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RESEARCH ARTICLE

A Preliminary Investigation Into Women's Sexual Risk-taking That Could Lead to Unintended Pregnancy

Sylis Claire A. Nicolas[1] · **Lisa L. M. Welling**[1]

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Abstract

A great deal of research has focused on women's attention to the physical and behavioral cues of potential romantic partners. Comparatively little work has investigated how these cues influence women's sexual risk-taking. The current study investigated the relationship between women's perceptions of various factors associated with their partner's genetic or investment quality, and women's risky sexual behaviors (i.e., behaviors that could lead to unintended pregnancy). This work also investigated the influence of estimated menstrual cycle phase using a between-subject design. Analyses failed to reveal menstrual cycle effects, but women reported a greater tendency to engage in risky sexual behaviors when they had more physically attractive partners and when they use sexual inducements as a mate retention strategy. Also, conception-risking behaviors occurred most often when the woman reported being more socially dominant and she reported being less upset by a potential pregnancy. Moreover, the self-reported likelihood that women would carry an unintended pregnancy to term with their partner was predicted by feeling less upset by a potential pregnancy, taking fewer social risks, religiosity, and by more favorable ratings of their partners' masculinity. These results are discussed in line with evolutionary theory surrounding mate choice.

Keywords Unintended pregnancy · Mate value · Risky sexual behavior · Conception-risking · Unprotected sex

Couples readily admit to having had unprotected sex (i.e., vaginal intercourse without the use of any contraception to prevent pregnancy or sexually transmitted infections) and some women report a willingness to deliberately have unprotected sex despite the risk of an unwanted pregnancy (Spohn, 2005). One study found that 23% of female respondents currently seeking pregnancy termination anticipated having unprotected sex in the next 3 months (Foster et al., 2012). Rather than contraceptive failure, it is the inconsistent use of contraception or lack of contraception at peak fertility that is responsible for most unintended pregnancies in the USA (Finer & Henshaw, 2006). Unintended pregnancy has been linked to a variety of social factors, such as a lack of sex education, a lack of access to contraceptive services/methods, and low socioeconomic status (Finer & Henshaw, 2006; Paine-Andrews et al., 1999). However, the underlying correlates of deliberately engaging in unprotected sex and exactly how couples engage in sexual behaviors that lead to unintended pregnancy remain under-studied avenues of research (see Foster et al., 2012). Several studies have found that consistent condom use is lowest among individuals in committed romantic relationships compared to individuals in non-committed relationships (e.g., Anderson, 2003; de Visser & Smith, 2001; van Empelen & Kok, 2006; Woolf & Maisto, 2008), so it is important to investigate factors that predict unprotected sex among committed couples.

Trivers' (1972) Parental Investment Theory, which has received support across hundreds of studies on humans (e.g., Feingold, 1992; Kenrick et al., 1990) and non-human animals (e.g., Trivers, 1985), posits that the sex that invests the most in its offspring will be the more discriminating sex when it comes to selecting a mate. In humans, women have a higher minimum investment in their children (e.g., gestation and lactation; Dufour & Sauther, 2002; Kaplan et al., 2000), whereas the minimum investment for men may be a single successful copulation. Accordingly, women should be more choosey than men when it comes to selecting a mate (e.g., Daly & Wilson, 1983; Schmitt, 2005; Williams, 1966). In support of Parental Investment Theory, men are

✉ Lisa L. M. Welling
welling@oakland.edu

[1] Department of Psychology, Oakland University, Rochester, MI 48309, USA

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more likely to seek and engage in casual, low-investment sexual opportunities (e.g., Clark, 1990; Clark & Hatfield, 1989), whereas women are comparatively less interested in uncommitted sexual encounters (e.g., Clark & Hatfield, 1989; Oliver & Hyde, 1993). Additionally, women value economic resources, such as income, in a long-term mate more than do men (e.g., Buss et al., 2001; Feingold, 1992; Hatfield & Sprecher, 1995; Kenrick et al., 1990), which may adaptively encourage the selection of mates who are more capable of investing in potential offspring (Gangestad & Simpson, 2000). Cues that signal that a man is capable of providing resources for, and willing to share those resources with, a female partner are preferred by women both in traditional societies (reviewed in Betzig, 1988) and in Western societies (e.g., Landolt et al., 1995; Sadalla et al., 1987). Yet, research has documented that women exhibit different preferences for long-term and short-term romantic partners (Buss & Schmitt, 1993; Schmitt & Buss, 1996).

Women seeking a long-term partner versus a short-term partner place a higher premium on indicators of resource acquisition, preferring such traits as "good financial prospects" (Buss & Schmitt, 1993). Women also express preferences for men with positive character traits, such as dependability, kindness, maturity, and trustworthiness for long-term partners, but consider these qualities to be less important for short-term partners (Li & Kenrick, 2006), although it is worth noting that both men and women prioritize honesty (Mogilski et al., 2019) and a history of sexual fidelity (Mogilski et al., 2014) when selecting either long-term or short-term partners. In contrast, for short-term relationships, women exhibit stronger preferences for good gene indicators, which are heritable traits including physical attractiveness, symmetry, masculinity (i.e., male-typical sexually dimorphic traits), muscularity, intelligence, dominance, and "confrontativeness" (e.g., Buss & Schmitt, 1993; Frederick & Haselton, 2007; Gangestad et al., 2007; Haselton & Gangestad, 2006; Haselton & Miller, 2006; Lukaszewski & Roney, 2009; Pawlowski & Jasiénska, 2005; Senior et al., 2007). These traits putatively signal genetic quality and are presumed to confer a survival advantage to offspring (e.g., Rhodes et al., 2003).

Men with certain phenotypic traits, such as bilateral symmetry (e.g., Miller & Todd, 1998; Waynforth, 1998) and masculinity (Foo et al., 2020; Rhodes et al., 2003), may possess superior immunity to infectious diseases that may be passed on to potential offspring (see also Gangestad & Cousins, 2001). Bilateral symmetry is a supposed indicator of developmental stability (Møller, 1997; Møller & Pomiankowski, 1993; Parsons, 1992), whereas male masculinity is associated with long-term health and immunocompetence (Foo et al., 2020; Rhodes et al., 2003) and is believed to be indicative of superior genetic quality (reviewed in Fink & Penton-Voak, 2002; Gangestad & Simpson, 2000). These cues are considered sexually attractive by women, and men exhibiting these cues tend to have more success in various aspects of reproduction. Men possessing these traits have had a greater number of sexual partners (e.g., Apicella et al., 2007; Mueller & Mazur, 2001; Rhodes et al., 2005; Weeden & Sabini, 2007), father more offspring (Waynforth, 1998), and have higher semen quality (Soler et al., 2003; but see Peters et al., 2008), which may predict fertilization success (Barratt et al., 1993; Youn et al., 2011).

In addition to reporting higher preferences for putative cues to immunocompetence in a mate when seeking short-term relationships (e.g., Schmitt, 2005), some evidence suggests that women increase their preferences for these men in late-follicular (i.e., fertile) phase of the menstrual cycle (e.g., Gangestad et al., 2007; Jones et al., 2005; Penton-Voak et al., 1999; Welling et al., 2007; reviewed in Welling & Burriss, 2019; but see Jones et al., 2018), with women reporting stronger preferences for men with masculine (Feinberg et al., 2006; Gangestad et al., 2007; Johnston et al., 2001; Jones et al., 2005; Little et al., 2007; Penton-Voak & Perrett, 2000; Penton-Voak et al., 1999; Puts, 2006; Welling et al., 2007) and symmetrical (Little et al., 2007; see also Gangestad & Thornhill, 1998; Rikowski & Grammer, 1999; Thornhill et al., 2003) traits, and stronger attraction to displays of dominance (Gangestad et al., 2004, 2007; Lukaszewski & Roney, 2009) near ovulation compared to other times. This shift in preferences may reflect a "mixed mating" strategy (see Gangestad & Thornhill, 2008; Penton-Voak et al., 1999), whereby women with lower quality primary partners may selectively engage in extra-pair copulations with men of higher genetic quality near peak fertility to secure superior genes for their children (Buss, 2003; Gangestad et al., 2000, 2007; Smith, 1984; Symons, 1979). Indeed, women prefer physical attractiveness over other qualities in an extra-pair partner (Scheib, 2001) and report stronger attraction to extra-pair men (e.g., Gangestad et al., 2002, 2010a; Pillsworth et al., 2004) and lower commitment to their primary partners (Jones et al., 2005) at peak fertility. However, these effects may be contingent on their primary partner's quality; women mated to relatively asymmetrical (Gangestad et al., 2005), feminine (Gangestad et al., 2010b), unattractive (Haselton & Gangestad, 2006; Larson et al., 2012; Pillsworth & Haselton, 2006), or genetically incompatible (Garver-Apgar et al., 2006) men displayed more attraction to extra-pair partners at peak fertility, whereas those mated to comparatively symmetrical, masculine, attractive, or genetically compatible men reported more attraction to their primary partners. Similarly, others have found that women who had more sexually desirable partners felt closer to their partner and more satisfied with their relationship during the fertile phase of their cycles, whereas fertile women whose partners were less desirable

felt less close to their partners and were more critical of their partners' faults (Larson et al., 2013).

Women may also experience shifts related to sexual interest/motivation and behavior at peak fertility. For example, women in the fertile phase display heightened physiological arousal to sexually explicit stimuli (Slob et al., 1996; Zillmann et al., 1995) and have more positive feelings toward depictions of nude males as measured both by self-report and neuroimaging data (Krug et al., 1994, 2000). Women's self-reported sexual desire (Cavanagh, 1969; Dennerstein et al., 1994; Pillsworth et al., 2004; Röder et al., 2009; Stanislaw & Rice, 1988; Van Goozen et al., 1997; but see Meuwissen & Over, 1992) and initiation of sexual activity (Adams et al., 1978; Bullivant et al., 2004; Roney & Simmons, 2013; see also Grebe et al., 2013) peaks at or just subsequent to ovulation. Even lesbian women are more likely to engage in and initiate sexual activity during the fertile phase of their cycles, signifying that peaks in sexual behavior and motivation around the time of ovulation are independent of both intentions to become pregnant and male advancement (Matteo & Rissman, 1984; also see Brown et al., 2011). Together these findings provide evidence that women are more sexually motivated and active when conception is more likely, and it is likely that this relationship is contingent on the fitness indicators (i.e., putative cues to immunocompetence) of women's partners.

Risky Sexual Behaviors

Risky sexual behavior is relatively common; one study found that approximately a third of prior pregnancies resulted from women simply forgetting to use a method of birth control (Eisenman, 2003). Although it is unclear how many of these women were truly desirous of becoming pregnant, it is possible that unconscious mechanisms facilitate conception-risking behaviors. For example, women may be more willing to engage in risky sexual behaviors with partners of higher quality. Certainly, greater perceived partner attractiveness is related to increased risky sexual behavior among men (e.g., Kelaher et al., 1994; Kruse & Fromme, 2005), which may increase women's willingness to engage in risky sexual behavior (e.g., Agocha & Cooper, 1999; Hennessy et al., 2007; Lennon & Kenny, 2013). Similarly, women report more willingness to have unprotected sex with physically attractive men (Lennon & Kenny, 2013). Women's testosterone levels rise in response to attractive men (López et al., 2009), which, given the positive association between testosterone and sexual motivation (Bancroft et al., 1991; Sherwin et al., 1985) as well as risk-taking (Sapienza et al., 2009; Stanton et al., 2011), may suggest that women with attractive partners are at increased risk for an unintended pregnancy. When directly asked about their risky sexual behaviors and their willingness to risk a pregnancy with partners displaying various characteristics outlined by Buss (1989), women reported having risked pregnancy with partners in the past who displayed the traits of commitment and physical attractiveness, and they expressed a strong willingness to risk pregnancy with partners with good financial prospects and moderate-to-high social status (Spohn, 2005). However, the directness of this question creates a demand characteristic, and, consequently, women may have altered their responses. The current study accounts for this confound.

The present study was designed to provide a preliminary investigation into factors that predict sexual behaviors that could lead to unintended pregnancies among committed, romantic couples. In this study, the terms "sexual risk-taking" or "risky sexual behavior" refer to sexual behaviors that could specifically lead to conception or a sexually transmitted infection (STI). For example, such behaviors could include vaginal intercourse without a condom, or vulvar exposure to semen without a method of contraception. Our main hypothesis was that, because women are more likely to report willingness to engage in unprotected sex with attractive men (Lennon & Kenny, 2013), partner quality would predict sexual risk-taking at last sexual encounter, particularly sexual risk-taking that could lead to conception. However, we also collected information on menstrual cycle phase so that we could conduct exploratory analyses investigating the influence of estimated cycle phase, conception risk values, and estimated hormones on risky sexual behaviors, although we note that the low sample size in the current study (see Gangestad et al., 2016) necessitates caution in interpreting these results. Given that women's sexual motivation increases near ovulation (Bloch et al., 1998; Cavanagh, 1969; Dennerstein et al., 1994; Pillsworth et al., 2004; Röder et al., 2009; Stanislaw & Rice, 1988; Van Goozen et al., 1997) and condom use is frequently cited by both sexes as being negatively associated with pleasure, arousal (Crosby et al., 2013; Higgins et al., 2009; Randolph et al., 2007), and orgasm (Crosby et al., 2008), we predicted that women tested near the fertile phase of their menstrual cycles would report engaging in more risky sexual behavior compared to women tested outside of the fertile window. Likewise, we predicted that women will be more likely to initiate a sexual encounter with their partners at or around ovulation than during non-fertile phases of the menstrual cycle, and that menstrual cycle effects would interact with indices of partner quality. Specifically, women who are in the fertile phase of their cycle will be more likely to initiate sex and engage in sexually risky behaviors with their partners *only* if they report that their partners possess cues to high genetic or investment quality.

Methods

Participants

In order to assess sexual risk-taking among women in committed, long-term relationships who were at risk of pregnancy, participants were only considered eligible if they had been in a heterosexual, sexual relationship for at least 3 months. To increase the likelihood that participants were capable of becoming pregnant, women were only considered eligible if they were between the ages of 18–35 years old, were naturally cycling (i.e., not currently using any kind of hormonal supplement, such as hormonal contraceptives or hormone replacement therapy), and had not used hormonal contraceptives or supplements in at least 3 months. Participants' romantic partners could not have had a vasectomy, be using a treatment for infertility, or using hormonal supplements. Because women's fertility was one of the variables assessed in this study, participants who were currently pregnant or breast-feeding were also excluded, as lactation and pregnancy hinder ovulation (for a review, see Ellison, 2009), and those who had given birth to a child within the previous 9 months were also excluded to increase the likelihood that participants who were recently pregnant had resumed natural cycles. Finally, women who were actively trying to become pregnant by their partners were considered ineligible so as to solely assess behaviors that could result in unintended or mistimed pregnancies. These exclusion criteria increased the likelihood that couples were all reproductively capable.

Participants ($N = 301$) were recruited either from the subject pool at Oakland University in Rochester, Michigan, in return for course credit, or from the online community through various social media and websites, such as Facebook. Participants from the general community did not receive compensation for participating. To increase the likelihood that participants were all regularly cycling, women with self-reported average cycle lengths of less than 21 days and greater than 35 days were excluded from analyses ($N = 57$). Women who rated their cycle regularity or indicated their confidence in the accuracy of their reported menstrual dates were less than a "5" on a 9-point Likert scale (anchors: 1 = not at all regular/certain, 9 = completely regular/certain) were excluded ($N = 26$). Although it was stated that only women who had sexual intercourse with their partners at least once in the previous week were eligible, 14 women nevertheless reported having had their last intercourse more than a week prior to their participation and were thus excluded from analyses because of concerns over their ability to accurately recall their behaviors at their last copulation. Therefore, 204 were deemed eligible for analyses after these exclusions (age: $M = 20.66$ years, $SD = 3.82$). All participants reported having a male partner, most reported being primarily attracted to the opposite sex (94.1%; 5.4% reported being equally attracted to both sexes, and 5% reported being unsure), and most (71.6%) reported being in a committed relationship but were not cohabitating with their romantic partners (23.5% were in a committed relationship and cohabitating, and 4.9% reported being married). The mean average relationship length in this sample was 25.24 months ($SD = 23.20$), or approximately 2 years. The majority of the sample was Caucasian (84.3%), with 7.4% African American, 3.9% Hispanic, 3.4% Asian, 1.5% Indian, 0.5% Native Hawaiian or Pacific Islander, 0.5% American Indian or Native Alaskan, and 3.9% reported belonging to an unlisted ethnicity. All procedures detailed below were approved by the Oakland University Institutional Review Board prior to testing. On behalf of all authors, the corresponding author states that there is no conflict of interest.

Procedures

A between-subjects non-experimental design was used where participants provided responses to questions via Qualtrics, an online survey distribution platform. After providing informed consent, participants were directed to a series of questionnaires, the first of which verified that they met the listed inclusion criteria (i.e., that they were female, currently in a sexual relationship with a man that had lasted at least 3 months, that they were between 18 and 35 years old, and that neither they nor their partner had used hormonal supplements or contraceptives in the last 3 months). Participants who did not verify that they met these inclusion criteria were directed out of the survey and thanked for their time. Their data were not saved.

Next, participants completed demographic measures, including age, their partner's age, ethnicity, relationship status (e.g., married, dating), relationship length, sexual orientation, and the sex of their romantic partner. After completing the demographic measures, participants reported information on their sex lives, menstrual cycles, sexual risk-taking, relationship satisfaction, and partner quality, as well as questionnaires related to the potential confounds of religiosity, attitudes toward pregnancy, mate retention behaviors, contraceptive self-efficacy, sociosexual orientation, general risk-taking, and sensation-seeking. These questionnaires were completed in a random order. With the exception of the Sociosexual Orientation Inventory-Revised (SOI-R; Penke & Asendorpf, 2008), questionnaires that asked about thoughts, feelings, and/or behaviors over time were modified to ask about the previous week only in order to better capture the participants' state during the time frame in which they last copulated with their partners. Thus, before

each questionnaire, the instructions provided to participants stated: "Please indicate the extent to which each of the following statements applies to your feelings over the past week."

Materials

Menstrual Cycle Questionnaire and Sex-related Questions Participants were asked 3 questions about their recent sexual experience with their partner, including how many times participants and their partners have sex on average every week ($M = 2.70$, $SD = 1.83$), the date and time of last sexual intercourse, and who initiated intercourse on this occasion. To estimate participants' fertility status at their last copulation, participants were asked to complete a brief menstrual cycle questionnaire. This survey requested that participants provide estimates of their average menstrual cycle length, the date of their last period, the date of the period before their last period, the estimated date of their next period, and accuracy ratings for each of these estimates (anchors: 1 = not accurate, 9 = completely accurate).

To estimate participants' menstrual cycle length, a weighted average (weighted by participants' reported certainty) of three cycle lengths was intended; however, an error in the online survey yielded participant responses to only two cycle lengths. An average of these two cycle lengths was taken: the length of their current cycle based on the number of days between their last recalled date of menstrual onset and the predicted date of their next menstrual onset, and their estimated average cycle length. Using this averaged menstrual cycle length, the point in each participant's menstrual cycle at last copulation relative to their predicted date of ovulation was calculated using the backward-counting method (e.g., Feinberg et al., 2006; Gangestad et al., 2004, 2016; Welling & Burriss, 2019). It was predicted that ovulation would occur 15 days prior to participants' next predicted menstrual onset (Dixon et al., 1980; Wilcox et al., 2000).

Sexual Risk-taking To measure the primary dependent variable of risky sexual behavior, an adapted version of Turchik and Garske's (2009) 23-item Sexual Risk Survey (SRS) was presented to participants. This reliable, psychometrically sound, and validated measure ($\alpha = 0.90$; Turchik & Garske, 2009) assesses the frequency of sexual behaviors that could lead to unintended pregnancy or that could result in a sexually transmitted infection (STI).[1] A glossary of terms was included for participants to use if they were unfamiliar with certain sexual terminology (e.g., vaginal sex). Three additional questions were added to further assess risky sexual behaviors at their last sexual encounter that were not captured by the SRS: (1) whether they used outdated/improperly stored condoms or birth control (e.g., expired condoms or spermicide left in a hot car), (2) whether they used less safe birth control methods such as estimating fertility or using the pull-out method, and (3) whether they had ejaculate around the vagina without a method of birth control such as spermicide.

Fifteen items were removed from the original SRS because they implied previous partners (e.g., "How many times have you 'hooked up' but not had sex with someone you didn't know or didn't know well?"), whereas the focus of this study was risky sexual behaviors with a person's primary partner. Participants responded "yes" to the items that applied to their last sexual encounter, and general sexual risk-taking was defined as the total number of "yes" responses out of the 8 items from the SRS and the 3 additional items outlined above. Scores were positively skewed ($M = 3.01$, $SD = 2.08$) and were log-transformed prior to analyses ($M = 0.54$, $SD = 0.25$). We also calculated a composite summed score of the 4 items of the SRS that encompass sexual behaviors that could lead to conception ($M = 1.22$, $SD = 1.22$), which were log-transformed ($M = 0.28$, $SD = 0.25$). Those conception-risk items included the following: "Did you have ejaculate around your vagina without a birth control method (such as spermicide)?", "Did you engage in vaginal sexual intercourse using a less safe birth control method, such as estimating fertility based on your period or using the pull-out method?", "Did you have vaginal intercourse without a condom?", and "Did you use any measures to protect yourself against pregnancy?" (reverse scored). Higher scores on both of the sexual risk-taking variables, which will hereafter be referred to as "general sexual risk-taking" and "conception risk-taking", respectively, indicate greater sexual risk-taking of each type.

Although the original version of the SRS asks participants to report on sexual behaviors that they engaged in within the past 6 months, here participants were instructed to answer all items relative to whether they engaged in them during their most recent copulation with their partner—the date and time of which they reported earlier in the survey. In order to assess their behaviors more generally, participants were also asked to report on the occurrence of those same sexual behaviors a second time, relative to whether they engaged in them in the previous 3 months. These latter sexual risk-taking items still referred to the participant's current relationship and were included because of the possibility that sexual risk-taking at the last sexual encounter may not reflect levels of sexual risk-taking that are typical for the

[1] It is worth noting that general risky sexual behaviors are relevant among both single and partnered individuals because even those in monogamous relationships can receive a STI from their partner (e.g., if their partner is unfaithful, uses certain drugs, was unknowingly infected by a previous partner, etc.).

participant due to, for example, unusual circumstances (e.g., use of alcohol or a recent pregnancy scare). Collecting general sexual risk-taking allows us to compare the participants' risk-taking at their last sexual encounter with what is typical for them over time.

Partner Mate Quality To measure perceptions of their partners' mate quality, participants were asked to fill out the mate value discrepancy scale (Kugeares, 2002), which was adapted by Sidelinger and Booth-Butterfield (2007) to measure perceptions of one's own attractiveness, social status, financial prospects, the degree to which one is fun or interesting, one's desirability for a long-term relationship, and one's overall desirability, relative to his or her partner. This scale has been found to have good internal consistency ($\alpha = 0.78$ for partner ratings and $\alpha = 0.89$ for self-ratings; Sidelinger & Booth-Butterfield, 2007). We also added items for participants to rate their partners and themselves on perceived social dominance, physical dominance, attractiveness, and masculinity/femininity. These items were added because the mate value discrepancy scale (Sidelinger & Booth-Butterfield, 2007) did not contain questions that reflect other indicators of putative genetic quality, such as dominance (e.g., Gangestad et al., 2004) and masculinity (e.g., Foo et al., 2020; Rhodes et al., 2003). All items were answered on a 9-point Likert scale (anchors: 1 = not at all, 5 = average, 9 = extremely), with 7 items reflecting ratings of the woman's partner and another 7 items reflecting identical questions except the woman was rating herself on the same attributes. To calculate overall mate value discrepancy, the sum of items that represent one's partner's mate value were subtracted from the sum of items representing one's own mate value. Negative scores indicate that one's partner has higher perceived mate value relative to oneself and positive numbers indicate that the participant believes she possesses higher mate value relative to her partner ($M = -4.02$, $SD = 7.25$).

Relationship Satisfaction Relationship satisfaction was measured using the Relationship Assessment Scale (Hendrick, 1988). This reliable ($\alpha = 0.83$) and valid scale consists of 7 questions (e.g., "To what extent has your relationship met your original expectations") where all items are rated on a 5-point scale that ranges from low to high satisfaction (anchor labels varied depending on the question). Items were summed and divided by 7 to yield a mean score. Participants' scores were negatively skewed ($M = 4.15$, $SD = 0.75$) and log-transformed ($M = 0.61$, $SD = 0.10$) prior to analyses. Higher scores represent greater relationship satisfaction.

Religiosity Having a religious affiliation is negatively associated with using condoms (Sheeran et al., 1999), and thus religiosity was believed to represent a possible confound. Participants were asked to report 1) what religion they affiliate with and 2) how religious they felt over the past week on a 10-point Likert scale (anchors: 1 = not at all religious, 10 = devout). Higher scores are indicative of stronger religiosity ($M = 3.78$, $SD = 2.61$).

Pregnancy Attitudes Attitudes about pregnancy were suspected to represent another potential confound because women's feelings of ambivalence about pregnancy have been found to predict inconsistent or lower use of contraception (Bruckner et al, 2004; Frost et al., 2007; Higgins et al., 2012; Jaccard et al., 2003; Schwarz et al., 2007; Zabin, 1999). Participants were asked: "How upset would you be if you found out that you were pregnant by your current romantic partner" (anchors: 1 = not at all upset, 7 = extremely upset; $M = 4.81$, $SD = 1.94$) and "If you found out you were pregnant by your current partner, how likely would you be to continue your pregnancy to term?" (anchors: 1 = not likely, 7 = extremely likely; $M = 5.01$, $SD = 2.34$).

Mate Retention Participants were asked to complete the Mate Retention Inventory-Short Form (MRI-SF; Buss et al., 2008), which was used to examine the degree to which women and their partners dedicate effort to retaining romantic partners (i.e., engage in behaviors that attempt to prevent a mate from straying or being poached). This instrument has been found to be both reliable ($\alpha = 0.89$) and valid (Buss et al., 2008) and is comprised of 38 items scored on a 4-point Likert scale (anchors: 0 = never performed this act, 3 = often performed this act) that assess 19 mate retention tactics (e.g., vigilance, concealment of mate). Participants completed this measure twice: once where they reported on their own use of mate retention tactics ($M = 33.15$, $SD = 16.41$) and once where they reported on their partner's use of mate retention tactics ($M = 33.26$, $SD = 15.34$). The items were summed to form an overall score, with higher scores indicating greater frequency of mate retention behaviors. The MRI-SF was also included because of a particular tactic it assesses: sexual inducements. This tactic measures how often an individual uses his or her sexuality as a form of mate retention and is formed by combining scores on two items asking participants to rate how often he or she engages in the following acts: "Performed sexual favors to keep my partner around" and "Had a physical relationship with my partner to deepen our bond." Higher scores on this variable are indicative of greater use of sexual inducements over the previous week ($M = 2.10$, $SD = 1.52$).

Contraceptive Self-efficacy Because ratings of self-efficacy in condom and contraceptive use are significantly related to safer sex behaviors (O'Leary et al., 2008), self-efficacy was measured using the Contraceptive Self-Efficacy Instrument (Levinson, 1986; $\alpha = 0.73$). Participants were asked

Table 1 Factor loadings and communalities based on a principal components analysis with Oblimin rotation for 11 items, including partner ratings and items from the mate value discrepancy scale ($N = 199$)

	Physical attractiveness	Dominance	Long-term desirability	Communalities
Relative to his peers, how attractive is your partner?	0.792			0.706
How physically attractive is this person to other people your age?	0.761			0.666
How physically attractive is this person to you?	0.733			0.742
Relative to his peers, how physically dominant is your partner?		0.850		0.729
Relative to his peers, how socially dominant is your partner?		0.837		0.698
Relative to his peers, how masculine is your partner?		0.696		0.645
How would you rate this person's social status?		0.609		0.676
How desirable is this person for a long-term committed relationship or marriage?			0.805	0.733
How desirable do you find this person overall?			0.772	0.782
How fun or interesting does this person seem?			0.645	0.610
How would you rate this person's financial prospects?			0.606	0.510

to rate how strongly they identify with each of the 15 items (anchors: 1 = not at all true of me, 5 = completely true of me) assessing contraceptive self-efficacy (e.g., "If my boyfriend and I are getting 'turned on' sexually and I don't really want to have sexual intercourse (go all the way, get down), I can easily stop things so that we don't have intercourse"). Higher scores represent greater contraceptive self-efficacy ($M = 58.15$, $SD = 6.92$).

Sociosexual Orientation Participants were asked to fill out of the revised Sociosexual Orientation Inventory (SOI-R), a validated and reliable ($\alpha = 0.85$) instrument that measures an individual's propensities toward unrestricted sexual relationships (i.e., promiscuity; Penke & Asendorpf, 2008). This measure was included because a more unrestricted sociosexual orientation has been positively associated with engaging in risky sexual behaviors (Seal & Agostinelli, 1994; Yeater et al., 2009). The SOI-R also includes three subscales formed by averaging particular items to yield 1) the Desire facet, which assesses individuals' sexual fantasies; 2) the Behavior facet, which measures sexual behaviors; and 3) the Attitude facet, which measures unrestricted attitudes about casual sex. All items were averaged together to yield global sociosexual orientation scores ($M = 19.34$, $SD = 4.58$). Higher scores on any of the facets of the SOI-R or the global SOI-R score are indicative of less restricted attitudes ($M = 8.13$, $SD = 1.89$), behaviors ($M = 5.50$, $SD = 2.20$), and desires ($M = 5.75$, $SD = 2.30$).

Domain-specific Risk-taking In order to test the specificity of sexual risk-taking, participants were given the revised 30-item Domain-Specific Risk-Taking scale (DOSPERT; Blais & Weber, 2006). The DOSPERT scale is comprised of 5 risk-taking domains, including social ($\alpha = 0.75$; $M = 27.39$, $SD = 5.65$), recreational ($\alpha = 0.83$; $M = 21.63$, $SD = 8.55$), financial ($\alpha = 0.71$; $M = 13.14$, $SD = 5.70$), health and safety ($\alpha = 0.86$; $M = 19.31$, $SD = 6.80$), and ethical risk-taking ($\alpha = 0.79$; $M = 11.91$, $SD = 5.06$). Participants rated the likelihood that they would engage in each of the risk-taking items on a 7-point Likert scale (anchors: 1 = extremely unlikely, 7 = extremely likely). Items from each domain were summed and higher scores indicated greater risk-taking in that domain.

Sensation-seeking Because sensation-seeking (i.e., thrill and adventure seeking) is positively related to risky sexual behavior (Hoyle et al., 2000; Vélez-Blasini, 2008), participants were administered the Impulsive Sensation-Seeking Scale (IMPSS, Zuckerman et al., 1993). This 19-item scale ($\alpha = 0.86$) asks participants to agree or disagree with statements such as, "I sometimes like to do things that are a little frightening" and "I'll try anything once". True statements were ascribed a value of 1 and items were summed to yield a total sensation-seeking score, with the maximum possible score being 19 ($M = 8.30$, $SD = 4.71$).

Results

Initial Processing of Data

All tests outlined below are two-tailed unless otherwise indicated. First, a principal components analysis was used to identify dimensions of mate quality using participants' ratings of their partners. The Kaiser–Meyer–Olkin measure of sampling adequacy was 0.79 and Bartlett's test of sphericity was significant ($\chi 2(55) = 1182.18$, $p < 0.001$). All communalities were above 0.5 (see Table 1), confirming that items shared common variance. The 11 items entered into this analysis included participant ratings of their partners'

social dominance, physical dominance, attractiveness, masculinity/femininity, and ratings on items from the mate value discrepancy scale (Sidelinger & Booth-Butterfield, 2007). Using an Oblimin rotation, three factors with an eigenvalue above 1 emerged from this analysis, explaining 39.30%, 17.27%, and 11.59% of the variance, respectively. These 3 factors were extracted. All primary factor loadings were above 0.35 and all 11 items were retained in the principal components analysis.

Factor 1 (3 items) appeared to capture aspects of a partner's mate quality related to physical attractiveness. Factor 2 (4 items) described partners' physical and social dominance, whereas Factor 3 (4 items) contained items relating to a partner's long-term mate quality. Specifically, Factor 3 was comprised of items that depicted a partner with high long-term and overall desirability, a fun and interesting disposition, and excellent financial prospects. These constructs were deemed sensible for analyses, as they collapsed across distinctive dimensions that were theorized to differ. Factor 1 (hereafter referred to as "Physical Attractiveness") and Factor 2 (hereafter referred to as "Dominance") were considered in analyses to capture putative genetic quality (i.e., "good gene indicators"). Factor 3 (hereafter referred to as "Long-term Desirability") was *not* predicted to interact with menstrual cycle phase to predict women's risky sexual behaviors because women's preferences or attraction to men or male stimuli for long-term relationships (i.e., investment indicators) have not been shown to vary across the menstrual cycle (Gangestad et al., 2007; Gildersleeve et al., 2014; Lukaszewski & Roney, 2009).

Calculating Cycle Phase

Participants' fertility status at their reported last copulation was calculated relative to ovulation. To maximize the between-subject differences based on women's cycle phases, participants were split into three phases based on the date of their reported last copulation: the early follicular phase, the fertile phase, and the luteal phase. These points in the menstrual cycle were chosen to reduce the variance among participants and because hormonal profiles differ predictably in each of these three phases (e.g., Bakos et al., 1994; Harlow & Ephross, 1995; Lenton et al., 1984). The fertile phase was counted as days -6 through + 1 relative to ovulation (i.e., 6 days prior to ovulation and up to 1 day after; see Jochle, 1973; Wilcox et al., 1995). The luteal phase was counted as 2 days after participants' estimated date of ovulation until next menses, and the early follicular phase was deemed to take place up to 5 days after menstrual onset. With these divisions, 50 women were predicted to be in the early follicular phase at the time of their last copulation, whereas 62 were in the fertile phase, and 92 were estimated to be in the luteal phase. In some additional exploratory analyses, conception risk estimates were used to assess women's fertility. Conception risk estimates ($M = 0.05$, $SD = 0.09$) represent a continuous variable for cycle phase where a higher conception risk value indicates a greater risk that a woman may conceive during that day of her cycle. These estimates were calculated by taking the weighted average (weighted by sample size) of three frequently cited conception risk estimates (Colombo & Masarotto, 2000; Schwartz et al., 1980; Wilcox et al., 1998).

Risky Sexual Behaviors

Unsurprisingly, general risky sexual behaviors were positively correlated with conception-risking behaviors ($r = 0.77$, $p < 0.001$). Two one-way ANOVAs were run to examine women's risky sexual behaviors across the menstrual cycle. The first ANOVA included the between-subject factors of cycle phase (i.e., early follicular phase, fertile phase, and luteal phase) and participants' general sexual risk-taking scores. No significant difference in general sexual risk-taking was found across the menstrual cycle, $F(2, 178) = 0.12$, $p = 0.83$. A second one-way ANOVA was run using the between-subjects factor of cycle phase and the conception risk-taking variable. Women were not shown to engage in riskier sexual behaviors that could put them at the risk of an unintended pregnancy during any of the phases of the menstrual cycle, $F(2, 194) = 0.14$, $p = 0.86$.

Next, to test the hypothesis that women would engage in riskier sexual behaviors during the fertile phase of their menstrual cycles if their partners had higher putative genetic quality (i.e., Factors 1 and 2: Physical attractiveness and dominance), several independent-measures ANCOVAs were run. Each factor was entered one at a time in the model to test for significance. Other covariates were selected based on their significant, one-tailed correlations with each of the two sexual risk variables. Specifically, the following variables were entered individually as covariates into the model because they correlated highly with general sexual risk-taking: participants' self-rated attractiveness ($r = 0.15$, $p = 0.03$), participants' use of sexual inducements mate retention tactics ($r = 0.24$, $p < 0.001$), the health and safety DOSPERT subscale ($r = 0.34$, $p < 0.001$), the ethical DOSPERT subscale ($r = 0.33$, $p = 0.002$), participants' sensation-seeking scores ($r = 0.32$, $p < 0.001$), participants' global scores on the SOI-R ($r = 0.12$, $p = 0.004$), and the estimate of how often participants have sex with their partners each week ($r = 0.21$, $p < 0.001$). Each of the mate quality factors were also entered individually. Partner physical attractiveness was the only factor correlated with risky sexual behaviors ($r = 0.21$, $p = 0.009$; two-tailed), such that women with more physically attractive partners engaged in more general risky sexual behaviors with them. There were no significant differences in women's risky sexual behaviors across cycle phases when entering each of these covariates into the model and no interactions, (all $F < 2.42$. all $p > 0.09$).

A second series of similar ANCOVAs were conducted using the dependent variable comprised of the 4 conception-risking items. The following variables correlated significantly with conception-risking behaviors and were selected as covariates for each of the ANCOVAs: participants' scores on the MRI-SF about their partners' mate retention behaviors ($r = 0.17$, $p = 0.01$), participants' use of sexual inducements as a mate retention tactic ($r = 0.16$, $p = 0.01$), ratings of their partners' social dominance ($r = 0.18$, $p = 0.006$), self-rated attractiveness ($r = 0.22$, $p = 0.001$), self-rated social dominance ($r = 0.18$, $p = 0.006$), self-rated femininity ($r = 0.17$, $p = 0.009$), total mate value discrepancy ($r = 0.12$, $p = 0.04$), global scores on the SOI-R ($r = 0.12$, $p = 0.05$), the SOI-R behavior subscale ($r = 0.20$, $p = 0.002$), the DOSPERT health and safety subscale ($r = 0.29$, $p < 0.001$), contraceptive self-efficacy scores ($r = -0.14$, $p = 0.02$), and an item measuring how upset participants would be if they found out they were currently pregnant by their partner ($r = -0.18$, $p = 0.007$). Each of the mate quality factors was also entered individually. Partner dominance was positively correlated to conception-risking behaviors ($r = 0.14$, $p = 0.04$; two-tailed). The ANCOVAs with the covariates included above yielded no cycle phase effects and no interactions, (all $F < 1.68$, all $p > 0.19$). Reducing the sample to increase the validity of cycle esimates (e.g., by restricting it to those with more average cycle lengths) did not impact the findings in any of these analyses.

Additional Analyses

Additional analyses were to clarify which variables best predicted the two types of sexual risk-taking and investigate whether estimates of underlying hormones influence dependent variables. Additional analyses were also conducted to test whether women's sexual risk-taking at their last copulation was predictive of their sexual risk-taking more generally (i.e., over the past 3 months), and, finally, to investigate the best predictors of women's rated likelihood that they would carry an unintended pregnancy to term.

Multiple regressions were conducted to examine how conception risk estimates and hormone estimates might predict sexual risk-taking with other variables of interest. Estimates of estrogen, progesterone, and testosterone were added into these models because women's hormones fluctuate with relative predictability across the menstrual cycle. Progesterone levels are highest in the luteal phase, roughly one week after a woman ovulates (Hatcher & Namnoum, 2004) and lowest at ovulation when the probability of conception is most likely (Wilcox et al., 2001). In contrast, testosterone (Bloch et al., 1998) and estrogen levels (Adams et al., 1978; Judd & Yen, 1973; Stanislaw & Rice, 1988) peak at or just prior to ovulation. Serum progesterone and estrogen estimates for days of the menstrual cycle were derived from Puts (2006), and testosterone estimates were calculated using an average of Judd and Yen's (1973) serum testosterone levels for each of their 6 participants for every day of the menstrual cycle. To increase the reliability of hormonal status estimates, and because testosterone estimates were only provided for 28 days of the menstrual cycle, testosterone estimates were used for only those women whose cycles were more average in length (i.e., between 26 and 32 days, inclusive). Bonferroni corrections were not used given the exploratory nature of these analyses.

First, a multiple regression was conducted to predict women's general sexual risk-taking at their last copulation. Other predictors entered into the model were chosen based on their strong, one-tailed linear associations and theoretical significance with the dependent variable. They included: ratings of partner physical attractiveness ($r = 0.21$, $p = 0.005$), scores on the DOSPERT health and safety subscale ($r = 0.34$, $p < 0.001$), participants' global SOI-R scores ($r = 0.12$, $p = 0.004$), participants' self-rated attractiveness ($r = 0.15$, $p = 0.03$), and participants' use of sexual inducements as a mate retention strategy ($r = 0.24$, $p < 0.001$), which was included in this model to control for their use of sexual behavior as a mate retention tactic. Hormone estimates were also included in this model, but because entering conception risk estimates increased its VIF considerably (8.54), this variable was removed. Overall, the model significantly predicted general sexual risk-taking, $F(8, 112) = 7.742$, $R^2 = 0.224$, $p < 0.001$, $f^2 = 0.229$, accounting for approximately 22.4% of the total variance. Participants who engaged in more general sexual risk-taking behaviors ($M = 0.54$, $SD = 0.24$) scored higher on the health and safety DOSPERT subscale ($M = 19.70$, $SD = 7.08$), $\beta = 0.26$, $t = 3.28$, $p < 0.001$, rated their partners more favorably on the factor of physical attractiveness ($M = 0.0007$, $SD = 1.02$), $\beta = 0.231$, $t = 2.89$, $p = 0.005$, and engaged in more sexual inducement mate retention tactics ($M = 2.32$, $SD = 2.82$), $\beta = 0.25$, $t = 3.27$, $p = 0.001$. Scores on the global measure of sociosexuality, participants' self-rated attractiveness, and hormone estimates did not predict engaging in more general risky sexual behaviors (all $p > 0.38$).

A second multiple regression was conducted to evaluate which variables predict women's risky sexual behaviors that could specifically lead to conception. Variables chosen to enter into the model included: the factor of dominance ($r = 0.14$, $p = 0.04$), the DOSPERT health and safety subscale ($r = 0.29$, $p < 0.001$), participants' scores on an item intended to measure how upset they would be if they found out they were currently pregnant by their partner ($r = -0.18$, $p = 0.007$), participants' self-rated social dominance ($r = 0.18$, $p = 0.006$), contraceptive self-efficacy ($r = -0.14$, $p = 0.02$), global scores on the SOI-R ($r = 0.12$, $p = 0.05$), and participants' use of sexual inducements as a mate retention tactic ($r = 0.16$, $p = 0.01$). These

factors and all hormone estimates (i.e., estrogen, progesterone, and testosterone) were entered into the model simultaneously. The overall model predicted a significant proportion of the variance, $F(10, 111) = 4.45$, $R^2 = 0.294$, $p < 0.001$, $f^2 = 0.416$. Engaging in more conception-risking sexual behaviors ($M = 0.29$, $SD = 0.25$) was related to being more socially dominant ($M = 4.80$, $SD = 1.44$), $\beta = 0.28$, $t = 3.008$, $p = 0.003$, and a lower rating on how upset participants would be if they found out they were pregnant by their partner ($M = 4.85$, $SD = 2.00$), $\beta = -0.286$, $t = -3.371$, $p = 0.001$. Participants' ratings of their partner's dominance approached but fell short of significance, $\beta = 0.16$, $t = 1.7418$, $p = 0.085$. Health and safety risk-taking, contraceptive self-efficacy, women's use of sexual inducements as mate retention, sociosexual orientation, and the hormone estimates did not predict engaging in risky sexual behaviors that could lead to an unintended pregnancy, all $p > 0.17$.

To determine whether women's sexual risk-taking at their last copulation was predictive of their propensity for sexual risk-taking more generally, two-tailed correlational analyses were run. It was found that women's general sexual risk-taking behaviors at their last copulation were strongly related to engaging in more risky sexual behaviors over the past 3 months, $r(172) = 0.73$, $p < 0.001$. In addition, women's conception-risking behaviors at last copulation were also significantly associated with engaging in more conception-risking behaviors over the past 3 months, $r(188) = 0.78$, $p < 0.001$.

Finally, a multiple regression examined how likely women reported they would be to carry an unintended pregnancy to term with their current romantic partner, as measured by a 9-point Likert scale (anchors: 1 = not likely, 9 = extremely likely, $M = 5.22$, $SD = 2.17$). Factors entered into the model were based on their one-tailed correlations with this variable, and included scores on the DOSPERT social subscale ($r = -0.21$, $p < 0.001$), the partner factor of long-term desirability ($r = 0.17$, $p = 0.005$), the partners' mate-retention behaviors ($r = -0.13$, $p = 0.04$), relationship satisfaction ($r = 0.17$, $p = 0.008$), an item measuring partner masculinity ($r = 0.12$, $p = 0.05$), women's self-rated religiosity over the past week ($r = 0.21$, $p = 0.002$), an item rating how upset they would be if they found out they were currently pregnant ($r = -0.50$, $p < 0.001$), women's scores on the SOI-R desire subscale ($r = -0.16$, $p = 0.01$), and relationship length ($r = 0.11$, $p = 0.09$). Overall, the model significantly predicted how likely women would be to carry an unintended pregnancy to term with their current romantic partner, $F(9, 122) = 8.18$, $R^2 = 0.331$, $p < 0.001$, $f^2 = 0.495$, accounting for approximately 33.1% of the total variance. Women rated themselves as being more likely to carry an unintended pregnancy to term with their current partner if they rated themselves as being less upset if they found out they were currently pregnant ($M = 4.83$, $SD = 1.88$), $\beta = -0.45$, $t = -5.83$, $p < 0.001$, take fewer social risks ($M = 27.36$, $SD = 5.35$), $\beta = -0.16$, $t = -1.95$, $p < 0.05$, were more religious ($M = 3.79$, $SD = 2.65$), $\beta = 0.25$, $t = 2.48$, $p = 0.005$, and if they rated their partners as being more masculine ($M = 5.49$, $SD = 1.10$), $\beta = 0.16$, $t = 2.00$, $p < 0.05$. Contrary to expectations, partner long-term desirability, relationship satisfaction, scores on the SOI-R desire subscale, and relationship length were not significant predictors, all $p > 0.06$.

Initiation of Sexual Intercourse

To test whether women are more likely to initiate sexual intercourse at or around ovulation versus during the non-fertile phases of the menstrual cycle (i.e., the early follicular/menstrual phase and the luteal phase), a Chi-square test of independence was conducted using responses to an item asking participants who initiated their last event of sexual intercourse with their partner. There was no significant difference in men versus women's initiation of sexual intercourse across the menstrual cycle, $\chi^2(2, N = 204) = 5.44$, $p = 0.07$. A follow-up ANOVA using conception risk as a dependent variable did not find a significant difference between men and women's sexual initiation over the cycle, with neither sex initiating more frequently closer to peak fertility, $F(1, 203) = 0.32$, $p = 0.57$.

Relationship Satisfaction

A one-way ANOVA was conducted to examine whether women's relationship satisfaction varied across the menstrual cycle. Because relationship satisfaction scores were negatively skewed, they were log-transformed prior to these analyses ($M = 0.61$, $SD = 0.10$). Furthermore, three outliers were removed ($M = 0.61$, $SD = 0.08$) because they were more than two standard deviations below the mean. Women were not found to have significantly different relationship satisfaction across menstrual cycle phases, $F(2, 190) = 0.21$, $p = 0.81$. To investigate whether interactions existed between the factors of mate quality and cycle phase to predict relationship satisfaction, three independent-measures ANCOVAs were run. An ANCOVA using the factor of physical attractiveness as a covariate found no main effect of cycle phase, $p = 0.85$, and no interaction between physical attractiveness and cycle phase on relationship satisfaction, $p = 0.76$. However, there was a simple main effect of partner physical attractiveness on relationship satisfaction, $F(1, 181) = 10.58$, $p = 0.001$, $d = 0.48$, which reflected women's relationship satisfaction being positively associated with having a more physically attractive partner ($r = 0.37$, $p < 0.001$). Including partner dominance as a covariate in a second ANOVA did not reveal any significant main effects or interactions, all $p > 0.13$. The third ANCOVA using the factor of long-term desirability as a covariate did not show a significant effect of cycle

phase, $p = 0.61$, and did not yield a significant interaction with cycle phase, $p = 0.42$. However, there was a main effect of long-term desirability on relationship satisfaction, $F(1, 181) = 78.24$, $p < 0.001$, $d = 1.31$. This reflected a positive relationship between long-term desirability and relationship satisfaction ($r = 0.65$, $p < 0.001$). Reducing the sample to increase the validity of cycle esimates did not impact the findings in any meaningful way.

Discussion

Consistent with previous work (e.g., Biglan et al., 1990; Shrier et al., 1996; Wilder & Watt, 2002), general sexual risk-taking was associated with overall health and safety risks, which indicates that women who take risks with their health and safety extend these habits to their sexual encounters. Women also reported a greater tendency to engage in risky sexual behaviors when they had more physically attractive partners and when they use sexual inducements as a mate retention strategy. The latter finding suggests that sexual risk-taking may function as a mate retention tactic to increase partner relationship satisfaction (see also Impett & Peplau, 2003; Umphrey & Sherbloom, 2007; Zawacki et al., 2009). For example, women report performing fellatio on their partners, which can put them at risk of a STI, as a mate retention strategy (Sela et al., 2015). Conception-risking behaviors, specifically, were most likely to occur when the woman reported being more socially dominant and she reported she would be less upset by an unintended pregnancy. Ambivalence about pregnancy is predictive of lower or inconsistent use of contraceptives (Bruckner et al, 2004; Frost et al., 2007; Higgins et al., 2012; Jaccard et al., 2003; Schwarz et al., 2007; Zabin, 1999), but these results further suggest that socially dominant women are more likely to risk pregnancy (even though men rate them as less likely to have unprotected sex; Dijkstra et al., 2000).

Our finding that riskier sexual behaviors were positively associated with having a more attractive partner is consistent with previous work (Kelaher et al., 1994; Kruse & Fromme, 2005). In fact, some studies have documented that individuals report greater intentions to have unprotected sex with more attractive targets despite perceiving them as being more likely to have a STI (Agocha & Cooper, 1999; Lennon & Kenny, 2013; see also Dijkstra et al., 2000). For example, although information about a target's sexual history strongly predicts perceived risk of contracting a STI, it does not predict participants' intentions to use condoms with these targets (Agocha & Cooper, 1999). A more physically attractive target reduces participants' intentions to use a condom by increasing their desire for sex via lowering their perceptions of risk (Agocha & Cooper, 1999). Indeed, physically attractive people are frequently judged as being healthier, more physically fit, and as posing less of a health risk (e.g., Fishbein et al., 2004; Gold et al., 1991; Hong et al., 2006; Singh, 1993; but see Dijkstra et al., 2000). If physical attractiveness is related to partner quality (see, e.g., Frederick & Haselton, 2007), an increased willingness to engage in risky sexual behavior with attractive partners could increase conception with high quality partners and, by extension, increase fitness (i.e., if those qualities are passed on to offspring and make them more likely to survive to adulthood). Downplaying the potential risks that can result from engaging in unprotected sexual activity with an attractive sexual partner may be unwise, however, because these individuals tend to have had a higher number of sexual partners (Apicella et al., 2007; Mueller & Mazur, 2001; Weeden & Sabini, 2007) and more casual, short-term partners (Rhodes et al., 2005), which puts them at greater risk of contracting a STI (Fichtenberg et al., 2009; Shiely et al., 2010).

Just as with physically attractive men, masculine and dominant men are more likely to pursue promiscuous, short-term mating strategies (Booth & Dabbs, 1993; Egan & Angus, 2004; Gray et al., 2002; Kruger, 2006; Mazur et al., 1994), and men who adopt short-term mating strategies have a tendency to be less agreeable, warm, faithful, and stable (Campbell et al., 2002; Paulhus, 2001; Paulhus & Williams, 2002). Women's conception-risking behaviors at their last sexual encounter were positively correlated with their ratings of their partner's dominance. This suggests that women may be more inclined to risk pregnancy with dominant men, or perhaps that dominant men may be better able to convince their partners to engage in these risky sexual behaviors, but these possibilities require further investigation. Another possible explanation is that although more masculine and dominant men are perceived by women to be less committed, less prosocial, and more promiscuous (Boothroyd et al., 2007; Johnston et al., 2001; Kruger, 2006; Perrett et al., 1998), pregnancy may function as a way to secure a partner with high genetic quality, such as a dominant or masculine partner (see, e.g., Foo et al., 2020). Consistent with this idea was the finding that—in addition to being more likely to carry an unintended pregnancy to term with their current partner if they take fewer social risks (i.e., wish to avoid social stigmatization; see also, e.g., Hall et al., 2015; Wiemann et al., 2005), are more religious (see also Henshaw & Silverman, 1988), and rated themselves as being less upset should they become pregnant—women were more likely to report that they would carry an unintended pregnancy to term if they rated their partners as higher in masculinity. However, the relationship between women's ratings of their partner's dominance and conception-risking behaviors fell short of significance when included in our multiple regression model, and so this relationship should be interpreted with caution and examined more thoroughly in future work.

Conception risk-taking was not associated with the likelihood that women would carry an unintended pregnancy to term, revealing an interesting disconnect between women's reported intentions and their behaviors. It appeared that women's intentions to carry an unwanted or mistimed pregnancy had little bearing on their sexual decision-making, which may illustrate the adaptive role of subconscious underlying sexual behavior. Similarly, only women who said they were *not* currently trying to become pregnant by their romantic partners were able to proceed to the online survey, yet 119 women out of the total eligible sample of 204 engaged in at least one behavior that put them at the risk of an unintended pregnancy at their last copulation. This perplexing incongruity is consistent with previous cross-cultural work (e.g., Bankole & Westoff, 1998; Trussell et al., 1999), with some studies finding that women who have an unintended pregnancy had unprotected sex because they did not mind if they got pregnant (e.g., Nettleman et al., 2007). This inconsistency may be because pregnancy intention may be distinct from a desire to become pregnant, pregnancy intention or planning may not be meaningful to some women, and/or because pregnancy ambivalence may be expressed in inconsistent use of contraception (see Trussel et al., 1999). To better assess women's attitudes about an unintended pregnancy, other items used to measure pregnancy ambivalence should be incorporated in future studies.

Another interesting contradiction in women's behaviors is that their ratings of their partner's long-term desirability, their reported relationship satisfaction, and relationship length were not significant predictors of women's rated likelihood of carrying an unintended pregnancy to term. Women who reported being more satisfied in their relationship also rated their partners higher on physical attractiveness and long-term desirability, and partner physical attractiveness was in turn related to general risky sexual behaviors, but, contrary to previous research (Spohn, 2005), long-term desirability was not. These findings demonstrate that the qualities women desire in a potential father may not be applicable to those men they risk turning into fathers. This provides some tentative support for the idea that women engage in a mixed mating strategy (see, e.g., see Gangestad & Thornhill, 2008). Specifically, Strategic Pluralism Theory (Gangestad & Simpson, 2000) argues that natural and sexual selection resulted in women having different preferences for short-term versus long-term mates. Under this theory, women would prefer men of higher genetic quality for short-term sexual encounters, but prefer men with greater investment potential for long-term partnerships. Strategic Pluralism accounts for potential trade-offs between important partner characteristics because those men who possess indicators of high immune quality (e.g., masculinity; Foo et al., 2020) that could be passed on to potential offspring, thereby potentially increasing fitness, might make poorer quality partners (see, e.g., Pollet et al., 2011) and fathers (see Fleming et al., 2002; Kuo et al., 2012, 2016). Mate choice should therefore reflect how women resolve this trade-off between genetic and investment benefits. That women in the current study are engaging in general risky sexual behaviors and conception-risking behaviors with men who would not necessarily make good long-term partners, and are also no more likely to report a higher likelihood of carrying an unintended pregnancy to term with investing men, suggests that long-term desirability may not be important in these reproductive decisions. However, more direct tests of this hypothesis, including future investigations into partner infidelity, are necessary before any firm conclusions can be drawn.

Contrary to our predictions, women's estimated fertility status did not significantly predict initiation of sexual activity, relationship satisfaction (for similar results, see Larson et al., 2013), or risky sexual behaviors—either by using hormone estimates or discrete menstrual cycle phases—and no interactions were revealed when examining aspects of partner quality to predict general sexual risk-taking or conception-risking behaviors at last intercourse. One possible explanation for the null effects of cycle phase on sexual risk-taking is that women perceive men's mating behaviors as more sexually coercive during the fertile phase (Garver-Apgar et al., 2007) and their behavior may function to counteract this perceived threat. Similarly, when fertile, women have been shown to reduce potentially unsafe behaviors that could put them at risk of sexual assault, such as walking alone in a dimly lit area (Bröder & Hohmann, 2003; Chavanne & Gallup, 1998)—a pattern which has been proposed as functioning to safeguard against rape and impregnation by undesirable men. However, these explanations seem unlikely because women did not engage in *fewer* risky sexual behaviors mid-cycle. Moreover, it was found that engaging in general sexual risk-taking and conception risk-taking at women's last copulation were both strongly related to their reported patterns of sexual risk-taking over the past 3 months. This suggests that women's tendencies to engage in risky sexual behaviors are consistent over time, and may explain why women's sexual risk-taking was unrelated to cycle phase. This may also suggest that women who engage in risky sexual behaviors in general could at some point have unprotected sex during the fertile phase, which still puts them at risk for an unintended pregnancy.

That women did not report being more likely to initiate sexual intercourse during the fertile phase of the menstrual cycle also contradicts previous research (Adams et al., 1978; Brown et al., 2011; Bullivant et al., 2004; Matteo & Rissman, 1984; Roney & Simmons, 2013). However, it is possible that our asking about a single event rather than looking at a larger within-subject pattern of behavior across several sexual encounters or menstrual cycles is obscuring

these results, particularly since men initiate sexual behaviors more often compared to women (Dworkin & O'Sullivan, 2005; Gossman et al., 2003; Simms & Byers, 2013; Vannier & O'Sullivan, 2012). This same criticism applies to all analyses that investigated cycle phase in the current study.

Limitations and Future Directions

This study adds to the literature on women's sexual strategies as a function of their partners' mate quality, with a specific focus on conception-risking behaviors that could lead to unintended pregnancy. Two important caveats to the current work, however, are that we used estimated menstrual cycle phase and a between-subject design. Our intention was to provide a preliminary investigation into factors that influence risky sexual behaviors that can lead to an unintended pregnancy, but using women's reports of their menstrual cycle phase, as opposed to hormonal assays or identification of a luteinizing hormone surge, represents a key limitation in our design (although others have also used between-subject designs and estimated cycle phase to address similar questions; e.g., Little et al., 2007, 2008). Women often provide incorrect cycle lengths (particularly toward the end of their cycle; Jukic et al., 2008; Small et al., 2007; Waller et al, 2000) and there are sizeable between-subject differences in hormonal profile (e.g., Gann et al., 2001). Although using a within-subject design with hormone measures or luteinizing hormone surge detection was beyond the scope of the current study, future research should use these techniques to investigate further. Moreover, all cycle-related findings discussed above should be interpreted with due caution, particularly in light of the small sample size used in the current study. Previous research has emphasized the need for between-subject designs that estimate cycle phase as we do in the current study to use sample sizes of close to 750 participants (Gangestad et al., 2016; for more in depth discussion of power estimates and effect sizes in cycle research, see Blake & Gangestad, 2020), whereas our final sample size consisted of only 204 women. Our cycle analyses were intended to be exploratory, but additional research that uses larger sample sizes would be beneficial.

Another limitation is that the adapted measure of sexual risk-taking reflecting conception risk did not fully capture the range of risky sexual behaviors that women could engage in which could put them at risk of an unintended pregnancy. Future studies examining sexual risk-taking should use a more comprehensive list of behaviors that women could engage in that might lead to an unintended pregnancy, expanding to include errors made using condoms (i.e., Crosby et al., 2008), and risk-taking behaviors specific to various types of contraceptive methods such as female condoms, spermicides, IUDs, and even the use of dual contraception (e.g., using a condom and an IUD). Future work could also measure corrective behavior, such as taking emergency contraception. In addition, it would be worthwhile to assess the involvement of women's romantic partners in proposing or encouraging risky sexual behaviors. To avoid issues with recollection, a daily diary method would be advisable, and further questions should be included about factors such as the quality of the sexual experience, motives for engaging in each sexual encounter, substance use before/during sex, and reasons behind engaging in specific sexual risk-taking behaviors. Future studies could also use more objective measurements of partner quality, such as facial photographs that could be analyzed for symmetry and sexual dimorphism (i.e., masculinity/femininity). Finally, participants were primarily Caucasian, which is problematic for studying unintended pregnancy risk given that sexual risk-taking varies by ethnicity (Gomez & Marin, 1996; Hale & Trumbetta, 1996) and non-White women are at a higher risk of having an unintended pregnancy (Finer & Henshaw, 2006; Kim et al., 2016). Future work should strive to include women from more diverse backgrounds.

Although a variety of social, learning, personality, and other factors play a significant role in how safe or risky individuals are in their sexual practices (Sheeran et al., 1999), evolutionary psychology offers a unique and necessary insight into the issue of risky sexual behavior. This study was among the first to investigate women's risky sexual strategies in relation to the mate quality of their long-term partners, informed by an evolutionary perspective. Results lend some support to other work demonstrating that women's sexual behaviors, preferences, motivations, and cognitions are somewhat conditional on the putative genetic quality of their long-term partners (see, e.g., Gangestad et al., 2005, 2010b; Haselton & Gangestad, 2006; Larson et al., 2012, 2013; Pillsworth & Haselton, 2006). This study therefore represents a useful first step in investigating the factors associated with conception-risking behavior and unintended pregnancy.

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Data Availability Participants did not consent to their data being shared with others.

Declarations

Ethics Approval This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the Ethics Committee of Oakland University (approved on 3/12/ 2014, approval #567,220–1).

Consent to Participate Informed consent was obtained from all individual participants included in the study.

Consent for Publication Participants consented to their data being published.

Competing Interest The authors have no relevant financial or non-financial interests to disclose. There are no conflicts of interest or competing interests.

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