DO WOMEN DEROGATE ATTRACTIVE OTHERS AS A
RELATIONSHIP MAINTENANCE STRATEGY?
EXAMINING THE ROLE OF COMMITMENT AND CONCEPTION RISK

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ABSTRACT

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Women experience a change in mate preferences across the ovulatory cycle. At high conception risk when ovulation is likely, women prefer men who display cues of genetic fitness and therefore can ostensibly pass on the best genes to their offspring (Gangestad & Thornhill, 1998). This change in mate preferences during periods of high and low conception risk can be detrimental for long-term relationships. Women are more likely to engage in extrapair relationships during ovulation (Bellis & Baker, 1990) and they are more attracted to physically attractive alternative partners when they are ovulating, particularly when their partner is physically unattractive (Larson, Pillsworth, & Haselton, 2012). Research finds that compared to single men, attached men will derogate extrapair women when the extrapair women are ovulating (Miller & Maner, 2010). Evidence from the current study suggests that, similarly, women who are highly
committed to their partners derogate physically attractive men at high conception risk. Results demonstrate that single women and women in a relationship did not rate photos of physically attractive men differently. However, own commitment and conception risk interacted such that women with high own commitment rated men less physically attractive at high conception risk compared to low conception risk. High perceived partner constraint commitment was associated with high ratings of the physically attractive alternative partner. The findings suggest that for women, own commitment is a more important factor than relationship status that motivates women to derogate physically attractive alternative partners. However, when women perceive their partner to be constrained to the relationship, women will be more open to seeking out physically attractive alternative options, following the dual-mating strategy (Pillsworth & Haselton, 2006). Findings are discussed in context of the contemporary relationship literature on evolutionary motivations in mate selection and relationship commitment.

*Keywords:* Romantic relationship, conception risk, attraction, commitment, ovulation, derogation.
Dedicated to Mom, Dad, Colton, and James,
for your love, encouragement, and patience over the last two years, and always.
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INTRODUCTION

If we commit ourselves to one person for life, this is not, as many people think, a rejection of freedom; rather, it demands the courage to move into all the risks of freedom, and the risk of love which is permanent; into that love which is not possession but participation. (L'Engle, 1977, p. 47)

Women's mate preferences change across the ovulatory cycle (Gangestad & Thornhill, 1998; Gildersleeve, Haselton, & Kales, 2014). During high conception risk, women experience increased attraction to men who display cues of genetic fitness (Gangestad & Thornhill, 1998). When a woman enters into a romantic relationship, she can still experience these evolutionary motivations, which may promote attraction toward extrapair men. To maintain relationships, commitment provides a couple a strong defense against relationship threats. Partners who are committed to each other, and perceive commitment from each other, engage in a variety of behaviors that contribute to long-term relationship success, including derogation of the physically attractive others, toward whom women’s evolutionary drives may arouse desire. Recent research shows that men will derogate non-partner women when the women are ovulating ostensibly as a relationship maintenance strategy (Miller & Maner, 2010). However, research has not been conducted to determine which strategies women use to maintain their long-term
relationships.

**A. Evolutionary Reproductive Strategies**

According to evolutionary theory, one of the fundamental drives in humans is to successfully reproduce by passing on their genes to healthy offspring (Darwin, 1871). Because men and women experience different challenges, they have developed different psychological adaptations to successfully achieve the goal of reproduction (Trivers, 1972). Women tend to be choosier than men when picking a mate because men and women have vastly different minimum investment requirements— a woman's minimum investment period is nine months if conception occurs, whereas a man's investment could end immediately after conception (Trivers, 1972). The relationship length expectation with a potential partner also impacts mate choice— short-term partners are evaluated differently than long-term partners (Buss & Schmitt, 1993; Li & Kenrick, 2006). Because women are only fertile when they are ovulating, conception is possible during a short window of time each month (Wilcox, Weinberg, & Baird, 1995). When ovulating, women are more attracted to men who demonstrate cues of genetic fitness, which promotes short-term relationships with physically attractive partners to secure the best possible genes (Gangestad & Thornhill, 1998). The effect is well-supported, and in a meta-analytic review of the literature, researchers demonstrated a robust shift in mate preferences across the ovulatory cycle toward short-term mate characteristics (Gildersleeve et al., 2014). On the other hand, women tend to value the ability to provide resources in long-term partners, and long-term values do not vary across the cycle (Buss, 1989; Gangestad, Garver-Apgar, Simpson, & Cousins, 2007).
How do women choose between good genes and the ability to provide? The dual-mating strategy suggests that they need not make a choice, but rather can optimize their own fitness through dual-mating. According to the dual-mating strategy, during ovulation, women can gain the benefits of good genes and partner resources by seeking genetically fit alternative partners who will pass on strong genes while maintaining a relationship with a long-term partner who is able to provide resources for the woman and her children (Pillsworth & Haselton, 2006). Support for the dual-mating strategy stems from a shift in the traits that women prefer in a mate across the ovulatory cycle, during high and low conception risk, which impacts the dimensions women value in potential mates (Gangestad et al., 2007; Gangestad, Simpson, Cousins, Garver-Apgar, & Christensen, 2004; Gangestad & Thornhill, 1998). During ovulation, women are more attracted to cues of strong and resilient genes in men, such as the scent of symmetrical men (Gangestad & Thornhill, 1998), masculinized facial features (Penton-Voak & Perrett, 2000), and displays of social presence (Gangestad et al., 2004) compared to low conception risk points in the cycle.

However, if women seek multiple partners, they run the risk of being abandoned by their long-term partners and subsequently losing their resources (Bellis & Baker, 1990). Typically, women will chose a long-term partner who is able to provide, regardless of gene quality (Gangestad & Simpson, 2000). Forming a long-term monogamous partnership with this chosen mate is called coupling, which is a strategy that increases offspring survival by ensuring that more resources are available to the offspring (Pillsworth & Haselton, 2005; Pillsworth & Haselton, 2006).
Recent findings show shifts in attached women's perceptions of established long-term partners across the ovulatory cycle. Women in relationships prefer men who display genetic fitness cues during ovulation, though these men are not necessarily their partners. These preferences are particularly strong when a woman's partner does not display genetic fitness cues (Bellis & Baker, 1990; Gildersleeve et al., 2014; Kenrick, Neuberg, Zierk, & Krones, 1994; Larson, Haselton, Gildersleeve, & Pillsworth, 2013; Larson, Pillsworth, & Haselton, 2012). For example, women tend to report that they are less satisfied with their relationship after viewing photos of dominant-looking men (Kenrick et al., 1994). Women's attraction to extrapair men increases during ovulation, especially when their long-term partner is physically unattractive and lacks cues to genetic superiority (Larson et al., 2012). Women report feeling less close to their partners during ovulation, once again, if their partner does not possess genetic fitness cues that indicate good genes (Larson et al., 2013).

Evolutionary drives for the use of reproduction strategies may underlie these shifts in behavior and attitude across the ovulatory cycle in both single and attached women. These findings beg the questions—how are relationships maintained through periods of increased attraction to alternative partners, and which strategies do women use to make their long-term relationships last?

**B. Commitment**

Commitment has been conceptualized in many ways in the study of romantic relationships. Two conceptualizations relevant to the study at hand include that of Stanley and Markman (1992) and that of Rusbult (1980). According to Stanley and Markman
(1992), commitment can be broken down into two categories: constraint commitment and personal dedication (Stanley & Markman, 1992). Constraint commitment is a sense of obligation to maintain a relationship due to factors other than positive feelings toward one's partner. For example, having many shared friends or shared pets might keep two partners together when they would otherwise separate. Personal dedication refers to one's desire to maintain a relationship due to positive feelings toward one's partner and satisfaction with the relationship (Stanley & Markman, 1992).

Rusbult's Investment Model demonstrates that commitment is the best predictor of whether or not a couple breaks up (Rusbult, 1983). The Investment Model proposes that partners determine whether to stay in a relationship by weighing the rewards and costs and considering comparison levels and alternative options. Comparison levels refer to general expectations for the relationship, whereas alternative options refer to potential alternative partners or being single. Commitment level is the degree to which a partner desires to maintain the relationship, based on these factors. The Investment Model takes three variables into account to calculate commitment level, including satisfaction level, quality of alternatives, and investment size (Rusbult, 1980). Satisfaction level refers to how happy one is with his or her relationship. Quality of alternatives refers to the options of having another partner or being single. Investment size refers to things that will be lost if the relationship ends, for example, shared belongings or mutual friends. These three constructs are related such that when satisfaction level is high, when there are few or poor alternatives, and when partners have a lot invested in the relationship, commitment level is at its highest (Rusbult, 1980). Research has demonstrated that high commitment is such
a powerful mechanism of relationship maintenance that it can predict when a person will stay in a relationship with an abusive partner (Rusbult & Martz, 1995).

Quality of alternatives and investment size are conceptually similar to Stanley and Markman's (1992) constraint commitment construct because they are aspects of a relationship that do not require positive feelings or affection between partners, but still influence whether partners will stay together. Satisfaction level and commitment level are conceptually similar to Stanley and Markman's (1992) personal dedication construct because satisfaction level and commitment level are internal relationship factors that are associated with the connection between partners, which motivate a person to stay in their relationship.

**Perceived partner commitment.** Own commitment plays an important role in maintaining romantic relationships, but so does the perception of a partner's relationship commitment. When commitment and perceived partner commitment are equal, couples have the greatest dyadic well-being (Drigotas, Rusbult, & Verette, 1999). In a longitudinal study, perceived partner commitment was found to be associated with an increased likelihood of a breakup, in that when perceived partner commitment fluctuated, breakup was more likely than if perceived partner commitment stayed consistent. Even when controlling for fluctuation in one's own commitment, perceived partner commitment was strongly associated with breakups (Arriaga, Reed, Goodfriend, & Agnew, 2006).

**Consequences of commitment.** There are several consequences of relationship commitment that help maintain a relationship. For example, committed relationship
partners experience cognitive interdependence. Partners tend to use more plural pronouns, perceive increased unity with their partner, and consider their relationship to be central in their lives (Agnew, Van Lange, Rusbult, & Langston, 1998). Commitment is associated with better "dyadic adjustment" or better relationship functioning, such as increased consensus between partners, more affective expression, and greater satisfaction in the relationship (Rusbult, Martz, & Agnew, 1998). High commitment is also associated with "perceived superiority" or a mindset that one's relationship is much better than others' relationships (Rusbult, Van Lange, Wildschut, Yovetich, & Verette, 2000).

High relationship commitment results in more trust toward a partner because partners' actions are more likely to be perceived as pro-relationship. Committed partners are more likely to perceive each other's actions as demonstrations of sacrificing own self-interest for the interests of the relationship (Wieselquist, Rusbult, Foster, & Agnew, 1999). Highly committed partners are more likely to accommodate each other by using constructive rather than destructive interaction strategies (Rusbult, Verette, Whitney, Slovik, & Lipkus, 1991). Research has demonstrated that commitment protects partners with insecure attachment styles by contributing to decreased feelings of rejection and increased feelings of acceptance from their partner (Tran & Simpson, 2009). In summary, relationship commitment is associated with the adoption of a number of behaviors that promote relationship satisfaction.

Commitment changes how people in a relationship view extrapair others. Plant, Kunstman, and Maner (2010) found that committed relationship partners experienced a threat response to physically attractive others in a simulated shooting task, in which
participants were instructed to shoot the "criminals." Criminals were either physically attractive targets or average-looking targets and were pictured with either a weapon or an innocuous object. Participants in committed relationships made more errors (i.e., shooting non-criminals) when the target was physically attractive as opposed to average, which may indicate that committed partners experience a threat response when they encounter physically attractive alternative partners (Plant et al., 2010).

When relationship partners are primed with thoughts of past experiences of either love or sexual experiences with their relationship partner, those who think of a love experience are more able to suppress thoughts of a physically attractive other (Gonzaga, Haselton, Smurda, Davies, & Poore, 2008). Committed relationship partners are less attentive to physically attractive others than single people and spend less time viewing photos of physically attractive alternative partners (Miller, 1997; Maner, Gailliot, & Miller, 2009).

**Derogation of alternative partners.** Committed partners tend to derogate physically attractive others, or report that attractive others are not very attractive (Johnson & Rusbult, 1989; Lydon, Fitzsimons & Naidoo, 2003; Simpson, Gangestad, & Lerma, 1990). Studies have found that attraction to physically attractive others decreases significantly during the first year of a romantic relationship (Rusbult, 1983; Johnson & Rusbult, 1989). Highly committed partners tend to report derogation of attractive, available others who are seen as a threat to the continuity of the relationship (Johnson & Rusbult, 1989). Partners will be more likely to derogate alternative partners and fail to notice an alternative partner when they feel that their self-concept extends to their partner.
Recent research examined the importance of conception risk in the derogation of physically attractive alternatives for men in romantic relationships. Miller and Maner (2010) found that men in a relationship evaluated a female confederate as less physically attractive when she was ovulating compared to single men (Miller & Maner, 2010). Miller and Maner (2010) noted that derogation of physical attractiveness occurs more when the threat to the relationship is higher, for example, when the alternative mate is very physically attractive and is open to engaging in extra-pair mating. Such relationship threats were positively associated with derogating the alternative mate's physical attractiveness (Miller & Maner, 2010). In the study, a female confederate interacted with single and attached male participants at two points of her ovulatory cycle (during high and low conception risk). After meeting the woman, the men were asked to rate her for several traits, including attractiveness.

Miller and Maner (2010) found that single men rated the woman to be more attractive than did men in a relationship, which supports the hypothesis that when one is in a relationship, he or she will derogate traits in alternative partners. When the woman was ovulating, single men rated the woman more attractive than single men rated her when she was not ovulating and, quite critically, single men rated the woman as
significantly more attractive than men in a relationship when she was ovulating. Men in relationships rated the woman to be significantly less attractive when she was ovulating compared to men in a relationship who rated her when she was not ovulating. Miller and Maner (2010) concluded that attached men derogated the confederate when she was ovulating by rating her as less attractive because an ovulating woman posed a greater threat to their current relationship.

C. The Present Study

Thus far, research has not explored derogation of alternatives as a relationship maintenance strategy used by women in relationships, and the role that conception risk plays in how women evaluate the viability of the dual-mating strategy. Miller and Maner’s (2010) study measured physical attractiveness ratings given to a female confederate by single men and men in a relationship when the confederate was at high or low conception risk. The present study replicated Miller and Maner's (2010) study by measuring physical attractiveness ratings given to photos of physically attractive men by single women and women in a relationship at different points of the women’s ovulatory cycles. The study extended Miller and Maner's (2010) study to examine the role of own commitment, perceived partner commitment, conception risk, and the interactions between these three variables on the derogation of physically attractive alternatives.

The objectives of the present study were threefold. The objectives were to identify (a) whether single women and women in a relationship differ on physical attractiveness ratings of attractive extrapair men, (b) whether women in a relationship engaged in increased derogation of physically attractive alternative partners during ovulation, and (c)
whether, among women in relationships, the effects were influenced by own commitment level and perceived partner commitment level and variations thereof, including constraint commitment, perceived partner constraint commitment, personal dedication, and perceived partner personal dedication.

To test the objectives, three hypotheses were developed. First, *single women and women in a relationship were expected to differ in their ratings of photos of physically attractive men. High conception risk was expected to be associated with higher ratings given by single women, whereas high conception risk was expected to be associated with derogation of the physically attractive alternatives by women in a relationship.* Like the men in Miller and Maner's (2010) study, attached women were expected to derogate physically attractive men at high conception risk, because attached women risk greater losses (i.e., relationship dissolution and loss of resources) if they experience and act on their attraction toward physically attractive alternative partners. Single women were expected to give higher ratings to photos of physically attractive men, especially during ovulation because single women at high conception risk are ostensibly motivated to capitalize on their fertility by seeking a mate who can offer strong genes.

Second, *for women in a relationship, own commitment level, perceived partner commitment level, and conception risk were expected to interact to influence physical attractiveness ratings.* Existing theories on commitment and conception risk suggested several viable outcomes based on levels of own and perceived partner commitment across the ovulatory cycle.

The literature on commitment suggests that women with high own commitment
should derogate attractive others as a way of ensuring that their relationship will last as long as possible (Johnson & Rusbult, 1989; Rusbult, 1983), whereas women with low own commitment should not derogate attractive others, as these women should be less concerned with maintaining their relationship and may be more open to having alternative partners. The commitment literature shows that perceived equal commitment between partners is associated with staying together, so if perceived partner commitment is low, a highly committed partner might be more open to alternative options. However, following the dual-mating strategy, when a woman is ovulating and perceives high partner commitment, she may give high physical attractiveness ratings to extrapair others because she may be motivated to take advantage of her partner's high level of commitment to the relationship.

The commitment literature and Miller and Maner's study (2010) support the hypothesis that attached women at high conception risk and high own commitment should derogate more than women at low conception risk or low own commitment. High conception risk should increase the likelihood of experiencing attraction to genetically fit alternative partners. However, women with high own commitment were expected to behave like men and derogate alternative partners as a relationship maintenance strategy (Miller & Maner, 2010).

Third, when commitment is conceptualized as constraint commitment and personal dedication, it was expected that there would be no interaction of conception risk, constraint commitment, and perceived partner constraint commitment to predict derogation of alternatives, whereas there would be an interaction of conception risk,
personal dedication, and perceived partner personal dedication to predict increased derogation of alternatives. Women who have high personal dedication and who perceive high personal dedication from their partners were expected to derogate men on physical attractiveness because they are highly devoted to the relationship and perceive devotion from their partners. Conversely, women who have high constraint commitment and who perceive high constraint commitment from their partners were not expected to derogate the attractive men on physical attractiveness because their relationship may be maintained for more practical reasons, rather than affection or a connection between partners.

This study sought to determine which factors are important in promoting the relationship maintenance behavior of derogating alternative partners on physical attractiveness, and evaluated conception risk, own commitment, and perceived partner commitment. Commitment was evaluated as a higher order construct and broken down into components of constraint commitment and personal dedication, and perceived partner constraint commitment and perceived partner personal dedication. The results show the patterns of the factors' influence on each other and their influence on a women's relationship maintenance behavior of derogating physically attractive alternative partners.
METHOD

A. Participants

This study recruited 130 female participants who were in a relationship and 130 female participants who were single using Amazon's Mechanical Turk (MTurk) online labor market system. Workers answered a series of screener questions and to qualify to complete the study, had to report being a woman between the ages of 18 and 25 from the United States or Canada, who did not currently and had not in the past month taken hormonal contraceptives. Those who were eligible were directed to the full study and upon completion, compensated $1.25 for their time. The desired number of participants was 260, and this number was generated based on the results of a power analysis (Faul, Erdfelder, Buchner, & Lang, 2009; Faul, Erdfelder, Lang, & Buchner, 2007).

A total of 3,467 participants were screened based on sex, age, current use of hormonal contraceptives, and use of hormonal contraceptives in the last month, and 3,274 participants were excluded for meeting one or more of the exclusion criteria. Of those excluded, 3,209 participants did not meet the criteria on one of the screener questions. An additional 13 cases were excluded because it was suspected that the participant had completed the study twice. When a participant completed the study twice, the first set of data reported was kept, based on the automatic time stamp. Despite using screener
questions to filter out participants who did not meet the criteria, several participants were excluded based on responses to the demographics questions that revealed that they did not meet criteria to participate. Three were excluded for indicating that they were men, and 10 participants were excluded because they indicated that they were older than 25 or younger than 18.

An additional 39 women were excluded because they reported past use of hormonal birth control. The literature on the ovulatory shift recommends that only naturally cycling women should be included in analyses of conception risk effects and typically, women are excluded if they have used hormonal birth control within three months prior to the study (Gildersleeve et al., 2014). Research reports evidence that ovulatory cycle length is affected by hormonal birth control use for up to three cycles after discontinued use (Nassaralla et al., 2011).

The final sample used for analysis included 193 women: 92 (47.6%) single women and 101 (52.3%) women in a relationship. Participant age ranged from 18 to 25, ($M = 22.78$, $SD = 1.71$). Of the women in a relationship, 1.9% (2 women) reported being in a casual relationship, 22.7% (23 women) reported being in a relationship, 41.5% (42 women) reported being in a serious relationship, 7.9% (8 women) reported being engaged, 17.8% (18 women) reported being married, and 7.9% (8 women) did not answer the question. For women in a relationship, the average relationship length was 28.18 months ($SD = 27.55$). Of the total final sample, 64.7% identified as non-Hispanic White, while the next largest group, African American or Black, made up 14.5% of the sample, and Asian or Asian American made up 9.8% of the sample. All other races combined
made up 7.7% of the sample, and 1.5% of participants selected the option, "wish not to answer."

**B. Procedure**

When a potential participant began the study, she answered four screener questions, and if she fit all of the criteria, she was presented with the informed consent, which explained the procedure of the study. Next, all participants completed the Rosenberg Self-Esteem Scale. Then, each participant indicated whether she was single or in a relationship. Participants in a relationship completed the Quality of Marriage Index (modified for non-marital romantic relationships), and the Investment Model Scale. Next, the participant completed the Quality of Marriage Index and the Investment Model Scale, but, this time, from her partner's perspective, to create variables representing perceived partner scores on each of the measures. Single participants skipped all relationship measures.

Next, all participants were asked to rate 8 photos of college-aged men and women for various traits. Participants viewed each photo in randomized order for an unlimited amount of time and made ratings of six traits, including physical attractiveness. Finally, each participant answered a series of questions about her ovulatory cycle and demographic questions to conclude the study.

**C. Materials**

**Self-esteem.** All participants responded to the Rosenberg Self-Esteem Scale to indicate how they feel about themselves (Rosenberg, 1965). This 10-item scale has often been used in the psychology literature to measure self-esteem and has been shown to be a
valid and reliable measure, with Cronbach's alphas generally between .77 and .88. Participants responded to prompts such as, "On the whole, I feel satisfied with myself," "At times, I think I am no good at all," and "I wish I could have more respect for myself," by choosing strongly disagree, disagree, agree, or strongly agree. The Cronbach's alpha for the Rosenberg Self-Esteem Scale in the present study was .92. The Rosenberg Self-Esteem Scale can be found in Appendix A.

**Relationship commitment.** Own commitment and perceived partner commitment were measured using the commitment level subscale of the Investment Model Scale, taken once from the participant's perspective and again from her partner's perspective (Rusbult et al., 1998). The 7-item subscale is well-tested in the literature and demonstrates strong validity and reliability, with reported Cronbach's alpha values ranging from .92 to .95 (Rusbult et al., 2009; Rusbult et al., 1998). When completing the own commitment level subscale, a participant responded to the following example question: "I will do everything I can to make our relationship last for the rest of our lives," whereas when completing the perceived partner commitment measure, the participant answered a modified version of the question: "My partner will do everything my partner can to make our relationship last for the rest of our lives." Participants responded to each item on a scale ranging from 0 (do not agree at all) to 8 (agree completely). The Cronbach's alphas for own and perceived partner commitment in the present study are as follows: own commitment level (.85), and perceived partner commitment level (.89). Rusbult's commitment level subscale can be found in Appendix A.
**Constraint commitment.** Constraint commitment refers to the forces that maintain a relationship other than positive feelings toward one's partner, for example, staying with a partner due to shared belongings, mutual friends, or pets (Stanley & Markman, 1992). Constraint commitment was defined as the combination of investment size and quality of alternatives, and perceived partner constraint commitment was defined as the combination of perceived partner investment size and perceived partner quality of alternatives. Scores from a measure of investment size and a measure of quality of alternatives were averaged to form the constraint commitment variable, and the Cronbach's alpha of the variable was .48. Scores from a measure of perceived partner investment size and a measure of perceived partner quality of alternatives were averaged to form the perceived partner constraint commitment variable, and the Cronbach's alpha for the variable was .48.

**Investment size.** Own investment size and perceived partner investment size were measured using the investment size subscale of the Investment Model Scale, taken once from the participant's perspective and again from her partner's perspective (Rusbult et al., 1998). The 10-item subscale is well-tested in the literature and demonstrates strong validity and reliability, with reported Cronbach's alpha values ranging from .82 to .84 (Rusbult et al., 2009; Rusbult et al., 1998). The investment size subscale includes five preliminary facet items that are included to enhance the measure quality of the subscale but were not included in formal analysis, based on the recommendation of the authors (Rusbult et al., 1998). An example item from the investment size subscale is: "Many aspects of my life have become linked to my partner (recreational activities, etc.), and I
would lose all of this if we were to break up," whereas on the perceived partner investment size measure, participants responded to the following version: "Many aspects of my partner’s life have become linked to me (recreational activities, etc.), and my partner would lose all of this if we were to break up." Participants responded to each item on a scale ranging from 0 (do not agree at all) to 8 (agree completely). The Cronbach's alphas for own and perceived partner investment size in the present study are as follows: own investment size (.83), and perceived partner investment size (.86). Rusbult's investment size subscale can be found in Appendix A.

**Quality of alternatives.** Own quality of alternatives and perceived partner quality of alternatives were measured using the quality of alternatives subscale of the Investment Model Scale, taken once from the participant's perspective and again from her partner's perspective (Rusbult et al., 1998). The 10-item subscale is well-tested in the literature and demonstrates strong validity and reliability, with reported Cronbach's alpha values ranging from .82 to .88 (Rusbult et al., 2009; Rusbult et al., 1998). The quality of alternatives subscale includes five preliminary facet items that are included to enhance the measure quality of the subscale but were not included in formal analysis, based on the recommendation of the authors (Rusbult et al., 1998). An example item from the quality of alternatives subscale is: "If I weren’t dating my partner, I would do fine–I would find another appealing person to date," whereas on the perceived partner alternatives measure, participants responded to the following question: "If my partner weren’t dating me, my partner would do fine–my partner would find another appealing person to date."

Participants responded to each item on a scale ranging from 0 (do not agree at all) to 8.
agree completely). The Cronbach's alphas for own and perceived partner quality of alternatives in the present study are as follows: own quality of alternatives (.88), and perceived partner quality of alternatives (.90). Rusbult's quality of alternatives subscale can be found in Appendix A.

**Personal dedication.** Personal dedication refers to the positive experience of being in the relationship and one's desire to maintain a relationship (Stanley & Markman, 1992). Personal dedication was defined as the combination of satisfaction and commitment. Perceived partner personal dedication was defined as the combination of perceived partner satisfaction and perceived partner commitment. Own commitment and perceived partner commitment were measured using Rusbult's commitment level subscale of the Investment Model Scale, described previously, completed from the participant's perspective (own commitment) and completed from the partner's perspective (perceived partner commitment).

**Relationship satisfaction.** Satisfaction and perceived partner satisfaction were evaluated in two ways: using the Quality of Marriage Index (Norton, 1985), and using the satisfaction level subscale of the Investment Model Scale (Rusbult, Martz, & Agnew, 1998).

*Quality of Marriage Index – Modified.* First, satisfaction was measured using a modified version of the Quality of Marriage Index (QMI), a 6-item scale that is commonly used to measure marriage satisfaction and demonstrates strong validity and reliability, with a typical Cronbach's alpha of .68 to .86 (Norton, 1985). Questions were altered to describe relational rather than marital satisfaction, and participants completed
this measure once from their own perspectives and again from their partners' perspectives. For example, on the own satisfaction Quality of Marriage Index, the participant responded to the prompt: "We have a good relationship," while on the perceived partner satisfaction Quality of Marriage Index, which followed immediately after, the same participant responded to the prompt: "My partner thinks that we have a good relationship." Participants responded on a scale ranging from 1 (I do not agree at all) to 7 (I completely agree). A final question required participants to select a point on a scale to indicate overall happiness in the relationship from both their own and their partner's perspectives, ranging from 1 (extremely low) to 10 (extremely high). To calculate a score for the Quality of Marriage Index, responses were summed, per the author's recommendation (Norton, 1985). In the present study, the Cronbach's alpha of the own satisfaction Quality of Marriage Index was .95, and the perceived partner satisfaction Quality of Marriage Index was .96. To create the personal dedication variable, the scores for the Quality of Marriage Index and Rusbult's commitment level subscale were summed to maintain consistency between the two scales. For the personal dedication variables, the Cronbach's alphas were as follows: personal dedication (.90) and perceived partner personal dedication (.94). The Quality of Marriage Index – Modified can be found in Appendix A.

*Rusbult's satisfaction level subscale.* Own satisfaction and perceived partner satisfaction were also measured using the satisfaction level subscale of the Investment Model Scale, once from the participant's perspective and again from her partner's perspective (Rusbult et al., 1998). The 10-item subscale is well-tested in the literature and
demonstrates strong validity and reliability, with high reported Cronbach's alpha values ranging from .92 to .95 (Rusbult, Kumashiro, Kubacka, & Finkel, 2009; Rusbult et al., 1998). The satisfaction level subscale includes five preliminary facet items that are included to enhance the measure quality of the subscale but were not included in formal analysis, based on the recommendation of the authors (Rusbult et al., 1998). An example item from the satisfaction level subscale for both own satisfaction is: "My relationship is close to ideal," whereas on the perceived partner satisfaction subscale, participants responded to the following: "My partner's relationship is close to ideal." Participants responded to each item on a scale ranging from 0 (do not agree at all) to 8 (agree completely). The Cronbach's alphas for own and perceived partner satisfaction in the present study are as follows: own satisfaction level (.95), and perceived partner satisfaction level (.95). The two Rusbult measures were averaged to create the personal dedication variables to maintain consistency between the two scales, and the Cronbach's alphas were as follows: personal dedication (.90) and perceived partner personal dedication (.92). Rusbult's satisfaction level subscale can be found in Appendix A.

**Physical attractiveness.** In the picture-rating task, participants viewed in randomized order and rated 8 photos of college-aged men and women for several traits, including physical attractiveness. The photos were chosen from a sample of pilot-tested photos, which were rated for physical attractiveness on a 10-point scale from 1 (not at all) to 10 (extremely) \( (N = 70, M = 4.82; N_{\text{men}} = 49, M = 4.40; N_{\text{women}} = 21, M = 5.79) \). In the pilot tested sample, for men, average ratings ranged from 2.26 to 5.91, while for women, average ratings ranged from 2.33 to 7.53. The photos chosen for the study
included two photos rated low in physical attractiveness (one man, \( M = 2.26 \) and one woman, \( M = 2.33 \)), two photos rated to be average in physical attractiveness (one man, \( M = 3.39 \) and one woman, \( M = 3.53 \)), and four photos rated high in physical attractiveness (two men, Photo 1: \( M = 5.73 \), Photo 2: \( M = 5.91 \) and two women, Photo 1: \( M = 7.34 \), Photo 2: \( M = 7.53 \)).

In the primary study, while viewing the pictures, participants answered questions about each photo on a scale from 1 (not at all) to 5 (extremely), following Miller and Maner (2010), in the following form: "Using the following scale, please rate how [physically attractive, intelligent, flirtatious, outgoing, understanding, compassionate] you find this person:" The rating scales used in the picture-rating task can be found in Appendix B.

**Conception risk.** Five questions were used to create conception risk scores for each participant. Each participant responded in free response blanks to the following questions: "Are you currently on any hormonal contraceptives (e.g., birth control pills, patches, IUDs, Depo-Prevaro):" "Have you ever used hormonal contraceptives (e.g., birth control pills, patches, IUDs, Depo-Prevaro):" and three questions addressing her typical cycle length, the onset of her last period, and when she anticipated the onset of her upcoming period. The ovulatory interview questions can be found in Appendix C.

**Demographic information.** Participants answered a series of demographic questions, including age, sexual orientation, race, relationship status, duration of her relationship with her romantic partner, and the local time. The demographic question form can be found in Appendix D.
RESULTS

A. Conception Risk Calculations

To calculate conception risk, the backward counting method was used, according to the guidelines from Garver-Apgar, Gangestad, & Thornhill (2008). Following this method, it is assumed that the luteinizing hormone (LH) surge occurs 15 days before the onset of menses, with ovulation occurring the following day, or 14 days before the onset of menses. The participants' reported typical cycle lengths were used to predict the next day of cycle onset. For each woman, a value was calculated to indicate how many days before or after her LH peak she completed the study. Then, each woman was put on a 28-day cycle in which ovulation occurred on day 14. Each woman’s cycle was adjusted by changing the follicular phase based on the reported cycle length, while maintaining a 14-day luteal period. If the woman was in the luteal phase, to calculate her day of the cycle when she completed the study, 14 days were added to the number of days after expected ovulation, given cycle length. If the woman was in the follicular phase, to calculate her day of the cycle when she completed the study, a proportion was created based on her typical follicular phase given her cycle length, and that proportion was multiplied by 14. All values were rounded to the nearest day. Each woman was assigned a conception risk score based on the calculations of Wilcox, Dunson, Weinberg, Trussel, & Baird (2001).
All primary analyses were conducted twice, using two sets of conception risk scores: first, a conception risk score was created assuming that the sample consisted of women with regular 28-day cycle lengths. Next, a conception risk score was created for all women, assuming that the sample included women with regular and with irregular cycle lengths (up to 35 days) and the cycles were adjusted to put all women on a 28-day cycle. Because Garver-Apgar, Gangestad, and Thornhill (2008) reported their findings by including all women, all analyses reported in the present study include all women, both those who reported regular cycle lengths and those who reported irregular cycle lengths.

B. Primary Analyses

Because women viewed two photos of highly attractive men and because those photos had similar mean attractiveness scores during pilot testing (Photo 1: $M = 5.73$, Photo 2: $M = 5.91$), a variable was created to represent the average attractiveness of both men. This mean score was used for each analysis. For all analyses, unstandardized betas are reported. Table 1 shows the means, standard deviations, and correlation between the independent and dependent variables used in the analyses.

**Hypothesis 1.** To test hypothesis 1, the proposed plan to use a 2-way ANOVA to evaluate the interaction of relationship status (single, in a relationship) and conception risk (high, low) on physical attractiveness ratings was revised. The existing literature supports testing models that use a continuous variable of conception risk because it is more precise than creating categorical variables of high and low fertility (Garver-Apgar et al., 2008; Gildersleeve et al., 2014; Wilcox et al., 2001). Instead, physical attractiveness ratings were regressed on a dummy-coded relationship status variable,
Table 1
Means, standard deviations, and correlation between the independent and dependent variables

| Variable                              | M   | SD  | 1    | 2    | 3    | 4    | 5    | 6    | 7    | 8    | 9    | 10   | 11   | 12   | 13   | 14   | 15   | 16   | 17   | 18   | 19   | 20   |
|---------------------------------------|-----|-----|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 1. Average of attractive men         | 3.37| 0.81|      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 2. Photo 1 physical attractiveness   | 3.39| 0.97| .84* |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 3. Photo 2 physical attractiveness   | 3.35| 0.96| .84* | .42* |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 4. Relationship status               | 1.52| 0.50| -.04 | -.01 | -.06 |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 5. Conception risk                   | 0.03| 0.03| .00  | .04  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 6. Own commitment (R)                | 6.75| 1.50| .35* | .35* | .26* | .00  | .01  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 7. Partner commitment (R)           | 6.81| 1.61| .17  |     | .12  | .00  | .20  | .51* |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 8. Own constraint commitment         | 4.26| 0.92| .08  |     | -.02 | .00  | .11  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 9. Partner constraint commitment     | 4.29| 1.01| .07  | .14  |     | .00  | -.11 | .02  | .03  | .64* |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 10. Own alternatives                 | 2.44| 1.90| -.08 | -.01 | -.12 | .00  | -.08 | -.31*| -.22*| .63* | .38* |      |      |      |      |      |      |      |      |      |      |      |      |
| 11. Partner alternatives            | 2.58| 2.05| -.02 | .00  | -.04 | .00  | -.23*| -.33*| -.53*| .40* | .60* | .72* |      |      |      |      |      |      |      |      |      |      |      |
| 12. Own investment                   | 6.09| 1.59| .20  | .23* | .11  | .00  | .09  | .50* | .40* | .39* | .28* | -.45*| -.39*|      |      |      |      |      |      |      |      |      |      |
| 13. Partner investment               | 6.04| 1.75| .11  | .15  | .04  | .00  | .14  | .43* | .59* | .29* | .37* | -.41*| -.49*| .83* |      |      |      |      |      |      |      |      |      |
| 14. Own personal dedication (R)      | 5.93| 1.13| .17  | .19  | .11  | .00  | .01  | .49* | .59* | .20  | .20  | -.27*| -.37*| .56* | .67* |      |      |      |      |      |      |      |      |
| 15. Partner personal dedication (R)  | 5.99| 1.15| .18  |     | .23* | .09  | .00  | .08  | .59* | .64* | .08  | .09  | -.31*| -.46*| .47* | .66* | .81* |      |      |      |      |      |      |
| 16. Own satisfaction (R)             | 6.51| 1.63| .14  | .17  | .07  | .00  | .03  | .51* | .61* | .20  | .15  | -.25*| -.41*| .53* | .67* | .93* | .79* |      |      |      |      |      |      |
| 17. Partner satisfaction (R)         | 6.68| 1.52| .19  | .23* | .09  | .00  | .13  | .61* | .62* | .07  | .09  | -.31*| -.44*| .47* | .62* | .78* | .92* | .77* |      |      |      |      |
| 18. Own personal dedication (Q)      | 75.85| 13.58| .23* | .09  | .00  | .07  | .51* | .65* | .18  | .17  | -.26*| -.39*| .52* | .64* | .95* | .79* | .85* | .75* |      |      |      |      |
| 19. Partner personal dedication (Q)  | 76.61| 15.89| .18  | .13  | .00  | .12  | .49* | .72* | .04  | .18  | -.28*| -.44*| .39* | .68* | .77* | .88* | .74* | .80* | .80* |      |      |      |
| 20. Own quality of marriage          | 37.57| 7.57| .15  | .14  | .11  | .00  | .15  | .55* | .71* | .17  | .11  | -.23*| -.45*| .47* | .62* | .84* | .74* | .87* | .72* | .88* | .79* |      |
| 21. Partner quality of marriage      | 38.71| 8.13| .22* | .23* | .15  | .00  | .19  | .54* | .77* | .07  | .09  | -.31*| -.50*| .46* | .66* | .79* | .85* | .77* | .86* | .82* | .92* | .81* |

*Note. *p<.05, (R) = Rusbult's Investment Model Scale, (Q) = Quality of Marriage Index*
conception risk, and the interaction of the dummy-coded relationship status variable and conception risk. Single women served as the reference group. Conception risk was mean-centered to reduce collinearity (Aiken & West, 1992; Cohen, Cohen, West, & Aiken, 2003).

When testing hypothesis 1, the Conception Risk x Relationship Status interaction to predict physical attractiveness ratings was not significant, $B = -3.43$, $t(170) = -0.86$, $p = .39$, and neither association for the lower order effects was significant, all $p’s > .38$. In an exploratory fashion, each photo was tested separately to examine whether one photo might be suppressing the effect. Photo 2 did not show any significant effects, all $p’s > .62$. For Photo 1, however, there was a marginal interaction for Relationship Status x Conception Risk, $B = -8.07$, $t(170) = -1.65$, $p = .09$. However, neither association for the lower order effects was significant, all $p’s > .24$. The interaction was decomposed by testing the simple slope of conception risk by relationship status (single, in a relationship) first with single women as the reference group, and then again with women in a relationship as the reference group. For single women, physical attractiveness ratings and conception risk were not associated, $B = 3.90$, $t(170) = 1.17$, $p = .24$, and for women in a relationship, physical attractiveness ratings and conception risk were not associated, $B = -4.17$, $t(170) = -1.17$, $p = .24$.

Figure 1 illustrates the change in the association of physical attractiveness ratings for Photo 1 and conception risk for each relationship status (single, in a relationship). The lack of significant effects suggests that for women, physical attractiveness ratings did not vary by relationship status, conception risk, or the interaction of relationship status and
conception risk. It is notable, though, that the pattern of effects is a cross-over interaction, suggesting that the effects of conception risk on attractiveness ratings may vary by relationship status, although the present data do not find this interaction to be significant.

Figure 1. Association between Physical Attractiveness Ratings for Photo 1 and Conception Risk by Relationship Status

**Hypothesis 2.** When testing for hypothesis 2, physical attractiveness ratings for the average of attractive men were regressed on own commitment, perceived partner commitment, conception risk, and all higher order interactions among those predictors. Own commitment, perceived partner commitment, and conception risk were mean-centered prior to forming interaction terms to reduce collinearity (Aiken & West, 1992; Cohen et al., 2003).

The 3-way interaction of own commitment, perceived partner commitment, and conception risk was not significant, $B = 1.11, t(83) = 0.98, p = .33$. However, there was a marginal 2-way effect of own commitment and conception risk, $B = -4.36, t(83) = -1.91$,
= .059, and a significant effect of the 2-way interaction of own commitment and perceived partner commitment, B = -.07, t(83) = -2.17, p = .03. There were no other significant effects, all p’s > .14.

The 2-way interaction of own commitment and conception risk was decomposed by testing the simple slope of conception risk at high and low levels of own commitment (i.e., 1 standard deviation above and below the mean level of own commitment). At low own commitment, there was no association between physical attractiveness ratings and conception risk, B = 4.40, t(83) = 0.89, p = .37, but at high own commitment, there was a trend toward an association between physical attractiveness ratings and conception risk, B = -8.73, t(83) = -1.73, p = .08. Additionally, the effect of commitment at high and low levels of conception risk was examined. At high conception risk, there was no association between physical attractiveness ratings and own commitment, B = -.02, t(83) = -0.28, p = .77. At low conception risk, however, there was an association between physical attractiveness ratings and own commitment, B = .24, t(83) = 2.28, p = .02.

Figure 2 illustrates the change in the association between physical attractiveness ratings and conception risk at high and low levels of own commitment. These findings suggest that for women who are less committed to their relationship, physical attractiveness ratings do not vary across the ovulatory cycle. However, for women who are highly committed to their relationship, physical attractiveness ratings are higher at low conception risk and decrease as conception risk increases. This suggests a derogation effect such that when women are most fertile, they tend to rate an attractive alternative as less attractive compared to when they are not fertile. Importantly, attractiveness ratings
did not vary by commitment when women were fertile, but when women were not fertile, women with high relationship commitment rated the alternative as more attractive.

![Figure 2. Association between Physical Attractiveness Ratings and Conception Risk at High and Low Levels of Own Commitment](image)

Next, the significant 2-way interaction of own commitment and perceived partner commitment was decomposed by testing the simple slope of perceived partner commitment at high and low levels of own commitment (i.e., 1 standard deviation above and below the mean level of own commitment) within the full model. There was no association between physical attractiveness ratings and perceived partner commitment at low, $B = .13, t(83) = 1.59, p = .11$, or at high levels of own commitment, $B = -.09, t(83) = -0.84, p = .40$. Additionally, the effects of own commitment on attractiveness ratings at high and low levels of perceived partner commitment were examined. There was no association between physical attractiveness ratings and own commitment at high levels of perceived partner commitment, $B = -.01, t(83) = -.14, p = .88$, or at low levels of...
perceived partner commitment, B = .10, t(83) = 1.48, p = .14.

Figure 3 illustrates the pattern of associations of physical attractiveness ratings for attractive men and perceived partner commitment at high and low levels of own commitment. Although the interaction was significant, the findings suggest that at high and low levels of own commitment, the extent to which a woman perceives her partner to be committed to their relationship does not influence how attractive she finds the alternative man.

Figure 3. Association between Physical Attractiveness Ratings and Perceived Partner Commitment at High and Low Levels of Own Commitment

A better test of the 2-way Own Commitment x Perceived Partner Commitment interaction may come from a model in which only own commitment, perceived partner commitment, and the interaction of the two are included, excluding conception risk and all of its higher order interactions, as this model was the last to explain a significant amount of variability in attractiveness ratings, $R^2$ change = .06, $F(1, 80) = 4.40, p < .05$. 
To decompose the interaction of own and perceived partner commitment, physical attractiveness ratings were regressed on only own commitment, perceived partner commitment and the Own Commitment x Perceived Partner Commitment interaction. There was a significant interaction of own commitment and perceived partner commitment, $B = -.07$, $t(90) = -2.34$, $p = .02$, and a significant association between attractiveness ratings and own commitment, $B = .15$, $t(90) = 2.22$, $p = .02$. There was no association between attractiveness ratings and perceived partner commitment, $B = -.02$, $t(90) = -0.42$, $p = .67$.

The 2-way interaction of Own Commitment x Perceived Partner Commitment was decomposed by testing the simple slope of perceived partner commitment at high and low levels of own commitment (i.e., 1 standard deviation above and below the mean level of own commitment). There was no association between physical attractiveness ratings and perceived partner commitment at low levels of own commitment, $B = .08$, $t(90) = 1.21$, $p = .22$, or at high levels of own commitment, $B = -.13$, $t(90) = -1.63$, $p = .10$. The effects of own commitment on physical attractiveness ratings at high and low levels of perceived partner commitment were also examined. At high perceived partner commitment, there was no association between physical attractiveness ratings and own commitment, $B = .03$, $t(90) = 0.33$, $p = .73$. However, at low perceived partner commitment, there was an association between physical attractiveness ratings and own commitment, $B = .27$, $t(90) = 3.84$, $p < .01$.

Figure 4 illustrates the change in the association of physical attractiveness ratings and perceived partner commitment over high and low levels of own commitment when
conception risk is excluded from the model. Although the slope of partner commitment at high own commitment is not significant, two-tailed, it suggests that women who are committed to their relationship are derogating alternative men when both they and their partner are committed to the relationship. However, the most curious finding is that when women perceive their partner to be low in commitment to their relationship, they find an alternative male most attractive when they are highly committed to their relationship. At low levels of partner commitment, own commitment could be positively associated with attractiveness ratings for several reasons. If a partner is not committed to a relationship, women may not feel like there is a reason to derogate attractive alternatives. Perceiving low commitment from a partner may also motivate the woman to seek out other, more secure relationship options. Women may be motivated to find a more committed partner to ensure that the she can obtain the resources that she needs for any potential offspring, or women may be motivated to find a more committed partner if she feels that her relationship expectations are not met by a relationship in which she is committed, but her partner is not committed in return. Notably, the pattern of effects for this figure is almost identical to that of Figure 3, suggesting that the pattern of findings is the same with and without conception risk in the model.
Hypothesis 3. To test hypothesis 3, two additional analyses were conducted to examine the interactive effects of conception risk and own constraint commitment and perceived partner constraint commitment, and conception risk and own personal dedication and perceived partner personal dedication, each on physical attractiveness ratings.

All constraint and conception risk terms were mean-centered before creating the interaction terms to reduce collinearity amongst the main effects and the product term (Aiken & West, 1992; Cohen et al., 2003). Physical attractiveness ratings were regressed on own constraint commitment, perceived partner constraint commitment, conception risk, and all higher order interactions of those predictors. There was not a significant 3-way interaction of own constraint commitment, perceived partner constraint commitment, and conception risk, $B = .93$, $t(83) = 0.45$, $p = .65$, but there was a significant effect of the 2-way interaction of perceived partner constraint commitment and conception risk, $B =$
10.69, \( t(83) = 2.09, p = .03 \). All other effects were not significant, all \( p's > .18 \).

The 2-way perceived partner constraint and conception risk interaction was decomposed by testing the simple slope of conception risk at high and low levels of perceived partner constraint commitment (i.e., 1 standard deviation above and below the mean of perceived partner constraint commitment) for the average of attractive men. There was a marginal association between physical attractiveness and conception risk at high perceived partner constraint commitment, \( B = 11.54, \ t(83) = 1.81, p = .07 \), and at low perceived partner constraint commitment, \( B = -10.07, \ t(83) = -1.70, p = .09 \). The effects of perceived partner constraint on physical attractiveness ratings at high and low levels of conception risk were also examined. At high conception risk, there was a significant association between physical attractiveness ratings and perceived partner constraint, \( B = .53, \ t(83) = 2.01, p = .04 \). However, at low conception risk, the association between physical attractiveness ratings and perceived partner constraint was not significant, \( B = -.12, \ t(83) = -0.77, p = .43 \).

Figure 5 illustrates the change in the association of physical attractiveness ratings for the average of attractive men and conception risk over high and low levels of perceived partner constraint. The pattern of findings suggest that women differentially evaluate an attractive alternative based on their fertility status and how constrained they perceive their partner to be in their relationship. In particular, when highly fertile, women found the alternative male more attractive when their partner was high in constraint commitment. That is, when women perceived their partners to be in the relationship because of non-relationship factors, or “stuck” in the relationship, they were more likely
to evaluate an attractive alternative as such, potentially because they feel they have the freedom to pursue alternatives without the consequence of relationship dissolution.

![Figure 5. Association between Physical Attractiveness Ratings and Conception Risk at High and Low Levels of Perceived Partner Constraint](image)

Each photo was tested separately to examine whether one photo might be suppressing the effects. When physical attractiveness ratings for Photo 2 were regressed on own constraint commitment, perceived partner constraint commitment, conception risk and all higher order interactions of those predictors, there were no significant effects, and all $p$'s > .22. When physical attractiveness ratings for Photo 1 were regressed on own constraint commitment, perceived partner constraint commitment, conception risk and all higher order interactions of those predictors, the 3-way interaction of own constraint commitment, perceived partner constraint commitment, and conception risk was not significant, $B = .11, t(83) = .04, p = .96$. However, there was a significant 2-way interaction of perceived partner constraint commitment and conception risk for Photo 1, $B = 13.97, t(83) = 2.40, p = .01$. There were no other significant 2-way interactions or
main effects, all $p$’s > .14.

Figure 6 illustrates the change in the association of physical attractiveness ratings for Photo 1 and conception risk at high and low levels of perceived partner constraint. When examining the significant interaction for Photo 1, the pattern of effects mirrored the pattern of the average of both photos, but was stronger, which suggests that Photo 1 may be driving the effect. Similar to the regression on the average of attractive men, physical attractiveness ratings for Photo 1 and conception risk showed a marginal association at high perceived partner constraint, $B = 12.34, t(83) = 1.70, p = .09$; however, there was a significant association between physical attractiveness ratings for Photo 1 and conception risk at low perceived partner constraint, $B = -15.90, t(83) = -2.36, p = .02$.

Figure 6. Association between Physical Attractiveness Ratings on Photo 1 and Conception Risk at High and Low Levels of Perceived Partner Constraint

Again, collinearity was reduced among main effects and the product term by centering all personal dedication terms before creating the interaction terms (Aiken &
West, 1992; Cohen et al., 2003). First, personal dedication and perceived partner personal dedication were examined using Rusbult, Martz, and Agnew's (1998) subscales of satisfaction and commitment. Physical attractiveness ratings for the average of the attractive men were regressed on own personal dedication, perceived partner personal dedication, conception risk, and all higher order effects of those predictors. The 3-way interaction of own personal dedication, perceived partner personal dedication, and conception risk was not significant, $B = -1.98$, $t(83) = -0.77$, $p = .44$, and the lower order effects were also not significant, all $p's > .11$. The same regression analysis was conducted for each photo separately to determine whether one photo was suppressing the effect. However, there was no significant effects for Photo 1, all $p's > .17$, or Photo 2, all $p's > .12$.

Second, personal dedication and perceived partner personal dedication were tested using the Quality of Marriage Index (Norton, 1983) and Rusbult, Martz, and Agnew's (1998) commitment subscale. Physical attractiveness ratings for the average of attractive photos were regressed on own personal dedication, perceived partner personal dedication, conception risk, and all of the higher order interactions. There was not a significant 3-way interaction of own personal dedication, perceived partner personal dedication, and conception risk, $B = -.03$, $t(83) = -1.44$, $p = .15$. However, there was a marginal 2-way interaction of own personal dedication and conception risk, $B = .86$, $t(83) = 1.87$, $p = .06$. No other interactions or main effects were significant; all $p's > .10$.

The 2-way interaction of own personal dedication and conception risk was decomposed by testing the simple slope of conception risk at high and low levels of own
personal dedication (i.e., 1 standard deviation above and below the mean of own personal
dedication) using the average attractiveness score. At high own personal dedication, there
was a marginal association between physical attractiveness ratings and conception risk, B
= 16.89, t(83) = 1.72, p = .08, but at low own personal dedication, there was not an
association between physical attractiveness ratings and conception risk, B = -6.48, t(83) =
-0.99, p = .32. The effects of own personal dedication on attractiveness ratings at high
and low levels of conception risk were also examined. There was not an association
between physical attractiveness ratings and own personal dedication at high conception
risk, B = .02, t(83) = 1.29, p = .19, or at low conception risk, B = -.02, t(83) = -1.38, p =
.17.

The same regression analysis of own personal dedication, perceived partner
personal dedication, and conception risk was conducted for each photo separately to
determine whether either of the photos was suppressing the effect. Photo 2 did not show
any significant effects, all p's > .11. For Photo 1, there was not a significant 3-way
interaction of own personal dedication, perceived partner personal dedication, and
conception risk, B = -.03, t(83) = -1.29, p = .19. However, there was a nearly significant
interaction of own personal dedication and conception risk, B = 1.01, t(83) = 1.98, p =
.051. No other interactions or main effects were significant; all p's > .20.

To decompose the 2-way interaction of own personal dedication and conception
risk for Photo 1, the simple slope of conception risk was examined at high and low levels
of own personal dedication (i.e., 1 standard deviation above and below the mean of own
personal dedication). At high own personal dedication, there was not an association
between physical attractiveness ratings and conception risk, $B = 14.88$, $t(83) = 1.36$, $p = .17$, but at low own personal dedication, there was a marginal association between physical attractiveness ratings and conception risk, $B = -12.67$, $t(83) = -1.74$, $p = .08$.

Additionally, the effects of own personal dedication on physical attractiveness ratings at high and low levels of conception risk were examined. There was not an association between physical attractiveness ratings and own personal dedication at high conception risk, $B = .02$, $t(83) = 1.33$, $p = .18$, or at low conception risk, $B = -.03$, $t(83) = -1.50$, $p = .13$.

Figure 7 illustrates the change in the association of physical attractiveness ratings for Photo 1 and conception risk at high and low levels of own personal dedication. Taken together, the findings for the average of attractive men and Photo 1 alone suggest that women may differentially evaluate an attractive alternative based on conception risk and own personal dedication to the relationship. In particular, when highly fertile, women found the alternative male more attractive when the woman had high personal dedication to her partner, but for women with low personal dedication, physical attractiveness ratings did not vary across the ovulatory cycle.
Figure 7. Association between Physical Attractiveness Ratings for Photo 1 and Conception Risk at High and Low Levels of Own Personal Dedication
DISCUSSION

The goal of the present study was to replicate and extend the findings of Miller and Maner (2010) concerning men's use of derogation as a relationship maintenance strategy, drawing from a population of women. Following Garver-Apgar et al. (2008), the backward counting method was used to calculate conception risk and assign each woman a continuous conception risk score. This method is well-supported in the literature as an ovulation assessment method that can produce precise scores, and that is less likely to result in errors of identifying women as having high conception risk when they have low conception risk, compared to categorical assignment of fertility level (Garver-Apgar et al., 2008; Gildersleeve et al., 2014; Wilcox et al., 2001).

**Hypothesis 1.** First, Miller and Maner (2010) found evidence that when interacting with an ovulating woman, men in a relationship derogated the woman on physical attractiveness, ostensibly as a way of maintaining their current romantic relationship. The first hypothesis of the current study predicted an interaction of relationship status (single, in a relationship) and conception risk (high, low) to predict physical attractiveness ratings given to photos of attractive men. Specifically, single women were expected to give higher ratings at high conception risk, whereas women in a relationship were expected to give lower ratings (or derogate) at high conception risk.
However, physical attractiveness ratings did not vary by relationship status, conception risk, or the interaction of relationship status and conception risk.

Despite not being significant, the pattern of effects showed a cross-over interaction such that women in a relationship showed derogation effects at high conception risk. This finding suggests that the effects of conception risk on physical attractiveness ratings may in fact vary by relationship status, although the current data did not show a significant interaction. One potential explanation for the lack of significance of effects is that the photos of attractive men that were used in the study may not have been physically attractive enough for ratings to vary across the ovulatory cycle, by relationship status. Though a collection of photos was pilot tested to identify photos of highly physically attractive men ($N = 49$), the most highly rated photos of men, which were used in the study, received only mid-range scores of physical attractiveness (Photo 1: $M = 5.73$, Photo 2: $M = 5.91$, on a 10-point scale from *not at all* to *extremely*). Women in a relationship may not have been motivated to derogate the men on physical attractiveness because the photos were not highly attractive, whereas single women may not have found the men in the photos to be attractive as short-term mates at high conception risk. Had photos of highly attractive men with consistent ratings of 9-10 on a 10-point scale been used in the study, there may have been a significant derogation effect for women in a relationship and a significant increase in ratings given by single women.

In addition, the photos of physically attractive men were not evaluated for masculine versus feminine faces during pilot testing. Research has demonstrated that women tend to find feminized faces attractive, except when they are ovulating, when they
find masculinized faces more attractive (Penton-Voak et al., 1999; Penton-Voak et al., 2000). If women perceived the two attractive male faces to be low in masculinity, the women may have been less motivated to derogate them at high conception risk than if they had perceived the faces to be high in masculinity. Since information was not gathered about the level of masculinization for each face, it is possible, that women may have rated the faces differently at high conception risk compared to low conception risk in part due to an effect of how masculine each face was perceived to be.

**Hypothesis 2.** In hypothesis 2, it was anticipated that for women in a relationship, there would be an interaction of own commitment, perceived partner commitment, and conception risk to predict physical attractiveness ratings for attractive men. This hypothesis was based on Miller and Maner's (2010) findings that attached men will derogate a non-partner woman when the woman is ovulating. Women were expected to derogate men when the women were at high conception risk, and had high own and perceived partner commitment. There was not a 3-way interaction of own commitment, perceived partner commitment, and conception risk, but there was a strong trend toward an interaction of own commitment and conception risk. For women with low own commitment, physical attractiveness ratings did not vary across the ovulatory cycle. Women with low own commitment may not have been motivated to derogate alternative partners, perhaps because a high level of relationship commitment is associated with derogation (Johnson & Rusbult, 1989; Lydon et al., 2003; Simpson et al., 1990). If a woman is not devoted to making her relationship last, she may be more willing to consider physically attractive, alternative partners and therefore, will not be motivated to
derogate physically attractive, alternative partners.

However, women with high own commitment demonstrated a strong trend toward giving higher physical attractiveness ratings at low conception risk and decreasing their physical attractiveness ratings of attractive men at high conception risk. This finding supports the hypothesis that women, like men, will derogate alternative partners at high conception risk, and for women, the effect is related to own commitment to the relationship. As Miller and Maner (2010) proposed, derogating alternative partners at high conception risk may be a relationship maintenance strategy. According to the ovulatory shift hypothesis, at high conception risk, women are motivated to seek out men who display cues of genetic fitness because the women have the ability to optimize their own fitness by obtaining those good genes for their offspring (Gangestad & Thornhill, 1998; Gildersleeve et al., 2014). However, for women who are highly committed to their partners, there is also a motivation to stay in the current relationship and maintain that relationship long-term (Johnson & Rusbult, 1989; Rusbult, 1980, 1983). Being committed to a relationship is associated with derogation of alternative partners, particularly on physical attractiveness (Johnson & Rusbult, 1989; Lydon et al., 2003; Simpson et al., 1990). Derogating attractive alternative partners during high conception risk is advantageous to a woman who wants to maintain her current relationship, or more specifically, a woman who is highly committed to her relationship.

Further testing of hypothesis 2 revealed that there was an interaction of own commitment and perceived partner commitment. Physical attractiveness ratings given by women who perceived high partner commitment did not vary based on level of own
commitment. But, when highly committed women perceived low commitment in their partner, the women gave higher ratings compared to women with low own commitment. When low commitment is perceived in a partner, own commitment may be associated with high attractiveness ratings for several reasons. First, when a partner is not perceived to be committed, a woman may not be motivated to derogate alternative partners because she may feel that her relationship will not last and that she should keep her options open. In addition, dyadic well-being is highest when own commitment and perceived partner commitment are equal, so even when a woman has high own commitment, perceiving low partner commitment has the capacity to increase the likelihood of a break-up (Arriaga, Reed, Goodfriend, & Agnew, 2006). A woman may be motivated to look for an alternative partner if she feels that her relationship is not secure and she does not perceive healthy relationship functioning (Drigotas, Rusbult, & Verette, 1999).

Having a partner who is committed to the relationship can help ensure that the woman has the advantage of her mate's resources for any potential offspring (Buss, 1989; Buss & Schmidt, 1993; Gangestad, Garver-Apgar, Simpson, & Cousins, 2007). Coupling, the strategy of forming a long-term monogamous relationship with a chosen mate, increases offspring survival by ensuring that more resources are available to the offspring (Pillsworth, 2005; Pillsworth & Haselton, 2006), and when women perceive low partner commitment, coupling may be an attractive strategy to pursue in other potential mates to compensate for the lack of commitment in the current partner. From another perspective, a woman may have more interest in seeking out alternative partners, if she feels that her relationship expectations are not being met, in this case, if she is not receiving
commitment back from her partner, she may be more willing to seek alternatives that would fulfill her expectations (Rusbult, 1983; Rusbult et al., 1998).

Hypothesis 3. For hypothesis 3, it was predicted that conception risk, constraint commitment, and perceived constraint commitment would not be associated with derogation, whereas conception risk, personal dedication, and perceived personal dedication would be associated with derogation.

Constraint commitment. There was not a significant interaction of conception risk, constraint commitment, and perceived constraint commitment to predict physical attractiveness ratings, but interestingly, there was a significant interaction of perceived partner constraint and conception risk, such that when women in a relationship had high conception risk and perceived their partner to be highly constrained to the relationship, women gave higher ratings to attractive men. On the other hand, when women in a relationship had high conception risk, but perceived their partner to not be constrained to the relationship, women gave low ratings, or derogated, the attractive men.

This finding can be explained in the context of the dual-mating hypothesis proposed by Pillsworth & Haselton (2006). When women felt that their partner did not have better options than to be in the relationship (i.e., had a low quality of alternatives and a large investment size in the relationship), women at high conception risk were more likely to rate a physically attractive alternative partner as high in physical attractiveness. It could be that women with highly constrained partners feel that they have the freedom to seek out alternative partners because their current partner is unlikely to leave the relationship. According to the dual-mating strategy, women can optimize their own
genetic fitness by seeking partners with cues of genetic fitness at high conception risk, while maintaining their long-term partner (Pillsworth & Haselton, 2006). Women with constrained partners may be more able to effectively "get away with" seeking alternative physically attractive partners to optimize their genetic fitness in this way, while maintaining their long-term partnership, which will provide the needed resources for any offspring. On the other hand, when women perceive their partner to be less constrained, they derogate men at high conception risk. If a woman feels that her partner is likely to leave the relationship because he has other viable options and little to lose, a woman may be more wary about seeking alternative partners and trying to use the dual-mating strategy because she is less likely to successfully optimize her genetic fitness if her partner will not stick around to provide long-term resources (Pillsworth & Haselton, 2006).

**Personal dedication.** The interaction of personal dedication, perceived partner personal dedication, and conception risk did not reach significance in predicting physical attractiveness ratings across different levels of conception risk using either the combination of Rusbult, Martz, and Agnew's (1998) scales or using the Quality of Marriage Index (Norton, 1983) and Rusbult, Martz, and Agnew's (1998) commitment subscale. However, the findings suggested that for women in a relationship, there was a trend toward a significant association of own personal dedication and conception risk, when using the Quality of Marriage Index (Norton, 1983) and Rusbult, Martz, and Agnew's (1998) commitment subscale. The findings did not reflect the hypothesized pattern. The hypothesis predicted that women with high personal dedication would
derogate attractive men at high conception risk, but the opposite effect was shown. When women had high conception risk, and high own personal dedication, there was a pattern of giving higher ratings to physically attractive men than women who had low own dedication. There was a crossover interaction in which women with low own personal dedication show a nearly significant difference in physical attractiveness ratings across the ovulatory cycle and a derogation effect at high conception risk.

At low personal dedication, women derogated the physical attractiveness of attractive, non-partner men. Because commitment alone predicted derogation on physical attractiveness ratings, it seems that for those with low own personal dedication, the addition of satisfaction in the personal dedication variable did not change the pattern of derogation for physically attractive men. Rusbult and Martz's (1995) findings on the Investment Model in a population of battered women suggests that it is possible for a relationship partner to experience low satisfaction, but high commitment to a relationship, which could be driving the effects in this situation. Because the scales were summed to create the personal dedication and perceived partner personal dedication variables using the Quality of Marriage Index (Norton, 1983) and Rusbult, Martz, and Agnew's (1998) commitment subscale, low levels of one variable, in this situation relationship satisfaction, may have had more effect on the overall variable than if the two scales were averaged. The scales were summed to maintain consistency between the Quality of Marriage Index (Norton, 1983), a summed scale, and Rusbult, Martz, and Agnew's (1998) commitment subscale, typically, an averaged scale. The creation of personal dedication through summing the Quality of Marriage Index (Norton, 1983) and
Rusbult, Martz, and Agnew's (1998) commitment subscale may also have lead to measurement error, which could account for this counterintuitive finding.

Additionally, women with high personal dedication showed a pattern of giving higher ratings to the physically attractive man in Photo 1 at high conception risk, though the simple slope was not significant and physical attractiveness ratings did not vary by level of personal dedication at high conception risk. It is possible that slightly higher ratings given by women with high personal dedication simply reflect the ovulatory shift hypothesis, the robust finding that women show a shift in attraction to men with physical cues of genetic fitness when the women are fertile (Gangestad & Thornhill, 1998; Gildersleeve et al., 2014). The lack of significance may suggest that women are showing the ovulatory shift in attraction, but may have derogated to some degree, because the ratings were not significantly higher than those of women who had low personal dedication and who showed a derogation pattern. On the other hand, perhaps, women with high satisfaction and commitment do not derogate physically attractive, alternative partners. There may be no need to derogate alternative partners because they feel fulfilled and secure in their current relationship. When women are committed to their relationship, the relationship becomes central to their lives and is highly self-relevant (Agnew et al., 1998), whereas physically attractive strangers are not personally meaningful, and therefore, women may not derogate a physically attractive non-partner because women do not feel the alternative partner will compromise the relationship.

A. Strengths and Limitations

The current study had several strengths. First, data was collected from an online
sample of women between the ages of 18 and 25 rather than from women on a university campus. The sample may be more representative of the general population because participants likely represent a greater variety of geographical locations, education levels, age, and by function of age, relationship statuses (i.e., more engaged and married women) compared to women on a college campus (Gosling, Vazire, Srivastava, & John, 2004).

The study also collected a sample of women who, predominantly, reported correct ovulatory cycle information to the extent that they reported plausible cycle lengths suggesting that they understood the questions being asked, from which valid conception risk calculations could be created and used in analyses. Past studies have revealed that college-aged women have some confusion about what the ovulatory cycle is, which has resulted in incorrect or impossible responses to ovulatory interview questions. However, the questions used in the current study not only asked for cycle length, but also verified cycle length by asking participants to report specific dates of the onset of menses, both before and after the date of the study.

The current study also suffered from some limitations. First, many participants in the sample were excluded for various reasons, resulting in a smaller sample than desired for data analysis. Aside from the analysis of hypothesis 1, all of the other effects were derived from samples of 80-85 women, which compromises the power of the effects. Future studies could benefit from greater numbers of participants to further strengthen and clarify the effects.

A sample of 39 women was excluded for reporting past use of hormonal contraceptives because it was not reported when the women discontinued use of
hormonal contraceptives, and therefore, it was safer to exclude the group. The literature shows that cycle length is affected by hormonal contraceptive use up to three cycles (roughly three months) after discontinued use of hormonal contraceptives (Nassaralla et al., 2011) and studies on conception risk typically exclude women who have used hormonal contraceptives in the last three months (Gildersleeve et al., 2014). Future studies should maintain consistent questions about hormonal contraceptive use and should specifically ask whether women had used hormonal contraceptives in the last three months before completing the study, as is recommended by the literature.

In addition, as mentioned, the attractiveness of pilot tested photos was generally low, and mid-range photos represented the highest ratings. Future studies should seek out a higher number of photos to pilot test and could focus the search for attractive targets by seeking out specific groups of people that tend to be highly physically attractive, for example, models or athletes. In addition, ratings for masculinity and femininity were not collected for the photos used in the study, and high conception risk is associated with attraction toward more masculine faces (Penton-Voak et al. 1999; Penton-Voak et al., 2000). Future studies could introduce computer-modified composite photos of more masculinized and more feminized male faces for ratings or photos could be rated for the degree to which a face is masculine and feminine during pilot testing.

In addition, Miller and Maner (2010) conducted their study using a female confederate who interacted with participants at high and low conception risk points of her ovulatory cycle. The current study assessed physical attractiveness ratings using photos of men, which women viewed in an online study. There may be stronger effects, if the
participant feels that the person they are rating is a real person, that the person is near by, and that the person could be a potential relationship partner, as opposed to viewing photos of people online, who the participant is not likely to meet. It is plausible that derogation is easier when the person feels that they are unlikely to meet the physically attractive alternative partner. On the other hand, women may give higher ratings if they feel that they were able to have a relationship with the person. In addition, in person, it would be possible to make future plans with the alternative partner or even engage in short-term mating behaviors, as in real life. When viewing a photograph, however, there is no communication, and in the case of the current study, no information was given to participants about the people in the photographs, and participants were not told that it would be possible to contact the person in the photo, if they were interested in him or her.

**B. Future Directions**

It would be an important step in future studies to pursue clarification of the mechanism of derogation using eye-tracking equipment to determine whether single women and women in a relationship behave differently when viewing the photos of physically attractive men. The mechanism underlying derogation may be explained by cognitive dissonance or a perceptual tendency. If a perceptual mechanism, women would be expected to attend more to alternative partners when ovulating if they are not fulfilled in their current relationship, whereas if the mechanism is cognitive dissonance, women should not differ in the degree to which they attend to alternative partners, but should derogate men on physical attractiveness to reduce dissonance when they are fulfilled by their current relationship. When viewing the photos of attractive men while at high
conception risk, women may have attended less to the photos of attractive men, following
the perceptual argument. On the other hand, women may have attended the men in the
photos and found them physically attractive, particularly if the women perceived cues of
 Genetic fitness (Gangestad & Thornhill, 1998; Gildersleeve et al., 2014). Consequently,
women may have experienced cognitive dissonance, due to having already chosen to
have a long-term, committed relationship with a current partner, with whom the goal is to
maintain the relationship (Brehm, 1956; Festinger, 1957; 1964) and reduced that
dissonance through derogation of the alternative.

The use of eye-tracking equipment while women evaluate alternative partners
would help clarify the mechanism of derogation as perceptual processes or cognitive
dissonance. Women in a relationship may intentionally divert their eyes more than single
women when viewing a physically attractive alternative partner. Testing for differences
in single women and women in a relationship on gaze patterns, fixation patterns, or time
spent viewing each photo could reveal whether there is a perceptual mechanism at play
that decreases an attached woman's attention to photos of attractive men, operationalized
by extended gazes, increased fixations, or extended viewing time. If there are no
significant differences in attending to photos, based on gaze patterns, fixation patterns, or
time spent viewing each photo, there may be evidence of dissonance reduction acting as
the mechanism in derogation effects.

Additionally, eye-tracking data may reveal a difference in women's reported
physical attractiveness ratings and their true experience of the photo. Research shows that
pupil diameter is associated with one's interest and attention to a stimulus (Hess, 1965;
Hess & Polt, 1960; Laeng & Falkenberg, 2007). Research shows that women's pupil diameter increases across the cycle when viewing sexually significant stimuli, for example, women's own sexual partners (Laeng & Falkenberg, 2007). There is evidence that eye-tracking data is consistent with self-reported preferences of attraction for feminine and masculine male faces (Burris, Marcinkowska, & Lyons, 2014). Eye-tracking data could provide evidence for perceptual processes or cognitive dissonance by confirming that women in fact find men more physically attractive at high conception risk, despite self-reported low physical attractiveness ratings. Evidence would be provided for true derogation if women show more pupil dilation for physically attractive men compared to other photos, but still assign low ratings to those photos. Therefore, finding men physically attractive, but reporting low physical attractiveness would indicate that women are truly derogating the men on physical attractiveness rather than finding them to be unattractive from the start.
REFERENCES


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APPENDIX A

PRELIMINARY MEASURES

1. Rosenberg Self-Esteem Scale

Please record the appropriate answer for each item, depending on whether you strongly agree, agree, disagree, or strongly disagree with it.

1 = Strongly agree
2 = Agree
3 = Disagree
4 = Strongly disagree

_____ 1. On the whole, I am satisfied with myself.
_____ 2. At times I think I am no good at all.
_____ 3. I feel that I have a number of good qualities.
_____ 4. I am able to do things as well as most other people.
_____ 5. I feel I do not have much to be proud of.
_____ 6. I certainly feel useless at times.
_____ 7. I feel that I'm a person of worth.
_____ 8. I wish I could have more respect for myself.
_____ 9. All in all, I am inclined to think that I am a failure.
_____ 10. I take a positive attitude toward myself.
2. Quality of Marriage Index – Modified

<table>
<thead>
<tr>
<th></th>
<th>I do not agree at all</th>
<th>I agree completely</th>
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<tbody>
<tr>
<td>We have a good relationship.</td>
<td>1 2 3 4 5</td>
<td>6 7</td>
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<tr>
<td>My relationship with my partner is very stable.</td>
<td>1 2 3 4 5</td>
<td>6 7</td>
</tr>
<tr>
<td>Our relationship is strong.</td>
<td>1 2 3 4 5</td>
<td>6 7</td>
</tr>
<tr>
<td>My relationship with my partner makes me happy.</td>
<td>1 2 3 4 5</td>
<td>6 7</td>
</tr>
<tr>
<td>I really feel like part of a team with my partner.</td>
<td>1 2 3 4 5</td>
<td>6 7</td>
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Choose the point that best describes the degree of happiness in your romantic relationship. The middle point represents the degree of happiness most get from a romantic relationship.

<table>
<thead>
<tr>
<th>Extremely Low</th>
<th>Extremely High</th>
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<td>1 2 3 4 5 6 7 8 9 10</td>
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3. Investment Model Scale

Satisfaction Level Facet and Global Items

1. Please indicate the degree to which you agree with each of the following statements regarding your current relationship (circle an answer for each item).

| (a) My partner fulfills my needs for intimacy (sharing personal thoughts, secrets, etc.). | Don't Agree At All | Agree Slightly | Agree Moderately | Agree Completely |
| (b) My partner fulfills my needs for companionship (doing things together, enjoying each other’s company, etc.). | Don't Agree At All | Agree Slightly | Agree Moderately | Agree Completely |
| (c) My partner fulfills my sexual needs (holding hands, kissing, etc.). | Don't Agree At All | Agree Slightly | Agree Moderately | Agree Completely |
| (d) My partner fulfills my needs for security (feeling trusting, comfortable in a stable relationship, etc.). | Don't Agree At All | Agree Slightly | Agree Moderately | Agree Completely |
| (e) My partner fulfills my needs for emotional involvement (feeling emotionally attached, feeling good when another feels good, etc.). | Don't Agree At All | Agree Slightly | Agree Moderately | Agree Completely |

2. I feel satisfied with our relationship.

| Do Not Agree At All | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | Agree Somewhat | Agree Completely |

3. My relationship is much better than others’ relationships.

| Do Not Agree At All | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | Agree Somewhat | Agree Completely |
4. My relationship is close to ideal.

0 1 2 3 4 5 6 7 8
Do Not Agree
Agree
At All
Somewhat
Completely

5. Our relationship makes me very happy.

0 1 2 3 4 5 6 7 8
Do Not Agree
Agree
At All
Somewhat
Completely

6. Our relationship does a good job of fulfilling my needs for intimacy, companionship, etc.

0 1 2 3 4 5 6 7 8
Do Not Agree
Agree
At All
Somewhat
Completely
Quality of Alternatives Facet and Global Items

1. Please indicate the degree to which you agree with each statement regarding the fulfillment of each need in alternative relationships (e.g., by another dating partner, friends, family).

(a) My needs for intimacy (sharing personal thoughts, secrets, etc.) could be fulfilled in alternative relationships.

(b) My needs for companionship (doing things together, enjoying each other’s company, etc.) could be fulfilled in alternative relationships.

(c) My sexual needs (holding hands, kissing, etc.) could be fulfilled in alternative relationships.

(d) My needs for security (feeling trusting, comfortable in a stable relationship, etc.) could be fulfilled in alternative relationships.

(e) My needs for emotional involvement (feeling emotionally attached, feeling good when another feels good, etc.) could be fulfilled in alternative relationships.

2. The people other than my partner with whom I might become involved are very appealing.

3. My alternatives to our relationship are close to ideal (dating another, spending time with friends or on my own, etc.).
4. If I weren’t dating my partner, I would do fine—I would find another appealing person to date.

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<th>6</th>
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<tr>
<td>Do Not Agree At All</td>
<td>Agree Somewhat</td>
<td>Agree Completely</td>
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5. My alternatives are attractive to me (dating another, spending time with friends or on my own, etc.).

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<tr>
<td>Do Not Agree At All</td>
<td>Agree Somewhat</td>
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6. My needs for intimacy, companionship, etc., could easily be fulfilled in an alternative relationship.

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<tbody>
<tr>
<td>Do Not Agree At All</td>
<td>Agree Somewhat</td>
<td>Agree Completely</td>
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Investment Size Facet and Global Items

1. Please indicate the degree to which you agree with each of the following statements regarding your current relationship (circle an answer for each item).

<table>
<thead>
<tr>
<th>(a)</th>
<th>I have invested a great deal of time in our relationship.</th>
<th>Don't Agree</th>
<th>Agree Slightly</th>
<th>Agree Moderately</th>
<th>Agree Completely</th>
</tr>
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<tr>
<td>(b)</td>
<td>I have told my partner many private things about myself (I disclose secrets to him/her).</td>
<td>Don't Agree</td>
<td>Agree Slightly</td>
<td>Agree Moderately</td>
<td>Agree Completely</td>
</tr>
<tr>
<td>(c)</td>
<td>My partner and I have an intellectual life together that would be difficult to replace.</td>
<td>Don't Agree</td>
<td>Agree Slightly</td>
<td>Agree Moderately</td>
<td>Agree Completely</td>
</tr>
<tr>
<td>(d)</td>
<td>My sense of personal identity (who I am) is linked to my partner and our relationship.</td>
<td>Don't Agree</td>
<td>Agree Slightly</td>
<td>Agree Moderately</td>
<td>Agree Completely</td>
</tr>
<tr>
<td>(e)</td>
<td>My partner and I share many memories.</td>
<td>Don't Agree</td>
<td>Agree Slightly</td>
<td>Agree Moderately</td>
<td>Agree Completely</td>
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2. I have put a great deal into our relationship that I would lose if the relationship were to end.

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<tbody>
<tr>
<td>Do Not Agree At All</td>
<td>Agree</td>
<td>Somewhat</td>
<td>Completely</td>
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</table>

3. Many aspects of my life have become linked to my partner (recreational activities, etc.), and I would lose all of this if we were to break up.

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</table>
4. I feel very involved in our relationship—like I have put a great deal into it.

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5. My relationships with friends and family members would be complicated if my partner and I were to break up (e.g., partner is friends with people I care about).

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6. Compared to other people I know, I have invested a great deal in my relationship with my partner.

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### Commitment Level Items

1. I want our relationship to last for a very long time.

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2. I am committed to maintaining my relationship with my partner.

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3. I would not feel very upset if our relationship were to end in the near future.

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4. It is likely that I will date someone other than my partner within the next year.

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5. I feel very attached to our relationship—very strongly linked to my partner.

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</table>

6. I want our relationship to last forever.

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7. I am oriented toward the long-term future of my relationship (for example, I imagine being with my partner several years from now).

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</table>

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APPENDIX B

PICTURE-RATING TASK QUESTIONS

Using the following scale, please rate how *physically attractive* you find this person:

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<thead>
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<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
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<td></td>
<td></td>
<td></td>
<td>Extremely</td>
</tr>
</tbody>
</table>

Using the following scale, please rate how *compassionate* you find this person:

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<td></td>
<td></td>
<td></td>
<td>Extremely</td>
</tr>
</tbody>
</table>

Using the following scale, please rate how *intelligent* you find this person:

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<th>4</th>
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<td></td>
<td></td>
<td></td>
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</table>

Using the following scale, please rate how *flirtatious* you find this person:

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<td></td>
<td></td>
<td></td>
<td>Extremely</td>
</tr>
</tbody>
</table>
Using the following scale, please rate how *outgoing* you find this person:

1  2  3  4  5
Not at all  Extremely

Using the following scale, please rate how *understanding* you find this person:

1  2  3  4  5
Not at all  Extremely
APPENDIX C

OVULATORY CYCLE INTERVIEW QUESTIONS

1. Are you currently on any hormonal contraceptives (e.g. birth control pills, patches, IUDs, Depo-Prevaro)?

2. Have you in the past taken any hormonal contraceptives (e.g. birth control pills, patches, IUDs, Depo-Prevaro)?

3. How many days typically occur between your menstrual cycles? (Not how long your menstrual period lasts, e.g., 7 days) Instead we want know how many days occur from the first day of a given menstrual cycle to the first day of your next cycle or, put simply, how often do you get your period.

4. By referring to a calendar, please write the first day of your most recent menstrual period (i.e., the day you most recently began bleeding. That day could have occurred during that past several weeks up through today).

5. By referring to a calendar, please write what you anticipate to be the first day of your next menstrual period (i.e., the day you expect to begin your next period, or the day that you expect to begin bleeding).
APPENDIX D

DEMOGRAPHIC QUESTIONS

Sex
____ Male
____ Female
____ Wish not to answer

Race
____ American Indian or Alaskan Native
____ Hawaiian or Other Pacific Islander
____ Asian or Asian American
____ Black or African American
____ Hispanic or Latino
____ Non-Hispanic White
____ Other
    If other, please list______________________________________
____ Wish not to answer

Age

________________________________________

Sexual Orientation
____ Heterosexual
____ Homosexual
____ Bisexual
____ Other
____ Wish not to answer
**Relationship Status**

_____ Single
_____ In a casual relationship
_____ In a relationship
_____ In a serious relationship
_____ Engaged
_____ Married

If you are in a relationship, how many *months* have you been in your relationship?

__________________________

What is your local time? Type the time in the text box using AM or PM as appropriate. (ex: 00:00 PM)

__________________________