * IP vs. EP	-0.003	0.01	-0.56	0.577
Muscularity * ln(P) ww	0.02	0.01	3.15	**0.002**
Adversity * ln(P) ww	0.005	0.003	1.47	0.140
IP vs. EP * ln(P) ww	-0.01	0.003	-3.90	**0.0001**
ln(E) ww * Muscularity * Adversity	0.03	0.01	4.82	**0.000001**
ln(E) ww * Muscularity * IP vs. EP	0.03	0.03	0.97	0.334
ln(E) ww * Adversity * IP vs. EP	-0.01	0.003	-3.88	**0.0001**
Muscularity * Adversity * IP vs. EP	-0.03	0.01	-4.86	**0.000001**
Muscularity * Adversity * ln(P) ww	-0.01	0.01	-1.93	*0.053*
Muscularity * IP vs. EP * ln(P) ww	0.07	0.04	1.82	*0.075*
Adversity * IP vs. EP * ln(P) ww	0.01	0.004	2.87	**0.004**
ln(E) ww * Muscularity * Adversity * IP vs. EP	-0.08	0.04	-2.24	**0.029**
Muscularity * Adversity * IP vs. EP * ln(P) ww	0.15	0.05	2.96	**0.005**

A7.1.3. Preference shifts for video stimuli of men

A7.1.3.1. Shifts in mate preferences for socially dominant men

Table A29. Short-term vs. long-term mate preferences for social dominance

Short-Term vs. Long-Term Attractiveness				
	γ	SE	t-value	p-value
Intercept	0.01	0.08	0.16	0.874
ln(E) ww	0.02	0.01	1.52	0.128
IP vs. EP	-0.001	0.02	-0.05	0.960
Adversity	-0.07	0.07	-0.99	0.326
ln(P) ww	-0.03	0.01	-2.32	**0.021**
Dominance	0.21	0.07	3.29	**0.006**
ln(E) ww * IP vs. EP	-0.003	0.01	-0.21	0.835
ln(E) ww * Adversity	-0.01	0.01	-0.76	0.445
IP vs. EP * Adversity	0.01	0.02	0.48	0.630
IP vs. EP * ln(P) ww	0.02	0.01	1.24	0.214
Adversity * ln(P) ww	0.02	0.01	1.66	*0.098*
ln(E) ww * Dominance	-0.01	0.01	-0.43	0.665
IP vs. EP * Dominance	-0.03	0.01	-2.56	**0.011**
Adversity * Dominance	0.02	0.01	1.73	*0.084*
ln(P) ww * Dominance	0.0003	0.01	0.02	0.983
ln(E) ww * IP vs. EP * Adversity	-0.01	0.02	-0.32	0.749
IP vs. EP * Adversity * ln(P) ww	0.02	0.02	1.07	0.284
ln(E) ww * IP vs. EP * Dominance	0.005	0.01	0.35	0.726
ln(E) ww * Adversity * Dominance	0.01	0.01	0.50	0.618
IP vs. EP * Adversity * Dominance	-0.01	0.02	-0.47	0.642
IP vs. EP * ln(P) ww * Dominance	0.02	0.01	1.52	0.128
Adversity * ln(P) ww * Dominance	0.01	0.01	1.10	0.271
ln(E) ww * IP vs. EP * Adversity * Dominance	-0.02	0.02	-0.96	0.335
IP vs. EP * Adversity * ln(P) ww * Dominance	0.06	0.02	3.18	**0.001**

Table A30. Short-term mate preferences for social dominance

Short-Term Attractiveness				
	γ	SE	t-value	p-value
Intercept	-0.02	0.06	-0.28	0.783
Long-Term Attractiveness	0.42	0.01	46.64	**< 2e-16**
ln(E) ww	0.02	0.01	2.90	**0.004**
IP vs. EP	-0.02	0.01	-1.27	0.205
Adversity	-0.07	0.06	-1.30	0.198
ln(P) ww	-0.02	0.01	-2.35	**0.019**
Dominance	0.14	0.04	3.40	**0.005**
ln(E) ww * IP vs. EP	-0.01	0.01	-0.66	0.512
ln(E) ww * Adversity	0.002	0.01	0.36	0.721
IP vs. EP * Adversity	0.01	0.02	0.79	0.432
IP vs. EP * ln(P) ww	0.02	0.01	1.60	0.109
Adversity * ln(P) ww	0.003	0.01	0.37	0.709
ln(E) ww * Dominance	-0.001	0.01	-0.16	0.876
IP vs. EP * Dominance	-0.01	0.01	-1.38	0.168
Adversity * Dominance	0.01	0.01	1.25	0.210
ln(P) ww * Dominance	-0.004	0.01	-0.42	0.673
ln(E) ww * IP vs. EP * Adversity	-0.01	0.01	-0.58	0.562
IP vs. EP * Adversity * ln(P) ww	0.01	0.01	0.96	0.339
ln(E) ww * IP vs. EP * Dominance	-0.003	0.01	-0.36	0.720
ln(E) ww * Adversity * Dominance	-0.001	0.01	-0.10	0.922
IP vs. EP * Adversity * Dominance	-0.01	0.01	-1.13	0.260
IP vs. EP * ln(P) ww * Dominance	0.02	0.01	1.69	*0.092*
Adversity * ln(P) ww * Dominance	0.01	0.01	1.24	0.214
ln(E) ww * IP vs. EP * Adversity * Dominance	-0.01	0.01	-0.77	0.444
IP vs. EP * Adversity * ln(P) ww * Dominance	0.04	0.01	3.06	**0.002**

Table A31. Long-term mate preferences for social dominance

Long-Term Attractiveness				
	γ	SE	t-value	p-value
Intercept	0.03	0.07	0.42	0.681
Short-Term Attractiveness	0.77	0.02	46.57	**< 2e-16**
ln(E) ww	-0.001	0.01	-0.08	0.936
IP vs. EP	-0.02	0.02	-0.84	0.400
Adversity	0.02	0.05	0.42	0.676
ln(P) ww	0.02	0.01	1.81	***0.070***
Dominance	-0.17	0.07	-2.60	**0.022**
ln(E) ww * IP vs. EP	-0.004	0.01	-0.27	0.786
ln(E) ww * Adversity	0.01	0.01	1.56	0.119
IP vs. EP * Adversity	-0.01	0.02	-0.26	0.793
IP vs. EP * ln(P) ww	-0.01	0.01	-0.67	0.504
Adversity * ln(P) ww	-0.03	0.01	-2.37	**0.018**
ln(E) ww * Dominance	0.01	0.01	0.58	0.559
IP vs. EP * Dominance	0.04	0.01	3.02	**0.003**
Adversity * Dominance	-0.02	0.01	-1.75	***0.080***
ln(P) ww * Dominance	-0.005	0.01	-0.40	0.689
ln(E) ww * IP vs. EP * Adversity	0.0002	0.02	0.01	0.991
IP vs. EP * Adversity * ln(P) ww	-0.02	0.02	-0.90	0.369
ln(E) ww * IP vs. EP * Dominance	-0.01	0.01	-0.88	0.377
ln(E) ww * Adversity * Dominance	-0.01	0.01	-0.91	0.364
IP vs. EP * Adversity * Dominance	-0.003	0.01	-0.20	0.839
IP vs. EP * ln(P) ww * Dominance	-0.02	0.01	-1.09	0.275
Adversity * ln(P) ww * Dominance	-0.01	0.01	-0.75	0.456
ln(E) ww * IP vs. EP * Adversity * Dominance	0.01	0.02	0.94	0.346
IP vs. EP * Adversity * ln(P) ww * Dominance	-0.04	0.02	-2.59	**0.010**

A7.1.3.2. Shifts in mate preferences for muscular men

Table A32. Short-term vs. long-term mate preferences for muscularity

Short-Term vs. Long-Term Attractiveness				
	γ	SE	t-value	p-value
Intercept	-0.01	0.09	-0.16	0.874
ln(E) ww	0.01	0.01	1.38	0.169
IP vs. EP mean	0.05	0.07	0.70	0.486
Adversity	-0.08	0.07	-1.08	0.281
ln(P) ww	-0.03	0.01	-2.44	**0.015**
Muscularity	0.27	0.10	2.73	**0.018**
ln(E) ww * IP vs. EP mean	0.004	0.01	0.40	0.686
ln(E) ww * Adversity	-0.01	0.01	-1.31	0.191
IP vs. EP mean * Adversity	0.08	0.08	0.98	0.329
IP vs. EP mean * ln(P) ww	0.02	0.01	1.41	0.157
Adversity * ln(P) ww	0.01	0.01	1.42	0.156
ln(E) ww * Muscularity	-0.02	0.02	-1.21	0.228
IP vs. EP mean * Muscularity	-0.02	0.02	-1.17	0.243
Adversity * Muscularity	0.04	0.02	2.41	**0.016**
ln(P) ww * Muscularity	-0.02	0.02	-0.94	0.347
ln(E) ww * IP vs. EP mean * Adversity	0.001	0.01	0.10	0.922
IP vs. EP mean * Adversity * ln(P) ww	0.03	0.02	1.59	0.112
ln(E) ww * IP vs. EP mean * Muscularity	0.01	0.02	0.50	0.620
ln(E) ww * Adversity * Muscularity	-0.01	0.02	-0.37	0.711
IP vs. EP mean * Adversity * Muscularity	-0.02	0.02	-0.83	0.405
IP vs. EP mean * ln(P) ww * Muscularity	0.07	0.02	3.37	**0.001**
Adversity * ln(P) ww * Muscularity	-0.01	0.02	-0.53	0.593
ln(E) ww * IP vs. EP mean * Adversity * Muscularity	0.004	0.01	0.30	0.767
IP vs. EP mean * Adversity * ln(P) ww * Muscularity	0.07	0.03	2.40	**0.016**

Table A33. Short-term mate preferences for muscularity

Short-Term Attractiveness				
	γ	SE	t-value	p-value
Intercept	-0.03	0.07	-0.40	0.693
Long-Term Attractiveness	0.42	0.01	45.65	**< 2e-16**
ln(E) ww	0.02	0.01	2.77	**0.006**
IP vs. EP mean	0.04	0.05	0.70	0.488
Adversity	-0.08	0.06	-1.38	0.171
ln(P) ww	-0.02	0.01	-2.77	**0.006**
Muscularity	0.13	0.07	1.81	*0.096*
ln(E) ww * IP vs. EP mean	-0.01	0.01	-1.14	0.254
ln(E) ww * Adversity	0.003	0.01	0.38	0.706
IP vs. EP mean * Adversity	0.02	0.06	0.36	0.721
IP vs. EP mean * ln(P) ww	0.01	0.01	1.38	0.168
Adversity * ln(P) ww	0.001	0.01	0.20	0.842
ln(E) ww * Muscularity	-0.01	0.01	-1.28	0.201
IP vs. EP mean * Muscularity	-0.01	0.01	-1.06	0.292
Adversity * Muscularity	0.04	0.01	3.21	**0.001**
ln(P) ww * Muscularity	-0.01	0.01	-0.83	0.404
ln(E) ww * IP vs. EP mean * Adversity	-0.01	0.01	-1.62	0.105
IP vs. EP mean * Adversity * ln(P) ww	0.03	0.01	2.25	**0.025**
ln(E) ww * IP vs. EP mean * Muscularity	0.01	0.01	0.43	0.666
ln(E) ww * Adversity * Muscularity	-0.01	0.01	-0.87	0.386
IP vs. EP mean * Adversity * Muscularity	-0.01	0.01	-0.89	0.372
IP vs. EP mean * ln(P) ww * Muscularity	0.05	0.01	3.68	**0.0002**
Adversity * ln(P) ww * Muscularity	-0.004	0.01	-0.42	0.671
ln(E) ww * IP vs. EP mean * Adversity * Muscularity	0.003	0.01	0.30	0.761
IP vs. EP mean * Adversity * ln(P) ww * Muscularity	0.05	0.02	2.48	**0.013**

Table A34. Long-term mate preferences for muscularity

Long-Term Attractiveness				
	γ	SE	t-value	p-value
Intercept	0.06	0.07	0.87	0.390
Short-Term Attractiveness	0.78	0.02	45.48	**< 2e-16**
ln(E) ww	0.001	0.01	0.08	0.940
IP vs. EP mean	-0.03	0.05	-0.59	0.555
Adversity	0.03	0.05	0.54	0.593
ln(P) ww	0.02	0.01	1.68	*0.093*
Muscularity	-0.28	0.08	-3.25	**0.007**
ln(E) ww * IP vs. EP mean	-0.02	0.01	-1.63	0.104
ln(E) ww * Adversity	0.02	0.01	2.46	**0.014**
IP vs. EP mean * Adversity	-0.10	0.06	-1.63	0.106
IP vs. EP mean * ln(P) ww	-0.01	0.01	-1.17	0.244
Adversity * ln(P) ww	-0.02	0.01	-2.17	**0.031**
ln(E) ww * Muscularity	0.01	0.02	0.90	0.366
IP vs. EP mean * Muscularity	0.02	0.02	1.00	0.319
Adversity * Muscularity	-0.02	0.02	-1.13	0.257
ln(P) ww * Muscularity	0.01	0.02	0.84	0.400
ln(E) ww * IP vs. EP mean * Adversity	-0.01	0.01	-1.53	0.127
IP vs. EP mean * Adversity * ln(P) ww	-0.01	0.02	-0.72	0.473
ln(E) ww * IP vs. EP mean * Muscularity	-0.01	0.02	-0.45	0.653
ln(E) ww * Adversity * Muscularity	-0.002	0.02	-0.12	0.907
IP vs. EP mean * Adversity * Muscularity	0.01	0.02	0.59	0.557
IP vs. EP mean * ln(P) ww * Muscularity	-0.05	0.02	-2.44	**0.015**
Adversity * ln(P) ww * Muscularity	0.01	0.01	0.52	0.602
ln(E) ww * IP vs. EP mean * Adversity * Muscularity	-0.003	0.01	-0.23	0.816
IP vs. EP mean * Adversity * ln(P) ww * Muscularity	-0.05	0.03	-1.87	*0.062*

A7.2. Analyses on mate preferences, excluding interactions with In-Pair vs. Extra-Pair Sexual Interests

Overall, analyses testing interactions with childhood adversity—without accounting for moderation by In-Pair vs. Extra-Pair Sexual Interests—yielded effects in predicted directions, though effects were not consistently robust. See the summary table below.

TableA35. Summary results of multilevel analyses on women's mate preferences as a function of interactions between childhood adversity and hormone levels

		Effect * Adversity [a]		**High Adversity** [b]		**Low Adversity** [c]	
DV	**Effect**	γ	*p*-value	γ	*p*-value	γ	*p*-value
Interest in Bodily Features	ln(E) ww	–.003	.924	.05	.223	.05	.172
	ln(P) ww	*–.06*	*.055*	**–.10**	**.011**	.01	.855
Bodily Attractiveness (Photo Rating)	ln(E) ww * Muscularity	**.06**	**.038**	**0.11**	**.016**	–.02	.566
	ln(P) ww * Muscularity	–.07	.126	*–0.11*	*.057*	.02	.672
ST vs. LT Attractiveness (Overall / Competition Video) [d]	ln(E) ww * Dominance	*.02* / **.05**	*.064* / **.019**	.02 / *.05*	.367 / *.098*	–.03 / –.04	.137 / .173
	ln(P) ww * Dominance	–.02 / **–.04**	.125 / **.037**	–.02 / –.03	.259 / .225	.02 / *.06*	.338 / *.075*
ST vs. LT Attractiveness (Overall / Competition Video) [d]	ln(E) ww * Muscularity	**.04 / .08**	**.039 / .002**	.01 / .06	.750 / .107	**–.06 / –.10**	**.027 / .018**
	ln(P) ww * Muscularity	–.03 / **–.08**	.107 / **.006**	–.03 / *–.06*	.214 / *.099*	.03 / **.09**	.345 / **.041**

[a] Higher-order interaction between childhood adversity and effect of interest
[b] Simple effects estimates for women with high childhood adversity (centered at 1 *SD* above the mean)
[c] Simple effects estimates for women with low childhood adversity (centered at 1 *SD* below the mean)

[d] The last four rows report estimates for effects on women's video ratings of men's short-term vs. long-term mate attractiveness, (1) on average across video scenarios (with scenario type effect-coded), and (2) in the intrasexual competition scenario (scenario type dummy-coded, with 0 = competition). Interactions with scenario type are statistically significant for muscularity preferences (*p*'s < .03) but not for social dominance preferences (*p*'s < .16).

Effects with ***p* < .05** are **bolded**
Effects with $p < .10$ are *italicized*

A7.2.1. Analyses on raw bodily attractiveness ratings, without inclusion of interactions with In-Pair versus Extra-Pair Sexual Interests

Consistent with predictions, the positive childhood adversity × muscularity × within-woman estrogen interaction was significant ($\gamma = .07$, $p = .038$). The 3-way interaction with within-woman progesterone was negative in direction and similar in magnitude but did not reach nominal significance ($\gamma = –.07$, $p = .126$). For women with high childhood adversity, men's muscularity more strongly and positively predicted women's sexual attraction to them as estrogen levels increased and progesterone levels decreased (within-woman estrogen × muscularity interaction: $\gamma = .11$, $p = .016$; within-woman progesterone × muscularity: $\gamma = –.11$, $p = .057$). These interactions were nonsignificant for women from secure childhoods ($p > .5$) and, indeed, ran descriptively in the opposite directions as for women from adverse childhoods. As hormone profiles approached periovulatory-phase levels, muscular men (1 *SD* above the mean) were rated as increasingly more attractive as levels of childhood adversity increased (within-woman estrogen × adversity interaction: $\gamma = .12$, $p = .018$; within-woman progesterone × adversity: $\gamma = –.11$, $p = .148$). No significant hormone-dependent changes in preferences were observed as a function of childhood adversity for unmuscular men (1 *SD* below the mean).

Interestingly, childhood adversity also strongly moderated interactions between male muscularity and between-woman estrogen levels (3-way interaction: $\gamma = .24$, $p = .003$). With increasing experiences of childhood adversity, muscular men became more strongly preferred as mean levels of estrogen increased (between-woman estrogen × adversity: $\gamma = .25$, $p = .046$), while unmuscular men became less preferred as mean levels of estrogen and

progesterone increased (between-woman estrogen × adversity interaction: $\gamma = -.22$, $p = .017$; between-woman progesterone × adversity: $\gamma = -.21$, $p = .039$).

A7.2.2. Preferences for video stimuli of muscular and socially dominant men, moderated by scenario type

During a targeted periovulatory and luteal session, women watched video clips of men competing for a date with an attractive woman. Men introduced themselves to the woman in the first scenario and set of tapes. In the second scenario, they told another male competitor why they should win the date. The sets of tapes watched were randomized across individual women's sessions. Women rated the men on their attractiveness as a long-term mate and as a short-term, sexual partner.

A7.2.2.1. Preference shifts for muscularity

Short-term vs. long-term attractiveness. For women's preferences across scenarios for men as short-term relative to long-term partners, the 3-way interaction between childhood adversity, male muscularity, and hormones was positive and significant for estrogen ($\gamma = .04$, $p = .039$) and negative but fell outside of statistical significance for progesterone ($\gamma = -.03$, $p = .107$). These interactions were further moderated by scenario type (4-way interaction with estrogen: $\gamma = -.05$, $p = .018$; with progesterone: $\gamma = .05$, $p = .023$). Moderation effects were especially strong in the intrasexually competitive scenario (3-way interactions in the introductory scenario have p's > .5). As experiences with childhood adversity increased, women increasingly preferred muscular men in competitive scenarios as hormones approached periovulatory levels (estrogen × adversity × muscularity: $\gamma = .08$, $p = .002$; progesterone × adversity × muscularity: $\gamma = -.08$, $p = .006$). These 3-way interactions were

driven by significant childhood adversity × muscularity interactions in opposing directions during the periovulatory phase ($\gamma = .21$, $p = .001$) and luteal phase ($\gamma = –.11$, $p = .045$). Men's muscularity moderated hormonal associations with their short-term versus long-term attractiveness in opposite directions for women from adverse and secure backgrounds. Although effect sizes were comparable, hormone × muscularity interactions were not consistently significant at $p < .05$. As progesterone levels decreased and/or estrogen levels increased, muscular men (1 *SD* above the mean) became more strongly preferred by women with higher childhood adversity (estrogen × adversity: $\gamma = .08$, $p = .036$; progesterone × adversity: $\gamma = –.04$, $p = .357$), while unmuscular men (1 *SD* below the mean) became increasingly less preferred (estrogen × adversity interaction: $\gamma = –.08$, $p = .048$; progesterone × adversity: $\gamma = .12$, $p = .007$).

Analyses next examined whether these results can be explained by preference shifts for men's muscularity in the context of short-term and/or long-term mating.

Short-term attractiveness. Results for short-term attractiveness, controlling for long-term attractiveness, mirrored those for short-term versus long-term attractiveness. However, they were slightly weaker. Across scenarios, the positive childhood adversity × muscularity × estrogen interaction ($\gamma = .02$, $p = .112$) and negative childhood adversity × muscularity × progesterone interaction ($\gamma = –.02$, $p = .126$) were in the predicted directions but were not significant. Moderation by scenario type also fell short of significant (4-way interaction with estrogen: $\gamma = –.03$, $p = .054$; with progesterone: $\gamma = .03$, $p = .109$). As before, interaction effects were stronger when men addressed a male competitor than when they introduced themselves (for the latter, γ's $< .01$, p's $> .6$). The interactions between childhood adversity,

muscularity, and hormones were significant when women rated men's short-term attractiveness in the competitive scenario (3-way interaction with estrogen: $\gamma = .05$, $p = .013$; with progesterone: $\gamma = -.05$, $p = .028$). Preferences for muscularity grew stronger with more adverse childhood experiences during estrus ($\gamma = .15$, $p = .001$), but not during extended sexuality ($\gamma = -.04$, $p = .397$). This effect appears to be driven most strongly by women from secure childhoods preferring muscular men less as hormones approached periovulatory phase levels (estrogen × muscularity: $\gamma = -.07$, $p = .031$; progesterone × muscularity: $\gamma = .06$, $p = .067$): The slope for muscularity was weak and nonsignificant during estrus ($\gamma = .13$, $p = .285$) and strongly positive during extended sexuality ($\gamma = .39$, $p = .004$). For women from adverse childhoods, muscularity's slope was positive during the luteal phase ($\gamma = .32$, $p = .012$) and descriptively even more strongly positive during the periovulatory phase ($\gamma = .44$, $p = .001$)—though muscularity's attenuated interactions with hormone levels were nonsignificant (estrogen × muscularity: $\gamma = .03$, $p = .323$; progesterone × muscularity: $\gamma = -.03$, $p = .290$).

Long-term attractiveness. Although no predictions were made, for completeness, analyses examined whether childhood adversity moderated hormonal effects on women's long-term preferences for male muscularity. Analyses controlled for short-term attractiveness. Results showed that the pertinent 3-way interactions were again moderated by scenario type (4-way interaction with estrogen: $\gamma = .03$, $p = .024$; with progesterone: $\gamma = .04$, $p = .017$): The childhood adversity × muscularity × hormone interactions were significant for estrogen ($\gamma = -.06$, $p = .003$) and progesterone ($\gamma = .06$, $p = .007$) in the competitive scenario but not the introductory scenario (p's > .35). During estrus, men's muscularity more

negatively predicted their long-term attractiveness as childhood adversity increased (adversity × muscularity: γ = –.13, p = .006). But during extended sexuality, this interaction reversed: Muscularity was more strongly undesirable in a long-term partner for women with fewer experiences of childhood adversity (adversity × muscularity: γ = .11, p = .010).

A7.2.2.2. Preference shifts for social dominance

In general, results for moderated preferences for men's social dominance were weaker but paralleled the directions of effects for men's muscularity. Interactions between childhood adversity, social dominance, and hormones significantly predicted men's short-term versus long-term attractiveness when they confronted a competitor (3-way interaction with estrogen: γ = .05, p = .019; with progesterone: γ = –.04, p = .037), but not when they introduced themselves (p's > .9). However, differences were not statistically significant between scenarios (p's = .126, .153 for interactions with estrogen and progesterone, respectively). As childhood adversity increased, women more strongly preferred socially dominant men as short-term over long-term partners during estrus (adversity × dominance: γ = .12, p = .009) but not during extended sexuality (adversity × dominance: γ = .03, p = .457).

These results were more strongly driven by changes in long-term mate preferences than by changes in short-term preferences. For men's short-term attractiveness, three-way interactions were in the expected directions but were nonsignificant and did not differ across scenarios. As before, moderation effects on long-term preferences significantly differed by scenario (4-way interaction with estrogen: γ = .04, p = .025; with progesterone: γ = –.04, p =

.047) and were not detected in the introductory scenario (for 3-way interactions, γ's < .01, *p*'s > .6). In the competitive scenario, interactions between childhood adversity, social dominance, and hormone levels significantly predicted men's long-term attractiveness in a negative direction for estrogen (γ = –.04, *p* = .002) and positive direction for progesterone (γ = .03, *p* = .014). Women from adverse backgrounds found more socially dominant men increasingly less desirable as long-term partners as estrogen increased and progesterone decreased. Differences in long-term preferences for dominant men as a function of childhood adversity were significant during estrus but not during extended sexuality.

A7.3. Sexual interest in attractive bodily features: Moderation by partner attractiveness

Table A35. Results of multilevel analysis on women's sexual interest in attractive bodily features

Sexual Interest in Attractive Bodily Features					
	γ	SE	df	t-value	p-value
Intercept	-0.02	0.07	175.76	-0.28	0.783
Menses	-0.12	0.09	454.67	-1.40	0.164
ln(E) mean	0.02	0.07	173.60	0.24	0.815
ln(P) mean	0.06	0.08	174.07	0.86	0.391
ln(E) ww	0.06	0.03	135.80	2.10	**0.037**
Adversity	0.07	0.07	171.94	1.05	0.296
Partner Attractiveness	-0.05	0.07	169.22	-0.65	0.518
ln(P) ww	-0.05	0.03	124.20	-1.60	0.113
ln(E) ww * Adversity	-0.01	0.03	99.63	-0.35	0.729
ln(E) ww * Partner Attractiveness	0.02	0.03	113.99	0.58	0.565
Adversity * Partner Attractiveness	0.06	0.08	170.72	0.77	0.442
Adversity * ln(P) ww	-0.05	0.03	99.74	-1.88	*0.063*
Partner Attractiveness * ln(P) ww	0.03	0.03	104.74	0.86	0.394
ln(E) ww * Adversity * Partner Attractiveness	0.07	0.03	106.72	2.25	**0.027**
Adversity * Partner Attractiveness * ln(P) ww	0.01	0.04	108.52	0.28	0.781

A8. Oxidative stress

Isoprostane, a measure of oxidative stress, was the outcome variable in multilevel models. Analyses tested interactions between within-woman hormone levels and childhood adversity or childhood health, in separate models. In an attempt to replicate and extend previous findings (Schisterman et al., 2010), indicating that women with earlier menarche tend to have higher isoprostane levels, separate analyses also tested interactions between within-woman hormones and pubertal timing. Follow-up analyses substituted the pubertal timing composite with its components: timing of menarche and developmental timing of secondary sexual characteristics. All analyses controlled for menses and between-woman hormone levels.

Consistent with previous research (Schisterman et al., 2010), analyses found that isoprostane levels were positively associated with both within-woman and between-woman levels of estradiol. As predicted, childhood adversity was also positively associated with isoprostane levels ($\gamma = .30$, $p = .020$). Earlier pubertal timing was associated with higher isoprostane levels, as expected, though this association fell short of significant ($\gamma = –.21$, $p = .071$). No significant interactions with menses or mean hormone levels were found (p's > .3); thus, analyses presented do not include these interaction terms.

Analyses revealed a significant positive interaction between childhood adversity and progesterone levels ($\gamma = .19$, $p = .042$). Childhood adversity was positively associated with isoprostane levels during the luteal phase (when progesterone was 1 *SD* above the mean), $\gamma = .49$, $p = .002$, but not during the follicular phase (when progesterone was 1 *SD* below the mean), $\gamma = .11$, $p = .502$.

The negative interaction between pubertal timing and progesterone was marginally significant ($\gamma = -.17$, $p = .061$). Follow-up analyses revealed a significant negative interaction between progesterone and timing of menarche ($\gamma = -.21$, $p = .026$), but not developmental timing of secondary sexual characteristics ($\gamma = -.11$, $p = .226$). Pubertal timing, and timing of menarche, were significantly negatively associated with isoprostane levels when progesterone levels were high ($\gamma = -.38, -.42$; $p = .010, .006$; respectively), but not when they were low (p's > .75).

Isoprostane levels did not differ as a function of childhood health or its interactions with hormone levels (p's > .3).

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