

ABSTRACT

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A BIOSOCIAL APPROACH TO NEGOTIATION: THE JOINT ROLE OF ESTRADIOL AND OPPONENT GENDER.

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The current study advances a biosocial model of negotiation, in which the effects of estradiol and opponent gender on competitive behavior are examined. Sixty-four female participants engaged in a computer-mediated negotiation simulation and completed measures assessing psychological distance, negotiation goals, opponent perceptions, and self-presentation concerns. Results demonstrated that psychological distance, estradiol, and opponent gender interact to predict competitive and conciliatory negotiation behavior. This study carries substantial implications for conflict management theory and practice as it illustrates the joint influence of biological and social situational factors on negotiation behavior.

A BIOSOCIAL APPROACH TO NEGOTIATION: THE JOINT ROLE OF
ESTRADIOL AND OPPONENT GENDER.

By

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Chapter 1: Introduction

Negotiation, or the ways in which individuals manage their interdependence (Walton & McKersie, 1965) pervades interpersonal exchanges, extending into both formal (e.g. organizational) and informal (e.g. personal) contexts. Not surprisingly, a substantial body of literature examines factors that affect negotiation processes and outcomes. The field has explored factors such as the social context of negotiation (e.g., negotiator relationships; Fry, Firestone, & Williams, 1983), cognitions (e.g. biases; Bazerman, Magliozzi, & Neale, 1985), motivation (e.g. prosocial versus proself; De Dreu, 2004), content issues (e.g., interests versus values; Wade-Benzoni et al., 2002), emotions (e.g. positive versus negative emotions; Barry & Oliver, 1996), power (e.g., equal versus asymmetric power; Mannix & Neale, 1993), the temporal context (e.g., time pressure; Carnevale, O'Connor, & McCusker, 1993), communication media (e.g. face-to-face versus electronic communication; McGinn & Croson, 2004), culture (e.g., intracultural versus intercultural negotiations; Gelfand & Brett, 2004), and gender (e.g., Small, Gelfand, Babcock, & Gettman, 2007), among others. However, one factor that has remained neglected is biology.

Organizational psychology arguably prioritizes social-contextual (e.g., group composition) and individual difference (e.g., personality) factors as predictors of behavior. However, recent work has shown the promise of biological factors also predicting a wide range of phenomena. Indeed, biological factors are increasingly being applied to fields such as social psychology and organizational behavior. For example, within the social psychological literature, biological approaches have been applied to diverse topics such as personality (Bouchard, 1999), interpersonal

attraction (Buss, 1994), and race bias (Navarette, Fessler, Fleischman, & Geyer, 2009). Within industrial and organizational psychology, biological approaches have been applied to entrepreneurship (White, Thornhill, & Thompson, 2006), leadership (Zhang, Ilies, & Arvey, 2009), and salary decisions (Senior, Lau, & Butler, 2007).

The recent surge in work relating evolutionary theory to various facets of organizational behavior speaks to the growing acknowledgment of biological influences on social behavior (for a more comprehensive review, see the 2006 *Journal of Organizational Behavior* Special Issue: Darwinian Perspectives on Behavior in Organizations).

The goal of this research is to move the negotiation literature beyond just social contextual factors to examine negotiation behavior as a function of both biological and social factors, or what I refer to as a biosocial approach to negotiation. My central thesis is that neither biological nor social factors alone are adequate to predict negotiation behavior, but that they interact predictably to produce unique patterns of behavior. This thesis is consistent with Gottlieb's (2007) metatheoretical model of probabilistic epigenesis, which emphasizes the reciprocal nature of the gene-environment interaction on affecting behavior. Much research shows that environmental factors influence the expression of genes, ultimately affecting phenotypic (physical or behavioral) outcomes (see Rutter, 2007). Likewise, genetic factors predispose individuals to certain patterns of behavior as she or he engages in their environment. This approach begets a "nature through nurture" model (Shonkoff & Phillips, 2000) in which situational factors constrain or facilitate the expression of biological factors. Employing this approach to study organizational phenomena

entails tailoring the biological and social factors under examination to the exact nature of the topic of interest, and moreover, must be theoretically driven.

In the current study, the biological factor under examination is the hormone estradiol. Estradiol levels fluctuate across the menstrual cycle (see Figure 1), hence providing a suitable avenue for the examination of hormonal variation. Moreover, estradiol has been linked to traits that may exert a considerable influence on negotiation behavior, such as aggression, dominance, and competitiveness (Cashdan, 1995; Michael & Zumppe, 1993; Stanton & Schultheiss, 2007; Zumppe & Michael, 1989). The social factor under examination in the current model is the gender of the negotiation opponent, which I assert operates in conjunction with biological factors to influence behavior. In this biosocial approach to negotiation, I argue that estradiol levels interact with negotiation opponent gender to produce varying levels of competitive and conciliatory cognitions, motives, and behavior. More specifically, evidence from the evolutionary psychology literature suggests that near ovulation (when estradiol levels peak), women should behave more competitively toward other women and less competitively toward men due to distally situated reproductive pressures during periods of high fertility. In contrast, during menstruation (when estradiol levels drop), women should behave equally competitively toward women and men due to a decrease in reproductive pressures as a result of low fertility at this time. These predictions highlight the dynamic nature of biological and social influences on behavior.

In what follows, I provide a roadmap of the literatures relevant to this biosocial approach. First, I discuss a review of evolutionary psychology and its relevance to

the organizational sciences and the current study. Subsequently, I present a review of the literature on estradiol and the menstrual cycle in relation to negotiation-related constructs. Finally, I present the biosocial model of negotiation advanced by the current study, discuss the study conducted, and end with theoretical and practical implications of this research.

Evolutionary Perspectives on Psychology

Evolutionary psychology explains human cognitions and behavior as produced by psychological mechanisms evolved to suit a specific (and usually, but not necessarily, ancestral) environment (Buss, 1995). Such mechanisms are selected for because they increase an organism's likelihood of survival under the constraints of a given environment (Tooby & Cosmides, 2005). Hence, an individual's behavior can be explained as a result of proximal (immediate) and distal (ancestral) influences. In the current study, hormones operate as a proximal mechanism while the motivation to reproduce serves as a distal, and likely subconscious, motivation.

Evolutionary psychological arguments have been applied to several topics of study in psychology, including gender differences (Cramer, Lipinski, Meteer, & Houska, 2008), altruism (Webster, 2008), and competition versus cooperation (Axelrod & Hamilton, 1981), among others. Gender differences in jealousy are a good example of a phenomenon that is elegantly explained by evolutionary psychology. Numerous studies have demonstrated that while men become more distraught over a partner's sexual infidelity, women become more distraught over emotional infidelity (Buss, Larsen, Westen, & Semmelroth, 1992; Buss et al., 1999). Evolutionary psychology offers a compelling explanation for this finding, positing

that gender differences in jealousy arise from the differential implications of sexual versus emotional infidelity. A man's reproductive success is compromised when his partner is sexually unfaithful because he risks investing substantial resources in a child that is not his own. In contrast, a woman's reproductive success is threatened if she loses her partner's resources and assistance in raising her children, such as when he develops an emotional bond with another. This example illustrates how evolutionary pressures (i.e., the need to procreate) may guide individual behavior.

Although still in its embryonic stage in the organizational behavior literature (Sewell, 2004), recent work has begun to shed light on the applicability of the evolutionary perspective to various facets of organizational life (Colarelli, 1998; Hantula, 2003; Ilies, Arvey, & Bouchard, 2006; Markc6zy & Goldberg, 1998; Nicholson, 1998; Nicholson, 2010; Nicholson & White, 2006; Pierce & White, 1999; Shane, 2009; White, Thornhill, & Hampson, 2006). For example, White, Thornhill, and Hampson (2006) found that, in an examination of over 100 male MBA students, those with higher testosterone were more likely to pursue entrepreneurship, an inherently risky undertaking. This association was likely selected for because in an ancestral environment, males high in testosterone tended to achieve greater success (than those lower in testosterone) when taking risks due to the benefits of high testosterone such as physical strength, enhanced visuo-spatial ability, and ease of mate attraction.

The Good Genes Hypothesis

One of the most widely discussed theoretical paradigms in the evolutionary psychology literature, and which is most relevant to the current study, is the good

genes hypothesis (Fisher, 1930). A focal claim of evolutionary theory is that individuals are motivated to produce healthy offspring, so as to ensure the perpetuation of their genes. Hence, mating with a desirable partner is a particularly important pursuit from an evolutionary point of view (Buss, 1995). The good genes hypothesis proposes that females are motivated to mate with desirable males during periods of high fertility (Gangestad, Thornhill, & Garver, 2002). This generally results in the increased use of mate-attraction tactics, such as sending sexually receptive signals to males during ovulation (Haselton, Mortezaie, Pillsworth, Beske-Rechek, & Frederick, 2007; Guéguen, 2009). In contrast, females generally behave competitively towards other females during ovulation, as they represent competition and a threat to mate procurement (Cashdan, 1995; Fisher, 2004). As the cycle progresses, females become less interested in mating as the likelihood of conception decreases, reaching its lowest point during menstruation. During menstruation, females engage in fewer mate-attraction tactics towards males, report lower interest in sexual activity, and exhibit decreased intrasexual competition (Haselton et al., 2007). The good genes hypothesis illustrates an important interaction between menstrual cycle phase and women's behavior towards men versus women.

Several studies within the psychological and biological sciences find ample support for the good genes hypothesis (Buss, 2004; Gangestad & Cousins, 2001; Gangestad, Thornhill, & Garver, 2002; Gangestad, Thornhill, & Garver-Apgar, 2005; Gangestad, Garver-Apgar, Simpson, & Cousins, 2007; Haselton & Gangestad, 2006; Pillsworth & Haselton, 2006). For example, empirical work has demonstrated that women report higher sexual interest (Bullivant et al., 2004; Regan, 1996; Stanislaw &

Rice, 1988), prefer more masculine features in men (Feinberg et al., 2006; Gangestad et al., 2007), wear more revealing clothing (Durante, Lee, & Hasleton, 2008; Haselton et al., 2007), are more receptive to male advances (Guéguen, 2009), and exhibit more intrasexual competition- in other words- competition toward other females (Cashdan, 1995; Fisher, 2004) during ovulation.

For example, in a recent field study, Guéguen (2009) examined women's responses to male advances across the cycle. Male confederates approached young women at a nightclub during a slow song and asked to dance. Upon leaving the club, women provided information about their cycles. Results showed that women in the fertile phase agreed more favorably to the dance request than did women in luteal or menstrual phases. Additional research shows that women exhibit increased interest in men other than their partner (Gangestad, Thornhill, & Garver, 2002), feel sexier (Haselton & Gangestad, 2006), and report a higher interest in attending social gatherings (Haselton & Gangestad, 2006) during ovulation. Furthermore, women are more likely to compete with other women when ovulating. For example, Fisher (2004) found that when asked to evaluate other women's attractiveness, women derogated each other significantly more during ovulation than during menstruation, illustrating increased intrasexual competition between females at periods of high fertility.

Numerous studies have also demonstrated a link between estradiol and aggressive behavior (Cashdan, 1995; Michael & Zumpe, 1993; Stanton & Schultheiss, 2007; Zumpe & Michael, 1989). For example Stanton and Schultheiss (2007) and Stanton and Edelstein (2009) found a positive relationship between estradiol levels and

implicit power motivation (a preference for having influence and dominance over others). In a similar vein, Cashdan (1995) investigated the hormonal correlates of dominance and status in college-age women. Participants' nonverbal behavior was examined for indicators of dominance, which were examined in conjunction with hormone levels and peer rankings of a dominance hierarchy. Results showed that estradiol was related to nonverbal behaviors indicating dominance and an enhanced perception of one's own social status among other women. Other studies have linked estradiol to dominating and aggressive behaviors, such as assertive posture, in non-human animals (Gandelman & Simon, 1980; Mayer, Monroy, & Rosenblatt, 1990; Mayer & Rosenblatt, 1987; Michael & Zumpe, 1993; Rosenblatt Hazelwood, & Poole, 1996; Zumpe & Michael, 1989).

In addition, the literature regarding person perception across the menstrual cycle has also uncovered substantial findings regarding gender salience, which likely contribute to an increased motivation to attract or compete for a mate (Johnston, Arden, Macrae, & Grace, 2003; Macrae, Alnwick, Milne, & Schloerscheidt, 2002; Senior, Lau, & Butler, 2007). In general, masculinity and femininity tend to be more salient during ovulation. According to the good genes hypothesis, this increased salience serves the purpose of further intensifying mate-attraction or competition techniques. For example, Macrae et al. (2002) found evidence that gender, especially masculinity, is more salient to women during ovulation. Participants were asked to identify 100 faces as male or female and to categorize 64 terms as typically masculine or feminine at two points in the cycle, high fertility and low fertility. Participants' responses times were fastest, both when identifying male faces and when categorizing

typically masculine terms, during ovulation. Likewise, Senior, Lau, and Butler (2007) found that menstrual cycle phase and perceptions of masculinity affected social decision-making in an organizational context. Female participants engaged in a resource assignment task during either ovulation or menstruation. The task involved considering dominant- or non-dominant looking male employees for social status job packages. The theory underlying this paradigm stems from the notion that dominant features in males generally indicate good health and therefore an attractive mating partner. As predicted, ovulating women were more likely to assign high-status job packages to dominant-looking men as opposed to non-dominant looking men. Other work provides evidence that femininity is also more salient to women during periods of high fertility (Brinsmead-Stockham, Johnston, Miles, & Macrae, 2008), although the literature remains mixed (Johnston, Arden, Macrae, & Grace, 2003).

To date, one study has employed evolutionary theory to the examine negotiation behavior. Lucas, Koff, and Skeath (2007) examined changes in women's monetary offers to other women in an ultimatum game across the menstrual cycle. Results demonstrated that during ovulation women made lower offers and rejected opponent offers more frequently than menstruating women and women in a control group (contraceptive users). These findings are consistent with increased intrasexual competition during ovulation as predicted by the good genes hypothesis. Although the Lucas, Koff and Skeath (2007) study was well-designed, it suffered from uneven sample sizes and only examined female-female pairs, and only included self-reported cycle information. Nonetheless, their work provides preliminary data for a

relationship between fertility risk and bargaining, upon which the current study builds by incorporating social contextual factors.

The Biosocial Approach in the Current Study

The above review has illustrated how both biological factors and aspects of the situation exert an important influence on individuals' behavior. In this model, I propose that hormonal fluctuations across the menstrual cycle interact with opponent gender to influence the negotiation dynamic.

The evolutionary perspective proposes that time in the cycle should dictate women's motivation to attract a desirable male partner while competing with other females. I propose that, during ovulation, women will attempt to attract male partners by engaging in cooperative, rather than competitive behavior. The use of cooperative as opposed to competitive tactics to foster interpersonal attraction is supported by Eagly's (1987) social role theory. Social role theory posits that men and women occupy different roles in society as dictated by norms, expectations, and social sanctions. Individuals who deviate from their prescribed role are often subject to criticism and punishment from others (Bem & Lenney, 1976). Following this, logic dictates that if one's goal is to attract another, it is best to behave in a gender-congruent manner. Feminine roles are generally described as warm, nurturing, and soft, while masculine roles are more strong, forceful, and assertive. Hence, behaving in a gender-congruent manner for a woman entails being cooperative as opposed to competitive, which I expect to occur in negotiations with male opponents. In contrast, women's motivation to compete with other females should manifest in the form of aggressive negotiation behavior with female opponents. When reproductive

pressures are minimal, such as during menstruation, behavior towards male and female opponents is expected to be more similar.

Hypotheses

The hypotheses of the present study hinge on an important interaction between women's estradiol levels and the gender of the negotiation opponent. Consistent with extant research (Van Kleef, De Dreu, & Manstead, 2004), I concentrate on both competitive intentions and actual offer behavior in a negotiation simulation. I propose that women should behave less competitively toward a male negotiation opponent, and more competitively toward a female negotiation opponent during ovulation, when estradiol levels are high. In contrast, women should behave equally competitively and cooperatively towards male and female negotiation opponents during menstruation, when estradiol levels are low. Competitive behavior is assessed using measures of negotiation intentions, minimum point goals for the negotiation, and actual offer behavior in a negotiation task, thereby generating three general hypotheses:

Hypothesis 1a: During ovulation, women will report less competitive intentions when negotiating with a male opponent and more competitive intentions when negotiating with a female opponent.

Hypothesis 1b: During menstruation, women will report equally competitive intentions when negotiating with a male or female opponent.

Hypothesis 2a: During ovulation, women will specify lower (less competitive) point goals when negotiating with a male opponent and higher (more competitive) point goals when negotiating with a female opponent.

Hypothesis 2b: During menstruation, point goals will be approximately equal when negotiating with a male or female opponent.

Hypothesis 3a: During ovulation, women will make higher (less competitive) offers to male opponents and lower (more competitive) offers to made to female opponents.

Hypothesis 3b: During menstruation, offer levels will be approximately equal for male and female opponents.

Figure 2 illustrates the expected interaction between menstrual cycle phase and opponent gender on the general construct of competitiveness (note that the intercept of the two lines, i.e. the relationship between absolute levels of competitiveness between ovulating and menstruating women, is unknown).

Exploratory Factors

Although the primary dependent variable in the current study is competitiveness in a simulated negotiation context, I explore numerous other factors that may play a role in the proposed biosocial model. These factors include psychological distance, perceptions of the negotiation opponent, self-presentation concerns, and anxiety toward negotiation.

Psychological Distance.

Psychological distance is defined as, “a subjective experience that something is close or far away from the self, here, and now” (pp. 117, Trope & Liberman, 2010). Psychological distance may exist across various dimensions, including temporal distance, spatial distance, hypotheticality, and social distance. In the current study, psychological distance is assessed by asking the participant how close they feel to their opponent. A large body of literature demonstrates the effects of psychological

distance on numerous constructs such as interpersonal attraction (Cialdini et al., 1976), social comparison processes (Tesser & Campbell, 1982), and self-evaluation (Tesser, 1988) among others. As such, psychological distance serves as an important exploratory factor in the current study.

Perceptions of the Opponent.

Given the importance of person perception in the development of interpersonal attraction (Buss, 1994), I examine whether estradiol interacts with the gender of the opponent to predict perceptions of the opponent (e.g., strength, warmth) and desired interpersonal contact. For example, it is likely that women have an increased desire for interpersonal contact with male opponents during ovulation, as opposed to menstruation, which may contribute to more conciliatory offers as a mate attraction technique.

Self-Presentation Concerns.

Self-presentation concerns indirectly tap into an individual's motivation to attract or compete with her negotiation opponent. In order to assess motivation to attract versus compete, participant desire to be perceived by their opponent as warm versus strong will be measured, which presents interesting opportunities for exploration. For example, I argue that ovulating women may attempt to attract male negotiation partners by behaving in a gender-congruent manner (consistent with Eagly, 1987). If this is the case, ovulating women should report attempting to appear warm as opposed to strong when negotiating with a male.

Anxiety Toward Negotiation.

A substantial body of literature examining gender and negotiation has demonstrated that women often feel anxious toward negotiation (Kray & Gelfand,

2009; Small, Gelfand, Babcock, & Gettman, 2007). Given that my sample was comprised of all women, anxiety toward negotiation seems an important construct to assess. Furthermore, it is possible that women experience more anxiety when negotiating with a male opponent given the general perception of negotiation as a masculine task (Bowles, Babcock, & McGinn, 2005) and/or due to the general anxiety that often accompanies feelings of interpersonal attraction (Rose & Frieze, 1993). Alternatively, perceptions of a female opponent as a threat could similarly contribute to anxiety toward negotiation.

Overview of the Study

The current study employed a lab-based paradigm in which the participant engaged in a computer-mediated negotiation task that has been widely used to study competition and cooperation in negotiation (De Dreu & Van Lange, 1995; Hilty & Carnevale, 1993; Van Kleef & Côté, 2007; Van Kleef & Van Lange, 2008), ostensibly with another participant. The gender, attractiveness and masculinity/femininity of the negotiation opponent were controlled using a picture and endorsement of gender-consistent activities. This design allowed for an examination of naturally occurring negotiation behavior in a systematically controlled environment. The use of a computer agent is preferred over the use of human confederates, as the latter can introduce a great amount of variability into the experiment via subtle differences in confederate attractiveness, masculinity, or femininity (among other factors).

A unique aspect of this study is that estradiol levels were measured in addition to self-reported menstrual cycle dates. Participants were scheduled to participate during

ovulation or menstruation and estradiol samples were collected upon arrival at the lab. This resulted in a 2 (opponent gender: male or female) x 2 (menstrual phase: ovulation or menstruation) design. After being presented with information regarding their negotiation opponent, participants completed measures designed to assess perceptions of the negotiation opponent, self-presentation concerns, psychological distance, anxiety, intentions, and goals for the upcoming negotiation. Participants then engaged in the computer-mediated negotiation task. This methodology allows for a clean yet comprehensive examination of individuals' hormone levels, cognitions, attitudes, and behavior in negotiation situations.

Chapter 2: Method

Participants

Participants included 62 University of Maryland female undergraduates. Nine participants were excluded from final analyses due to failing a suspicion check, while an additional seven were excluded due to the unavailability of saliva samples, leaving a final sample size of 46 individuals. Participants' mean age was $M=19.14$ years, $SD=1.54$ years and the racial composition was 47.8% White, 21.7% African American, 8.7% Asian, 8.7% Hispanic, 2.2% multi-racial, 2.3% other and 4.3% unreported.

Participants were screened for eligibility in the study using the following criteria: 1) female, 2) not pregnant, 3) not using hormonal birth control (currently and for at least 3 months prior to the experiment), 4) having a regular menstrual cycle, and 5) able to report with relative confidence (5, 6, or 7 on a 7-point scale of confidence) the date of the first day of their last menstrual cycle. A complete version of the eligibility

questionnaire is available in Appendix B. Participants were asked to come into the lab during menstruation (days 1-5) or ovulation (day 14) as calculated by self-reported cycle dates.

Procedure

Twenty-four hours before the experiment, participants were sent a reminder e-mail that instructed them **not** to 1) consume alcohol 12 hours prior to the study, 2) eat a major meal or brush their teeth within one hour of study, and 3) chew gum, eat candy, or drink soda/juice within 20 minutes of the study (as suggested by Salimetrics, 2007). Upon arrival at the lab, participants were placed alone in a room to provide the saliva sample. Subsequently, the participant was asked to provide information about their three favorite hobbies and to have their picture taken, both for the purposes of reducing suspicion (this mirrors the information that participants would receive about their ostensible opponent). At this point, the experimenter started a computer program, which presented instructions regarding the negotiation task. After these instructions, a screen instructed the participant to notify the experimenter. Upon being notified, the experimenter provided the participant with information regarding their negotiation opponent (a list of hobbies and a picture displayed on the computer screen) and instructed the participant to continue. The computer program continued and asked participants to complete measures assessing perceptions of the opponent, self-presentation concerns, psychological distance, anxiety, and negotiation intentions and goals. After these questionnaires, the participant engaged in the negotiation task, provided demographic information and underwent a suspicion check.

Materials

Opponent Gender Information.

Opponent gender and masculinity/femininity were controlled using a picture of an attractive college-aged man (Figure 3) or woman (Figure 4), sitting in a room similar to that of the participant, and a list of gender-specific hobbies. The male and female pictures were selected from a larger set of 12 pictures that were rated on attractiveness (using a 1 to 7 scale, 7 being “extremely attractive”) by 39 undergraduate students. The male ($M=5.00$, $SD=1.04$) and female ($M=5.14$, $SD=1.21$) photos were both rated as significantly above average, and similar to each other, on attractiveness.

The male hobbies included “rock climbing, working out, and hanging out with friends,” while the female hobbies included “dancing, fashion, and hanging out with friends.” These hobbies were selected from a longer list of 14 hobbies that were rated on masculinity and femininity (using a 1 to 7 scale, 7 being “extremely masculine/feminine” depending on the hobby) by 20 undergraduate students. Rock-climbing ($M=4.9$, $SD=1.02$) and working out ($M=5.7$, $SD=0.80$) were among the most masculine, while dancing ($M=6.2$, $SD=0.70$) and fashion ($M=5.65$, $SD=0.99$) were among the most feminine. One gender-neutral activity, “Hanging out with friends” was chosen to increase believability of the stimuli. These hobbies were also selected because they do not impart an inordinate amount of information about socioeconomic status, intelligence, or other confounding variables. These stimuli were designed to represent a desirable potential male partner and a formidable potential female competitor via their highly gender-stereotypic nature.

Negotiation Task.

The negotiation task, adapted from Van Kleef, De Dreu, & Manstead (2004), was designed to measure competitive negotiation behavior with a standardized opponent. Although computer-mediated, the task shares many similarities with real-life negotiation (e.g., multiple issues differing in utility to the negotiator, information about one's own payoffs only, and the typical offer-counteroffer sequence; Van Kleef, De Dreu, & Manstead, 2004). Such computer-mediated negotiation simulations are commonly used in the literature and have shown substantial real-world applicability (De Dreu & Van Lange, 1995; Hilty & Carnevale, 1993; Van Kleef & Côté, 2007; Van Kleef & Van Lange, 2008).

The negotiation involved a conversation between a buyer and seller of a consignment of mobile phones who are instructed to negotiate about three issues: 1) price, 2) warranty period, and 3) contract duration. All participants were assigned to the seller role. Prior to negotiating, participants were presented with a payoff chart that specified a point value for each option within the negotiation (Table 1). This table allows the participant to see what their best outcome would be (the highest number of points). As specified in the table, price for Level 9 (\$110) yields a 0 payoff and for Level 1 (\$150) yields a 400 payoff (i.e., increments of 50 points per level). For warranty period, Level 9 (9 months) yields a 0 payoff, and Level 1 (1 month) yields a 120 payoff (i.e., increments of 15 points per level). Finally, for duration of service contract, Level 9 (9 months) yields a 0 payoff, and Level 1 (1 month) yields a 240 payoff (i.e., increments of 30 points per level). Participants were explicitly told what their best and worst outcomes would be (maximum versus

minimum number of points) and completed a brief quiz to ensure that they understood.

After taking time to review role information and instructions, participants were given 15 minutes to negotiate with their ostensible opponent over six rounds of offers. In accordance with Van Kleef, De Dreu, and Manstead's (2004) paradigm, once the negotiation started, the buyer (i.e., the computer) made a first offer. Over the negotiation rounds, the buyer proposed the following levels of agreement (for price - warranty - service): 8-7-8 (Round 1), 8-7-7 (Round 2), 8-6-7 (Round 3), 7-6-7 (Round 4), 7-6-6 (Round 5), and 6-6-6 (Round 6). Past research has shown that this preprogrammed strategy has face validity and is seen as intermediate in cooperativeness and competitiveness (De Dreu & Van Lange, 1995; Van Kleef, De Dreu, & Manstead, 2004). The negotiation terminated if a demand by the participant equaled or exceeded the offer the computer was about to make in the next round. Thus, for example, if the participant demanded 7-6-6 in Round 4, this demand resulted in a termination of the negotiation because the buyer's next offer (in Round 5) would have been 7-6-6. After the sixth round, the negotiation will be stopped regardless of whether participants reach an agreement (cf. De Dreu & Van Lange, 1995; Van Kleef et al., 2004). Figure 5 depicts a screenshot of the negotiation program and instructions for the negotiation task are available in Appendix A.

Measures

Assessment of Estradiol Levels.

In order to avoid suspicion on the part of the subjects, participants were told that saliva samples would be used to "examine normal body chemistry." Participants were asked to passively salivate through a straw into a vial, which was then stored in

a freezer at -80°C. These samples were later sent to the Kirschbaum lab at the Technical University of Dresden for analysis. The Kirschbaum lab is a global leader in the development of salivary analysis techniques and is frequently entrusted with samples from universities around the world. Using salivary assays for estradiol analysis is a common and accurate technique (Grammer, Renninger, & Fischer, 2004; Jasienska et al., 2006; Mead & Hampson, 1997; Rantala, Eriksson, Vainikka, & Kortet, 2006).

Perceptions of the Opponent.

Following the presentation of information about their negotiation partner, participants completed various measures regarding their perceptions of the opponent. Maximum likelihood factor analysis using varimax rotation identified two factors, one tapping into perceptions of *opponent strength* (8 items: strong, competitive, powerful, aggressive, assertive, masculine, weak (reverse-coded), feminine (reverse-coded)) and another tapping into *opponent warmth* (3 items: kind, warm, friendly) as well as two single-item measures for *opponent attractiveness* and *intelligence*. Descriptive statistics and reliability estimates for all measures are available in Table 2.

Desire for interpersonal contact was measured using a single factor, three item measure (“how much do you think you would enjoy talking/going to a party with/having dinner with your opponent?”).

Self-Presentation Concerns.

Immediately after assessing their negotiation partner, participants completed measures assessing how they would like to be perceived by the negotiation partner. Maximum likelihood factor analysis using varimax rotation identified two

dimensions, one of *self warmth* (3 items: kind, warm, understanding) and one of *self strength* (3 items: strong, aggressive, competitive).

Psychological Distance.

The psychological distance measure was based on Bogardus's (1947) social distance scale. Participants were asked to think about a person that they felt the closest to in their life and assign a +5 to that person. Then, they were asked to specify how close they felt to the opponent using a -5 to +5 scale.

Anxiety Toward Negotiation

Anxiety toward negotiation was assessed using a single factor, 5-item measure (anxious, embarrassed, nervous, comfortable (reverse-coded), relaxed (reverse-coded)).

Negotiation Intentions

To tap into participants' objective negotiation goals, they were asked to specify the total minimum number of points they would deem acceptable. Participants also completed measures tapping into more subjective goals and priorities, which varied along dimensions of *cooperating* (5 items: reaching agreement, cooperating, achieving a good outcome for both parties, achieving the best outcome for myself (reverse-coded)) and *competing* (3 items: trying to compete, doing better than the other participant, not losing the negotiation), as identified by maximum likelihood factors analysis with varimax rotation.

Objective Negotiation Outcomes.

The point values associated with offers in the negotiation task provides an objective measures of competitiveness. In accordance with Van Kleef, De Dreu, and Manstead (2004), the offers made by participants in each round were transformed into

an index revealing the negotiator's total level of demand across rounds (e.g., mean levels of offers for price, warranty, and service).

Demographics.

After the negotiation exercise, participants were asked to provide information regarding their age, race, relationship status (single or in a relationship), and the first day of their last menstrual cycle (for reliability purposes).

All measures are available in Appendix B.

Chapter 3: Results

Descriptive Statistics and Tests of Hypotheses

As a first step in analyses, correlations among variables were examined. Several predictable relationships emerged, such as a positive correlation between strong-self presentation and competitive intentions. Descriptive statistics and item inter-correlations are presented in Table 2. Control variables (race, relationship status, and age) did not affect variables of interest and will therefore not be further discussed.

Main effects of opponent gender and estradiol on dependent variables were examined as a subsequent step in analyses. There was an approximately equal number of participants in the male (N=24) and female (N=22) conditions. Opponent gender has a significant effect on perceptions of opponent strength (Male: $M=5.78$, $SD=.47$; Female: $M=4.05$, $SD=.71$.; $t(44)=-9.78$, $p=.00$.) and the desire to be perceived as warm (Male: $M=5.77$, $SD=.79$; Female: $M=5.06$, $SD=1.07$; $t(44)=-2.587$, $p=.013$; see Table 3 for additional opponent gender analyses). Estradiol is negatively correlated with warm-self presentation, but does not have a relationship with any other variables.

To test my hypotheses, the gender and estradiol interaction was examined across multiple variables using linear regression. There were no significant two-way gender by estradiol interactions on any variables of interest. Hence, hypotheses were not supported.

Exploratory Analyses

Subsequently, analyses were conducted to probe interactions between gender, estradiol, and exploratory factors. A three-way interaction emerged between gender, estradiol, and psychological distance on *mean offers* made in the negotiation simulation ($\beta=5.305, p=.04$), *acceptable minimum goal* ($\beta=-6.158, p=.016$), *anxiety toward negotiating* ($\beta=6.431, p=.051$), perceptions of *opponent warmth* ($\beta=4.482, p=.075$), perceptions of *opponent strength* ($\beta=4.189, p=.004$), and *desired contact* with the opponent ($\beta=4.277, p=.084$). Please refer to Table 4 for comprehensive statistics.

In order to probe the nature of the three-way interactions between gender, estradiol, and psychological distance, graphs were created to illustrate within-gender effects of psychological distance as moderated by high and low levels of estradiol across multiple dependent variables (see Figures 6-17). High and low levels of estradiol are defined as one standard deviation above or below the mean, respectively (Aiken & West, 1991; Dawson & Richter, 2006). Subsequently, simple slopes analyses (Aiken & West, 1991; Friedrich, 1982) were conducted to further probe the nature of these interactions and regression analyses were conducted to determine the significance of within-gender psychological distance by estradiol interactions (see Table 5). Graphs depicting within-gender two-way estradiol by psychological distance interactions were chosen over graphs depicting the three-way interactions

between gender, estradiol, and psychological distance as the former provides a clearer visualization of the pattern of results.

Negotiation offers made during the simulation and minimum point goals specified prior to negotiating provide an objective measure of competitiveness, while anxiety toward negotiation, perceptions of opponent warmth, perceptions of opponent strength, and desire for interpersonal contact with the opponent tap into more subjective aspects of the negotiation experience. Between- and within-gender findings across these variables are discussed below.

Negotiation Offers

When negotiating with a female opponent, low estradiol levels are linked to *less* competitive offers as psychological distance decreases (or in other words, as closeness increases; $\beta = -1.245, p = .094$). In contrast, high estradiol levels trend towards predicting *more* competitive offers as psychological distance decreases ($\beta = .190, p = .464$). This interaction is illustrated in Figure 6. Put simply, women with low estradiol levels are less competitive towards female opponents they perceive as being close than with female opponents they perceived as being distant. In contrast, women with high estradiol trend towards being more competitive with female opponents they perceive as close than with those they perceive as distant. The overall psychological distance by estradiol interaction for female opponents is significant ($\beta = .717, p = .088$).

Offers made to male opponents exhibit nearly the exact opposite pattern, as *low* levels of estradiol are linked to more competitive offers as psychological distance decreases ($\beta = -.771, p = .035$), while *high* levels of estradiol trend towards predicting less competitive offers as psychological distance decreases ($\beta = .279, p = .30$). The

psychological distance by estradiol for male opponents is significant ($\beta = -.525, p = .03$; See Figure 7). As noted, these results demonstrate the opposite pattern demonstrated in negotiations with female opponents, a trend that replicates across other dependent variables of interest.

Minimum Point Goal

Results for minimum goal exhibit a similar pattern to mean offers. In negotiations with a female opponent, low estradiol is linked to *less* competitive goals as psychological distance decreases ($\beta = 1.349, p = .038$), while high estradiol is linked to *more* competitive goals ($\beta = -.436, p = .06$) as psychological distance decreases (see Figure 8). The two-way interaction for female opponents is significant ($\beta = -.893, p = .017$). As is the case with mean offers, negotiations with a male opponent exhibit a markedly different pattern. While high estradiol trends toward predicting *less* competitive goals as psychological distance decreases ($\beta = .568, p = .124$), low estradiol trends toward predicting *more* competitive goals ($\beta = -.345, p = .218$) as psychological distance decreases (see Figure 9). This within-gender two-way interaction is also significant ($\beta = .457, p = .065$).

Anxiety, Opponent Warmth, Opponent Strength, and Desired Contact

Anxiety toward negotiation, opponent warmth, opponent strength, and desired contact demonstrate fascinating patterns in negotiations with a female opponent. Consistent with findings for mean offer and minimum goal, results across these variables suggest a link between prosocial attitudes and closeness in low-estradiol women, but a link between competitive attitudes and closeness in high-estradiol women. However, these variables do not vary not vary as a function of estradiol and

psychological distance when negotiating with a male opponent, which will be further discussed below. (see Figures 11, 13, 15, and 17).

In the case of the female opponent, results for anxiety toward negotiation demonstrate that low estradiol is positively related to anxiety levels as psychological distance decreases ($\beta = -1.829, p = .07$), while high estradiol levels are unrelated to anxiety ($\beta = .049, p = .851$). The two-way interaction between estradiol and psychological distance is significant ($\beta = .939, p = .074$; see Figure 10). Perceptions of female opponent warmth demonstrate a similar pattern, as low estradiol links positively to opponent warmth as psychological distance decreases ($\beta = -1.314, p = .063$), while no interaction emerges for high estradiol ($\beta = -.005, p = .983$). This two-way interaction is significant ($\beta = 0.654, p = .098$; see Figure 12).

With regard to perceptions of female opponent strength, low estradiol links to higher perceptions of strength as psychological distance decreases ($\beta = -1.566, p = .029$), while high estradiol trends toward predicting lower perceptions of strength ($\beta = .338, p = .172$) as psychological distance increases. The two-way interaction is significant ($\beta = .530, p = .20$; see Figure 14). Finally, low estradiol is positively linked to desired contact with a female opponent as psychological distance decreases ($\beta = -1.368, p = .048$), while high estradiol is negatively linked to desired contact as psychological distance decreases ($\beta = .521, p = .038$). This interaction is also significant ($\beta = -.570, p = .018$; see Figure 16).

The lack of a significant estradiol by psychological distance interaction across these variables in the case of the male opponent prompted further analyses. A significant correlation emerged between psychological distance and perceptions of

male opponent warmth ($r=-.413, p=.045$) and strength ($r=-.348, p=.095$), and the desire for interpersonal contact ($r=-.404, p=.050$), thereby suggesting that the influence of psychological distance on these variables appears to override the influence of estradiol.

Chapter 4: Discussion

Biology is a word rarely mentioned in the organizational psychology literature, and the field remains skeptical of work incorporating biological factors into models of organizational behavior (Sewell, 2004). However, this study provides compelling evidence of the influence of biological and social influences on negotiation behavior.

This research demonstrates that opponent gender interacts with psychological distance and estradiol to predict multiple aspects of negotiation behavior, cognitions, and attitudes. In general, results demonstrate that when negotiating with female opponent, low levels of estradiol predicts less competitive behavior while high levels of estradiol predict more competitive behavior as psychological distance decreases, or as psychological closeness increases. In contrast, when negotiating with a male opponent, low estradiol predicts *more* competitive behavior while high estradiol is linked to *less* competitive behavior as psychological distance decreases.

Objective Evidence for Competitiveness

Perhaps most compelling are the findings regarding two objective measures of competitive behavior- mean offers made during the negotiation simulation and minimum goals specified prior to negotiating. Mean offers made during the negotiation reflect actual negotiation behavior, hence providing a behavioral measure of competitiveness while the report of minimum point goal reflects intentions to

behave competitively. As noted, participants high in estradiol demonstrate a pattern of increased competitiveness toward female opponents as psychological distance decreases. Looking at estradiol in isolation, these findings are consistent with previous literature linking estradiol to aggressive, dominant, and competitive behavior . High estradiol levels may have predisposed these participants to view the female negotiation opponent as a substantial threat, mirroring findings of intrasexual competition during ovulation (Fisher, 2004). Results from negotiations with male opponents exhibit the exact opposite pattern, showing that women high in estradiol behave less competitively as psychological distance decreases. The finding of conciliatory behavior toward males during ovulation is consistent with literature demonstrating an increased use of mate attraction techniques during the luteal phase . However, it should be emphasized that estradiol alone does not drive behavior but that it interacts with psychological distance to influence behavior toward male and female opponents, a point that will be further discussed below.

The findings regarding women low in estradiol are fascinating. These women negotiated less competitively with a female opponent but more competitively with a male opponent as psychological distance decreased. It was originally hypothesized that the gender of the opponent would be irrelevant in this case, so it is especially interesting that psychological distance moderates participant reactions to male and female opponents. A more comprehensive discussion of psychological distance may shed further light on these findings.

The Role of Psychological Distance

As mentioned, psychological distance concerns the experience that something is “close or far away from the self” (pp. 117, Trope & Liberman, 2010). Drawing on Lewin’s (1952) notion of a ‘life space,’ the locus of an individual’s subjective reality, it may be inferred that psychologically close others are seen as more relevant to the self. Hence, reactions to close others might be especially intense while reactions to distant other might be more benign in nature.

The finding that decreased psychological distance exacerbates competitive intrasexual but conciliatory intersexual behaving in ovulating women is especially fascinating. When perceived as psychologically close, it is likely that a female opponent is appraised a realistic threat while a male opponent is perceived as a realistic potential mate, thereby intensifying participant reactions to these targets. Furthermore, a wealth of social psychological studies on social comparison processes has demonstrated that individuals are especially likely to compare themselves to close and similar others (Festinger, 1954; Heider, 1958; Pleban & Tesser, 1981; Pritchard, 1969; Tesser & Campbell, 1982). Engaging in such comparison processes could easily lead to the evaluation of a female opponent as a threat, hence eliciting competitive reactions. Such comparisons would not be expected to occur with the male opponent given the lack of similarity based on gender. In the case of women low in estradiol, psychological closeness exacerbated conciliatory intrasexual behavior but competitive intersexual behavior. During menstruation, women do not face the same reproductive pressures as during ovulation, which should dampen the motivation to compete with other women while attracting men. Findings certainly

support this conclusion. However, it remains unclear why low estradiol participants behaved competitively with close men but cooperatively with close women.

Negotiator Attitudes and Cognitions

Looking at the more subjective measure of the current study, findings from the female opponent condition regarding anxiety toward negotiation, evaluations of opponent warmth, strength, and desired contact are consistent with the estradiol by psychological distance interaction on mean offers and minimum goal. That is, women with low estradiol levels evaluate a female opponent as more warm and express a greater desire for interpersonal contact as psychological distance decreases. This implies a more prosocial motivation on the part of these low-estradiol women. In contrast, women with high estradiol express much lower interest in interpersonal contact with a female opponent as psychological distance decreases, hence implying a lack of interpersonal liking toward the opponent. In addition, women with low estradiol evaluated the female opponent as stronger and reported more anxiety toward negotiating as psychological distance decreased, while women high in estradiol evaluated a female opponent as weaker as psychological distance decreased, which may imply the use of opponent derogation as a competitive tactic (Fisher, 2004).

The lack of an estradiol by psychological distance interaction across anxiety, opponent warmth, strength, and desire for contact with male opponents presents an interesting pattern. While estradiol is uncorrelated with these variables, psychological distance is significantly correlated with warmth, strength, and desire for interpersonal contact. This diverges from findings on mean offer and minimum goal, which are jointly predicted by estradiol and psychological distance (and uncorrelated with either

in isolation). Furthermore, psychological distance is uncorrelated with these variables in the female opponent condition. The fact that these variables are influenced by different predictors in the male and female opponent conditions implies that negotiation anxiety, opponent warmth, and opponent strength are differentially related to perceptions of men and women. For example, strength is characteristic typically associated with men but not women, while warmth is a construct typically associated with women but not men. In addition, these findings may indicate that negotiators give priority to different types of information when negotiating with men and women.

While compelling results emerged for several variables, many predicted results did not materialize. One possibility is that certain constructs are more sensitive to biosocial influences, while others are less sensitive. Another possibility is that some of the measures employed were not sensitive enough to pick up on subtle changes. An additional possibility concerns the small sample size and accompanying small power to detect differences in the current study.

Limitations

The current study faces various limitations. One limitation is the small sample size. Due to the stringent eligibility criteria for the current study, only approximately 19% of undergraduate psychology students were eligible to participate (as calculated by responses to a battery of tests administered at the beginning of each semester). Once a participant was deemed eligible (and expressed an interest in participation), scheduling presented additional obstacles. Participants in the ovulation condition were asked to come to the lab on day 14 of their cycle. If a participant was unable to

come on that day (or if that day fell on a Saturday or a Sunday), the participant needed to be rescheduled for the following month. Scheduling participants in the menstruation condition proved more manageable, as participants could come in between days 1 and 5. In addition, sporadic access to the freezer in which saliva samples were stored contributed to the small sample size. Occasionally, experimenters could not gain access to the freezer to store the samples, thereby resulting in the exclusion of these participants. Finally, although extensive measures were taken to increase the believability of the study, a few participants were excluded on grounds of suspicion.

Another limitation concerns the use of estradiol to predict menstrual cycle phase. Although this method is used (e.g., Grammer, Renninger, & Fischer, 2004) some literature suggests that intra- and inter-individual variations in estradiol compromise the accuracy of this technique (e.g., Allende, 2002). A better approach would be to collect estradiol samples at multiple points through multiple cycles, which would provide information regarding individuals' basal levels of estradiol, ultimately resulting in greater accuracy. In addition, analyzing additional hormones (such as luteinizing hormone, which reliably predicts the onset of ovulation) could also result in a more accurate assessment of menstrual cycle phase. It should be noted that participant self-reported cycle data was not used in the current study due to a low (approximately 40%) agreement rate between cycle dates provided during eligibility screening and in lab.

An additional concern is the possibility of participants either 1) beginning to taking hormonal birth control or 2) becoming pregnant between completing the

eligibility survey and participating in the study. In some cases, eligibility was assessed as long as three months prior to participation, but was not subsequently assessed in lab. Furthermore, although participants were instructed to avoid certain activities (e.g. eating a major meal within an hour of participation), they were not asked if they complied with these instructions, which may have compromised the accuracy of the salivary assays. A final factor that may have affected participant responses, but was not measured, is participant sexual orientation. It seems likely that sexual orientation would influence an individual's desire to attract versus compete with a male or female opponent, which could have affected the results of the current study.

One final limitation concerns the good genes hypothesis, which provides a substantial theoretical base for the current study. Despite the preponderance of studies supporting the good genes hypothesis, it is important to note that it remains controversial (Houle & Kondrashov, 2002). For example, some studies have found that the good genes hypothesis holds for some, but not all, populations within a species (e.g. birds in the tit family; Akcay & Roughgarden, 2007; Roughgarden, 2009). Other recent studies have failed to replicate previous findings, such as a differential preference for masculine and symmetrical male faces and bodies across the menstrual cycle (Peters, Simmons, & Rhodes; 2009), while other work has criticized the good genes hypothesis on theoretical grounds (Kirkpatrick, 1996; Kirkpatrick & Barton, 1997).

Implications

The findings of this work are potentially controversial in that some may jump to the conclusion that hormones override an individual's ability to objectively consider all aspects of a negotiation situation. This is especially dangerous when one considers that our examination is limited to women, who are already at a general disadvantage when negotiating (e.g., Bowles, Babcock, & McGinn, 2005; Curhan, Neale, Ross, & Rosencranz, -Engelmann, 2008; Kray, Galinsky, & Thompson, 2002) and in other organizational contexts (e.g. leadership, Bowles & McGinn, 2005; networking, Ibarra, 1993). The finding that women high in estradiol concede to men perceived as close could be damaging to women both within and beyond organizations. However, this work is not evidence that women behave solely on the basis of distal reproductive pressures, failing to take into account objective aspects of the situation; rather, this work indicates that biological and social factors predispose individuals to certain patterns of behavior. An awareness of these behavioral predispositions can be immensely helpful to negotiators by enabling them to either correct for or continue these patterns of behavior, depending on their goal. Let's take the example of a female vendor who needs to come to an agreement with a female purchaser. If the vendor knows that she is predisposed to be especially competitive during ovulation, she can reign in these competitive tendencies in order to reach agreement. Similarly, if the vendor were to negotiate with a male purchaser, she would know that perhaps she should negotiate more aggressively than she is naturally inclined in order to reach an optimal agreement. In sum, the knowledge of how biological and social factors affect negotiation dynamics can *empower* negotiators rather than impair them.

Furthermore, the differences between the setting and sample of the current study and the real-world negotiation context should be taken into consideration. The current study was a one-time event conducted with female undergraduate students. Unlike real-world negotiators, participants did not have to consider the long-term effects of their negotiation behavior, nor did they have much to lose or gain in the negotiation simulation. It may be the case that negotiators who have more on the table are less sensitive to biological factors and more sensitive to other situational pressures. The findings regarding psychological distance speak to the contingency of biosocial effects on extraneous variables. While biosocial factors may exert a considerable influence in some negotiation situations, they may be overridden in others. Identifying these situations is a logical next step.

The current work also helps to illuminate to shed light on the gender and negotiation literature. Gender differences have been demonstrated in negotiation styles, strategies, and tactics (Bowles, Babcock, & McGinn, 2005), goals and expectations (Stevens, Bavetta, & Gist, 1993), and emotions and attitudes (Bowles, Babcock, & Lai, 2007; Kray & Gelfand, 2009; Kray, Thompson, & Galinsky, 2001; Small et al., 2007), among others. Nonetheless, the literature remains largely inconsistent as several studies report gender differences in negotiation, while others report opposite findings, and still others report no differences at all between men and women (Rubin & Brown, 1975; Stuhlmacher & Walters, 1999; Thompson, 1990). Furthermore, when gender differences *are* demonstrated, effect sizes tend to be small and there tends to be large variability across studies (Stuhlmacher & Walters, 1999). The examination of biological and social variables into future gender and negotiation

research may help to explain discrepant findings given the differences in women's negotiation behavior as a function of menstrual cycle phase and social factors.

Future Research

The present study also provides several forays for future research. The identification of psychological distance as a moderator of negotiation behavior has implications for other studies examining negotiation and associated phenomena. The fact that differences in behavior emerged only under conditions of low psychological distance suggest that psychological distance is a crucial factor to measure, especially when using virtual paradigms, which arguably facilitate greater psychological distance between opponents than do face-to-face paradigms. Furthermore, psychological distance as a construct itself presents several avenues for future research. While some work has examined negotiations between friends and strangers (Fry, Firestone, & Williams, 1983; Thompson & DeHarpport, 1998; Thompson, Peterson, & Brodt, 1996), there remains little work examining the broader role of psychological distance between negotiators.

In addition, other hormones that may exert an influence on constructs relevant to organizational behavior should be examined. One possibility is testosterone, a hormone that has already been linked to organizational constructs like job type (Dabbs & Morris, 1990) and entrepreneurship (White, Thornhill, & Hampson, 2006). Given the strength of the link between testosterone and aggression, it is an important hormone to examine in the negotiation context. For example, it is likely the case that men with higher testosterone levels negotiate more aggressively. Another potential avenue concerns pregnancy hormones (e.g. progesterone, prolactin). Given the

substantial hormonal fluctuations that accompany pregnancy, it would be fascinating to see what kinds of workplace behaviors this affects, especially given the fact that increasing numbers of women continue to work well into their third trimester. For example, pregnant women might be especially protective of resources given the evolutionary importance of providing resources for offspring. It is therefore possible that pregnant women may negotiate more aggressively than non-pregnant women.

Conclusion

The current study represents the first attempt to advance a biosocial model of negotiation. Furthermore, it represents an important step for the organizational sciences as one of few studies to examine biology as a central factor in organizational decision-making. Hopefully, this work will spark an interest in a broader integration of disciplines such as the evolutionary and biological sciences into organizational theory, research, and practice, as this interdisciplinary approach can lead to a more comprehensive understanding of existing phenomena as well promising new directions.

Appendices

Appendix A

Negotiation Instructions Provided to Participants. A solid line below a paragraph indicates that the following section appears on a new screen.

In this part of the experiment, we are interested in looking at behavior during negotiation between individuals who have asymmetrical amounts of information about each other. That is, while one person knows various facts about the other player, the other player doesn't have any information. You are about to negotiate virtually with another participant about the terms and conditions of the sale of a consignment of mobile phones.

First, you will receive instructions regarding the negotiation and will be asked to answer some questions.

In the upcoming negotiation, you will act as the seller of a consignment of mobile phones. The other participant will act as the buyer. You will communicate via the computer.

The negotiation revolves around three issues: the price of the phones, the warranty period, and the duration of the service contract. As a seller, you wish to obtain the highest possible price for the phones. Further, you are interested in making a deal that involves the shortest possible warranty period and service contract. There are nine possible levels of agreement for each issue. You have to agree on one of these levels for each issues. As we will explain over the next pages, the better your deal, the more points you earn. If you do not reach an agreement, you receive no points. On the next page, you will see a payoff table displaying how many point you receive for each level of agreement on the three issues under negotiation.

[Payoff Chart- See Table 1]

Here you see a payoff table which shows how many points you will receive for a given agreement. Your goal is to reach an agreement on three issues: the price of the phone, the warranty period, and the service package. There are 9 possible levels of agreement for each issue. The first column shows the payoffs for the price of the phones for each of the 9 levels of agreement. The second and third columns show the payoffs for warranty and service. For each issue, level 1 is more favorable to you than 2, 2 is more favorable than 3, and so forth. Level 9 is the most unfavorable option for you because it does not give you any points at all.

As you can see, for you agreement 1-1-1 yields the highest payoff, namely $400+120+240=760$ points, Press “ENTER” to continue

Agreement 9-9-9 yields the lowest payoff, namely $0+0+0=0$ points. Press “ENTER” to continue

Your goal is to reach an agreement. You can propose any combination of numbers, for example:

Your offer for price: 1 (meaning you ask 150 dollars per phone and get 400 points)
Your offer for warranty: 2 (meaning you offer 2 months warranty and get 105 points)
Your offer for service: 3 (meaning you offer 3 months service and get 180 points)

Keep in mind! The payoff table of the buyer looks different! On level 1-1-1, where you get the highest payoff, the buyer gets nothing. On level 9-9-9, where you get nothing, the buyer gets the highest payoff.

Your goal is to earn as many points as possible. The more points you earn, the better. However, you should try to reach an agreement.

The computer will now randomly decide who receives information and who doesn't. Please wait a moment.

The computer has decided that you will receive information about the other participant, (but they will not receive any information about you). Please notify the experimenter.

[Experimenter enters, presents picture and hobbies of ‘other participant’. Participant completes measures of opponent perceptions, self-presentation concerns, psychological distance, negotiation heuristics, and goals].

[Negotiation task resumes]

Summary

- In the upcoming negotiation you will act as the seller of a consignment of mobile phones.
 - Your job is reach an agreement with the buyer about the price of the phones, the warranty period, and the service package.
 - Your goal is to earn as many points as possible.
 - On level 1-1-1, where you get the highest payoff, the buyer gets zero points. On level, 9-9-9, where you get zero points, the buyer gets the highest payoff.
 - If you do not reach an agreement you get zero points.
-

The computer has determined that the buyer will make the first offer. You will receive this offer shortly and you will then be asked to make a counteroffer. The buyer will then in turn react with a counteroffer, etc. This procedure will go on until you reach an agreement or time runs out.

[Payoff Chart]

As soon as the buyer has made the first offer, this will appear on your screen. Please wait...

The buyer offers 8-7-8

Please enter your offer for price (1-9):

Please enter your offer for warranty (1-9):

Please enter your offer for service (1-9):

Enter your offer and press "ENTER" to continue

Your offer has been sent to the buyer. We are now waiting for the buyer's counteroffer. As soon as they make an offer, it will appear on your screen.

[6 rounds total of negotiation]

END OF EXPERIMENT

Appendix B.

Measures

1. Eligibility Questionnaire

Please indicate your gender: F M

E-mail address: _____

How old are you? _____

Are you currently pregnant? Y N

Are you taking any kind of hormonal birth control (the pill, the patch, the shot, etc.)?

If you are not *currently* taking hormonal birth control, have you within the last three months?

Is your menstrual cycle usually regular? (*occurs every 26-35 days*)

When was the first day of your last menstrual period? Month: Day:

How confident are you in your answer to the above question regarding when was the first day of your last menstrual period?

 1 2 3 4 5 6 7
Not at all Somewhat Very

2. Perceptions of Negotiation Opponent

We are interested in your perceptions of the other participant. Please use the scales below to indicate your answers to the following questions. Please note that this information will not be seen by the other participant.

How intelligent do you think the other participant is?

1 2 3 4 5 6 7
Not at all Somewhat Very

How attractive do you think the other participant is?

1 2 3 4 5 6 7
Not at all Somewhat Very

How kind do you think the other participant is?

1 2 3 4 5 6 7
Not at all Somewhat Very

How strong do you think the other participant is?

1 2 3 4 5 6 7
Not at all Somewhat Very

How competitive do you think the other participant is?

1 2 3 4 5 6 7
Not at all Somewhat Very

How masculine do you think the other participant is?

1 2 3 4 5 6 7
Not at all Somewhat Very

How feminine do you think the other participant is?

1 2 3 4 5 6 7
Not at all Somewhat Very

How powerful do you think the other participant is?

1 2 3 4 5 6 7
Not at all Somewhat Very

How aggressive do you think the other participant is?

1 2 3 4 5 6 7
Not at all Somewhat Very

How friendly do you think the other participant is?

1 2 3 4 5 6 7
Not at all Somewhat Very

How warm do you think the other participant is?

1	2	3	4	5	6	7
Not at all			Somewhat			Very

How weak do you think the other participant is?

1	2	3	4	5	6	7
Not at all			Somewhat			Very

3. Desire for Interpersonal Contact

How much do you think you would enjoy talking to the other participant outside of class?

1 2 3 4 5 6 7
Not at all Somewhat Very

How much do you think you would enjoy talking to other participant at a party?

1 2 3 4 5 6 7
Not at all Somewhat Very

How much do you think you would like to go to dinner with the other participant?

1 2 3 4 5 6 7
Not at all Somewhat Very

4. Self-Presentation Concerns

*How important to you is it that the other participant perceives **you** as...? Please note that the other participant will not see your answers.*

Kind

1 2 3 4 5 6 7
Not at all Somewhat Very

Aggressive

1 2 3 4 5 6 7
Not at all Somewhat Very

Competitive

1 2 3 4 5 6 7
Not at all Somewhat Very

Attractive

1 2 3 4 5 6 7
Not at all Somewhat Very

Warm

1 2 3 4 5 6 7
Not at all Somewhat Very

Easygoing

1 2 3 4 5 6 7
Not at all Somewhat Very

Strong

1 2 3 4 5 6 7
Not at all Somewhat Very

Understanding

1 2 3 4 5 6 7
Not at all Somewhat Very

5. Psychological Distance (Reverse Scored)

We are interested in your feelings of closeness toward the other participant. Please think about a person that you feel the **closest to in your life** and assign a +5 to that person. Then, using this as a reference point, please how close you feel to **the other participant** on the following scale.

-5	-4	-3	-2	-1	0	1	2	3	4	5
someone					someone				someone	
you intensely					you feel				you are	
dislike					neutral				closest to	

6. Negotiation Goals

What is the **MINIMUM POINT VALUE** that you are willing to accept in the negotiation? _____
(please indicate the *lowest* number of points you are willing to accept).

7. Demographic Questions

Relationship status (circle one): Single In a Relationship

Age: _____ years

Race: _____

When was the first day of your last menstrual cycle?

Tables

Table 1

Participant Payoff Chart.

Participant Payoff Chart

Level	Price of phones		Warranty period		Service contract	
	Price (\$)	Payoff	Warranty	Payoff	Service	Payoff
1	150	400	1 month	120	1 month	240
2	145	350	2 months	105	2 months	210
3	140	300	3 months	90	3 months	180
4	135	250	4 months	75	4 months	150
5	130	200	5 months	60	5 months	120
6	125	150	6 months	45	6 months	90
7	120	100	7 months	30	7 months	60
8	115	50	8 months	15	8 months	30
9	110	0	9 months	0	9 months	0

Table 2

Descriptive Statistics and Inter-correlations for Measures

Note. N = 46. Internal reliability coefficients (alphas) appear in bold along the diagonal. Opponent gender is coded as 0 (females) and 1 (males).

p<.10. **p<.05. *p<.01.*

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Age	-													
2. Gen. Opp	-0.155	-												
3. Estradiol	-0.028	-0.107	-											
4. Psyc. Dist.	0.223*	0.24*	-0.11	-										
5. Opp. Strength	-.282**	.828***	-0.154	0.105	0.854									
6. Opp. Warmth	-0.028	0.139	0.146	-.274**	0.095	0.873								
7. Des. Contact	-0.101	0.224*	-0.083	-0.241*	.285**	.291**	0.825							
8. Self Warmth	-0.045	.363***	-0.209*	0.117	.400***	.441***	0.18	0.757						
9. Self Strength	0.092	-0.072	0.092	-0.06	-0.192	0.062	-0.013	-0.127	0.753					
10. Compete	0.221	0.076	-0.127	0.005	0.04	0.055	0.225*	0.13	.408***	0.715				
11. Cooperate	0.052	0.106	0.141	-0.161	0.234*	.437***	-0.043	.310**	-0.165	-.337**	0.823			
12. Anxiety	-0.112	0.24*	-0.022	-0.063	.312**	-0.067	0.101	0.082	-0.122	-.308**	0.159	0.865		
13. Minimum	.462***	0.011	0.122	-0.034	-0.138	.263**	0.184	0.128	0.208*	0.216*	-0.112	-0.206*	-	
14. Offer	-.477***	0.052	-0.046	-0.081	0.123	-0.088	-0.096	0.026	-0.176	-.333**	0.098	0.22*	-.509***	0.950

Table 3

Opponent Gender Main Effects

Variable	Gen. Opp	N	Mean	SD	T
Estradiol	Female	22	3.638	2.298	0.711
	Male	24	3.185	2.014	
Psyc. Dist	Female	22	-0.136	0.560	-1.638
	Male	24	0.458	1.615	
Opp. Strength	Female	22	4.046	0.717	-9.784**
	Male	24	5.779	0.469	
Opp. Warmth	Female	22	4.030	0.997	-0.928
	Male	24	4.278	0.809	
Des. Contact	Female	22	3.523	0.777	-1.527
	Male	24	4.042	1.408	
Cooperate	Female	22	3.921	0.904	-0.706
	Male	24	4.083	0.650	
Compete	Female	22	4.379	0.692	-0.503
	Male	24	4.486	0.748	
Anxiety	Female	21	3.414	1.324	-1.622
	Male	24	3.996	1.080	
Self Warmth	Female	22	5.057	1.069	-2.587*
	Male	24	5.771	0.794	
Self Strength	Female	22	4.318	1.270	0.478
	Male	24	4.167	0.857	
Offer	Female	22	4.038	1.075	-0.348
	Male	24	4.167	1.398	
Minimum	Female	22	372.727	99.160	-0.074
	Male	24	375.208	124.512	

Note. Degrees of freedom for T-tests is 44.

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

Table 4

Summary of Regression Analyses for Three-Way Interaction between Gender, Psychological Distance, and Estradiol Predicting Dependent Variables.

Variable	B	SE B	β	<i>T</i>	<i>p</i>	f^2
Offer	-0.825	0.388	-2.536	-2.125	0.04	0.119
Minimum Goal	86.233	34.055	2.945	2.532	0.016	0.169
Anxiety	-0.974	0.482	-3.077	-2.021	0.051	0.11
Opponent Warmth	-0.506	0.276	4.482	-1.832	0.075	0.088
Opponent Strength	-0.555	0.182	-2.003	-3.048	0.004	0.245
Desired Contact	-0.625	0.352	4.277	-1.775	0.084	0.038

Note. *N*=46.

Table 5

Summary of Slopes and Regression Analyses for Psychological Distance Predicting Various Dependent Variables Moderated by High and Low Levels of Estradiol for Male and Female Opponent Conditions.

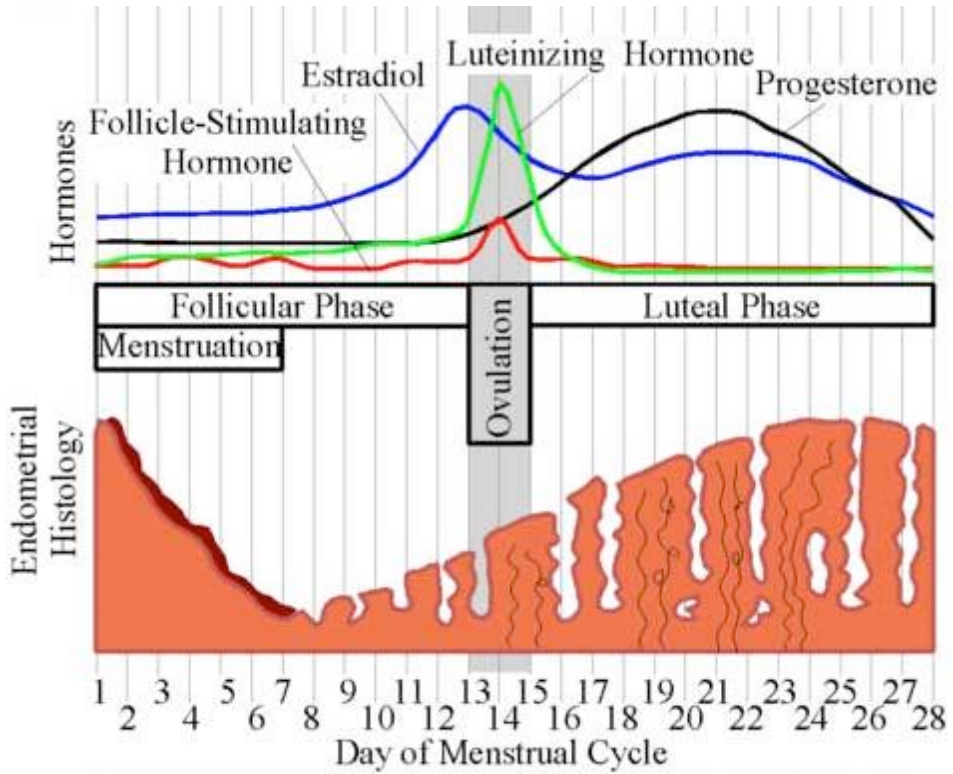
Variable		β	SE B	<i>df</i>	<i>T</i>	<i>p</i>		
Offer	Female	Estradiol _{Low}	-1.245	0.704	18	-1.768	0.094	
		Estradiol _{High}	0.190	0.254	18	0.747	0.464	
		Interaction	0.599	0.332	18	1.804	0.088	
	Male	Estradiol _{Low}	0.279	0.262	20	1.065	0.300	
		Estradiol _{High}	-0.771	0.340	20	-2.268	0.035	
		Interaction	-.226	0.097	20	-2.334	0.030	
	Minimum Goal	Female	Estradiol _{Low}	1.349	0.601	18	2.243	0.038
			Estradiol _{High}	-0.436	0.217	18	-2.008	0.060
			Interaction	-68.747	26.172	18	-2.627	0.017
Male		Estradiol _{Low}	-0.345	0.272	20	-1.271	0.218	
		Estradiol _{High}	0.568	0.353	20	1.608	0.124	
		Interaction	17.486	8.945	20	1.955	0.065	
Anxiety	Female	Estradiol _{Low}	-1.829	0.946	18	-1.934	0.070	
		Estradiol _{High}	0.049	0.259	18	0.191	0.851	
		Interaction	0.966	0.507	18	1.906	0.074	
	Male	Estradiol _{Low}	-0.170	0.292	20	-0.581	0.568	
		Estradiol _{High}	-0.214	0.380	20	-0.564	0.579	
		Interaction	-.007	0.03	20	-0.088	0.930	
Opponent Warmth	Female	Estradiol _{Low}	-1.314	0.664	18	-1.980	0.063	
		Estradiol _{High}	-0.005	0.240	18	-0.021	0.983	
		Interaction	0.507	0.290	18	1.746	0.098	
	Male	Estradiol _{Low}	-0.418	0.271	20	-1.543	0.139	
		Estradiol _{High}	-0.412	0.352	20	-1.171	0.255	
		Interaction	.001	0.058	20	0.013	0.990	

DV		B	SE	Df	T	p	
Opponent Strength	Female	Estradiol _{Low}	-1.566	0.659	18	-2.377	0.029
		Estradiol _{High}	0.338	0.238	18	1.422	0.172
		Interaction	0.530	0.207	18	2.558	0.020
	Male	Estradiol _{Low}	-0.226	0.272	20	-0.466	0.417
		Estradiol _{High}	-0.565	0.354	20	-1.595	0.126
		Interaction	-.024	0.034	20	0.724	0.477
Desired Contact	Female	Estradiol _{Low}	-1.368	0.644	18	-2.124	0.048
		Estradiol _{High}	0.521	0.233	18	2.240	0.038
		Interaction	0.570	0.220	18	2.595	0.018
	Male	Estradiol _{Low}	-0.314	0.266	20	-1.183	0.251
		Estradiol _{High}	0.570	0.345	20	-1.650	0.115
		Interaction	-.055	0.099	20	-0.559	0.582

Figures

Figure 1

Graph illustrating hormone changes across days of the menstrual cycle (<http://cindilamb.com/images/MenstrualCycle2.jpg>).



(Average values. Durations and values may differ between different females or different cycles.)

Figure 2

Figure of hypothesized gender by estradiol interaction

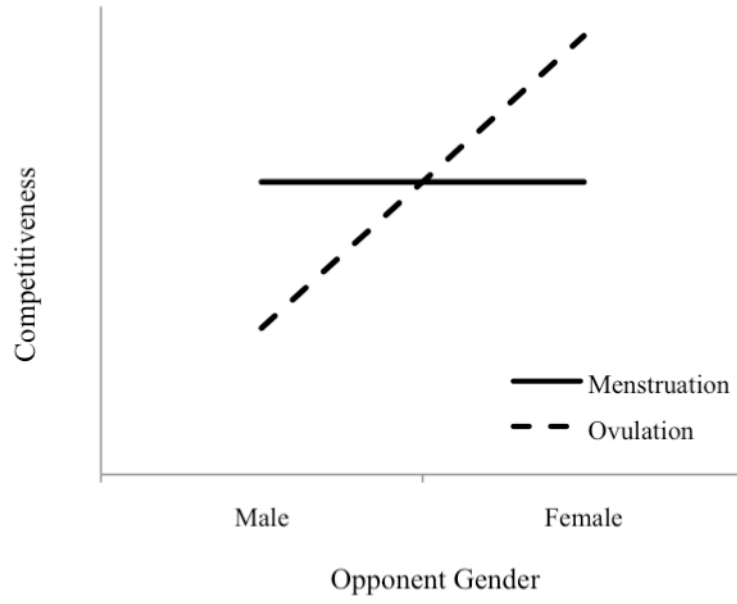


Figure 3

Picture of male negotiation opponent.



Figure 4

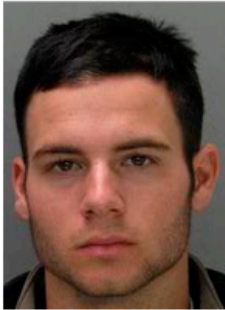
Picture of female negotiation opponent.



Figure 5

Screenshot of Negotiation Simulation.

Seller Payoff Chart						
Level	Price of phones	Price (\$) Payoff	Warranty period	Warranty Payoff	Service contract	Service Payoff
1	150	400	1 month	120	1 month	240
2	145	350	2 months	105	2 months	210
3	140	300	3 months	90	3 months	180
4	135	250	4 months	75	4 months	150
5	130	200	5 months	60	5 months	120
6	125	150	6 months	45	6 months	90
7	120	100	7 months	30	7 months	60
8	115	50	8 months	15	8 months	30
9	110	0	9 months	0	9 months	0



Your opponent's current offer: 8 - 8 - 7

Please enter your offer for price (1-9):

Please enter your offer for service (1-9):

Please enter your offer for warranty (1-9):

NEXT >

Figure 6

Graph Depicting Mean Negotiation Offers Made to Male Opponents as a Function of Estradiol and Psychological Distance.

Note. Lower offers indicate more competitive behavior.

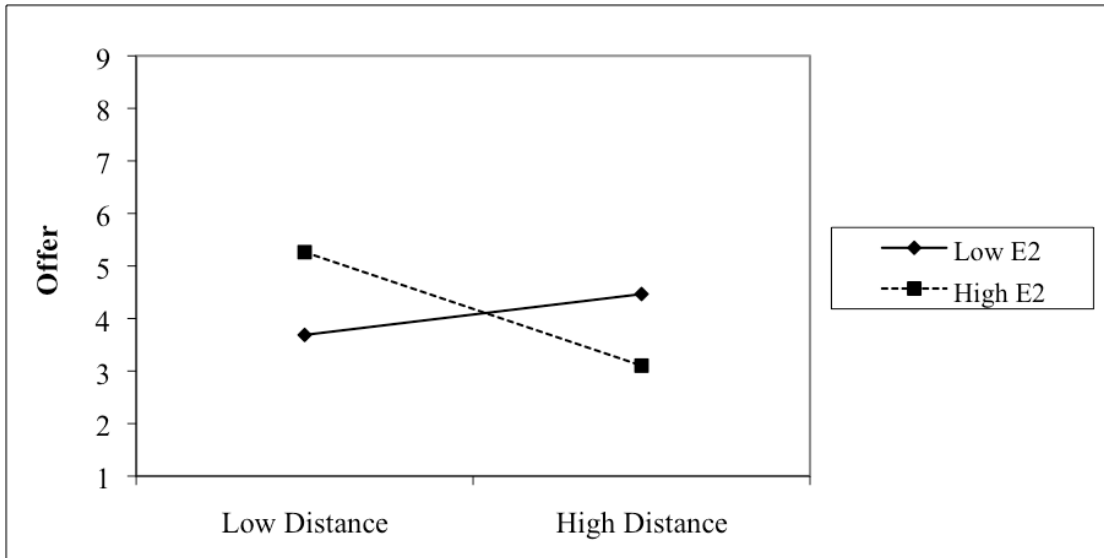


Figure 7

Graph Depicting Mean Negotiation Offers Made to Female Opponents as a Function of Estradiol and Psychological Distance.

Note. Lower offers indicate more competitive behavior.

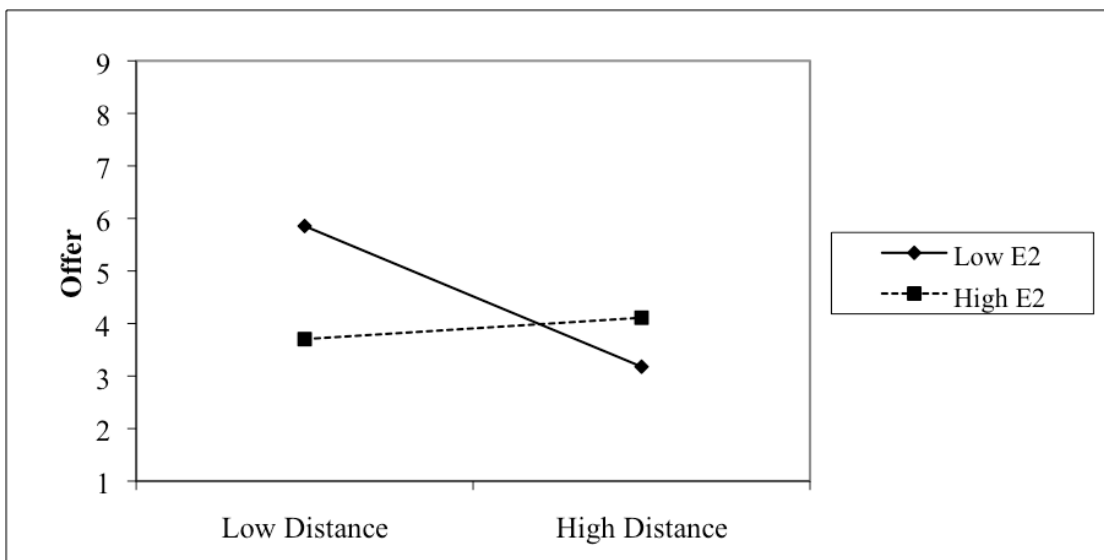


Figure 8

Graph Depicting Minimum Goal Point Specified with Male Opponents as a Function of Estradiol and Psychological Distance.

Note. Higher point goals indicate more competitive behavior.

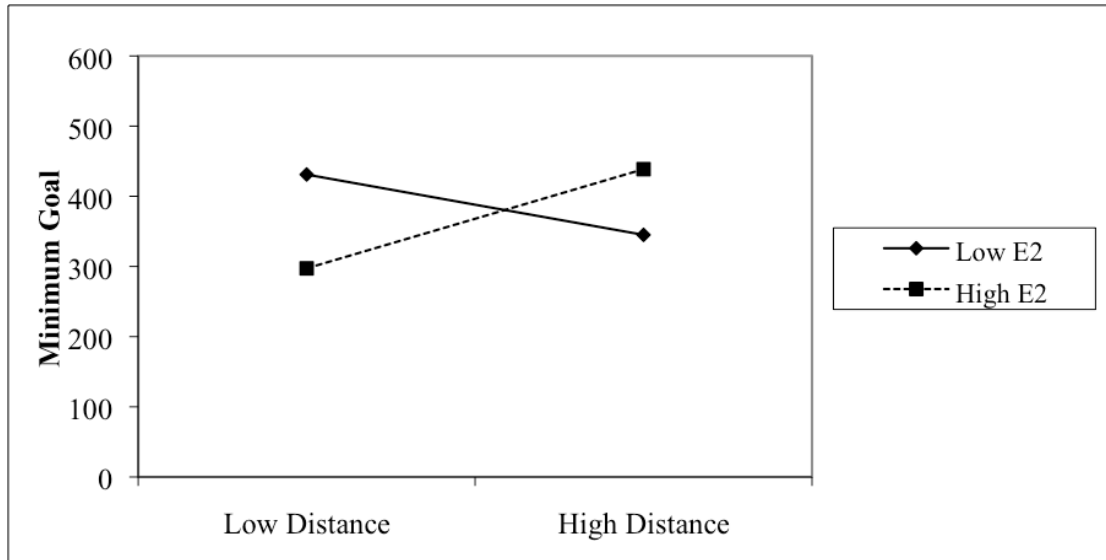


Figure 9

Graph Depicting Minimum Point Goal Specified with Female Opponents as a Function of Estradiol and Psychological Distance.

Note. Higher point goals indicate more competitive behavior.

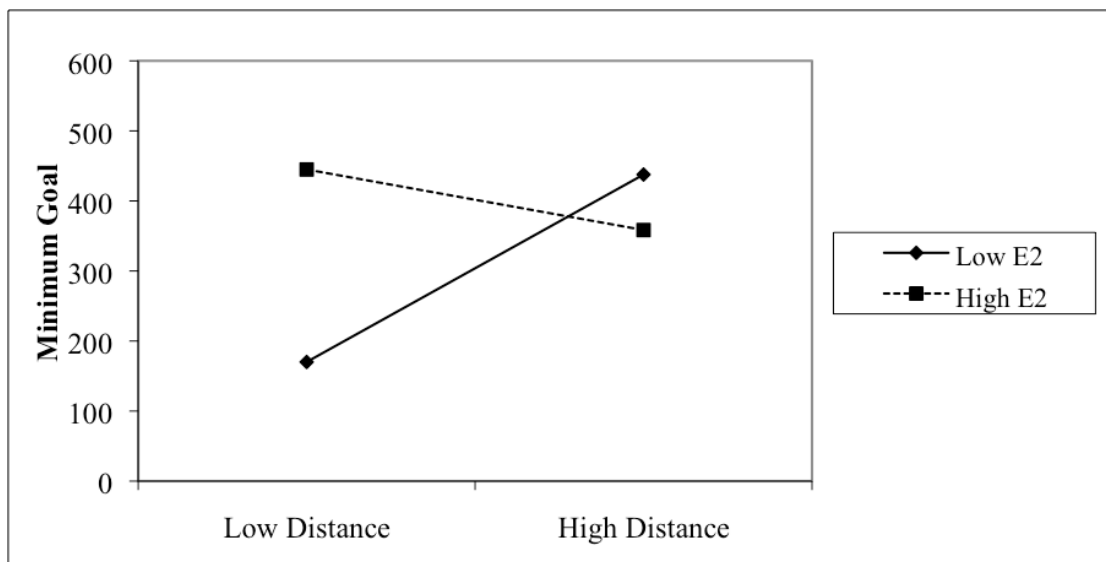


Figure 10

Graph Depicting Anxiety Toward Negotiating with Male Opponents as a Function of Estradiol and Psychological Distance.

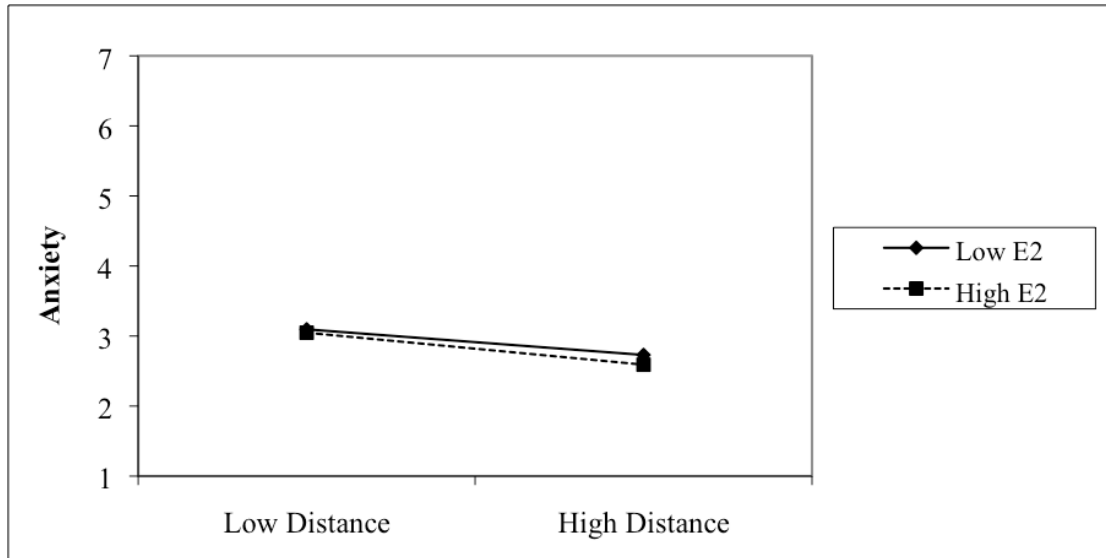


Figure 11

Graph Depicting Anxiety Toward Negotiating with Female Opponents as a Function of Estradiol and Psychological Distance.

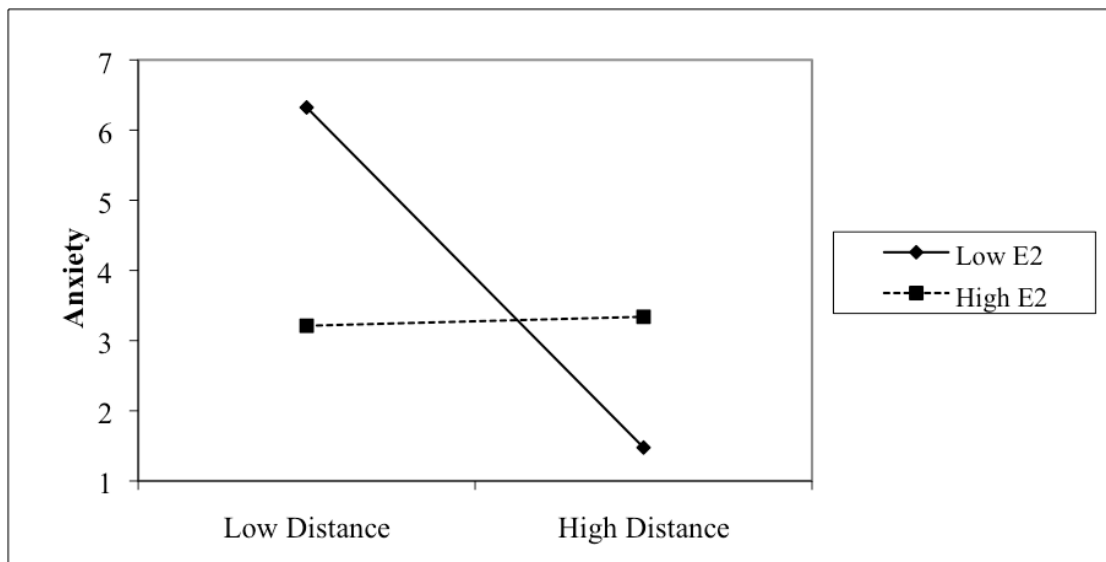


Figure 12

Graph Depicting Perceptions of Opponent Warmth for Male Opponents as a Function of Estradiol and Psychological Distance.

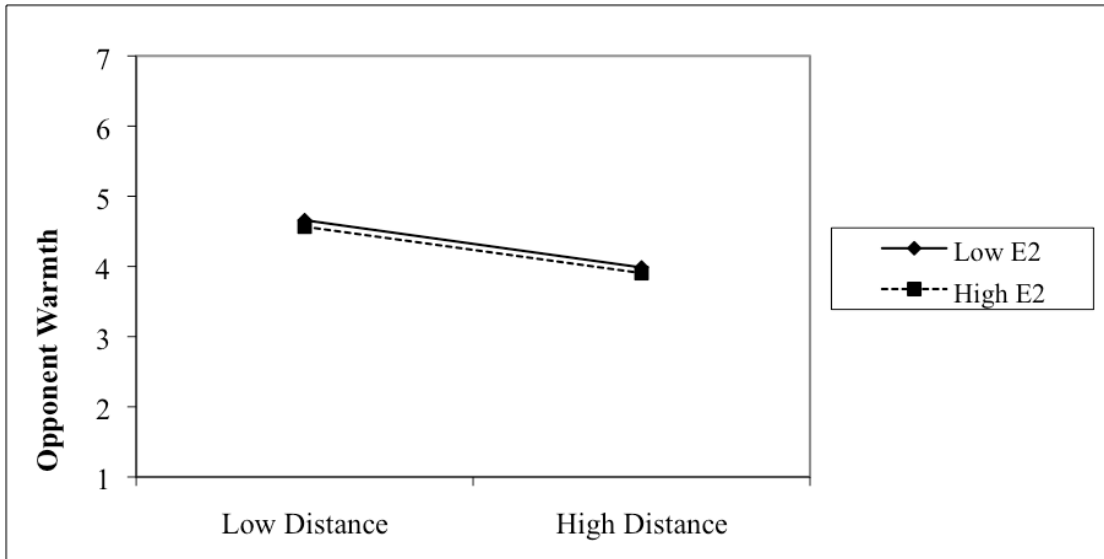


Figure 13

Graph Depicting Perceptions of Opponent Warmth Made to Female Opponents as a Function of Estradiol and Psychological Distance.

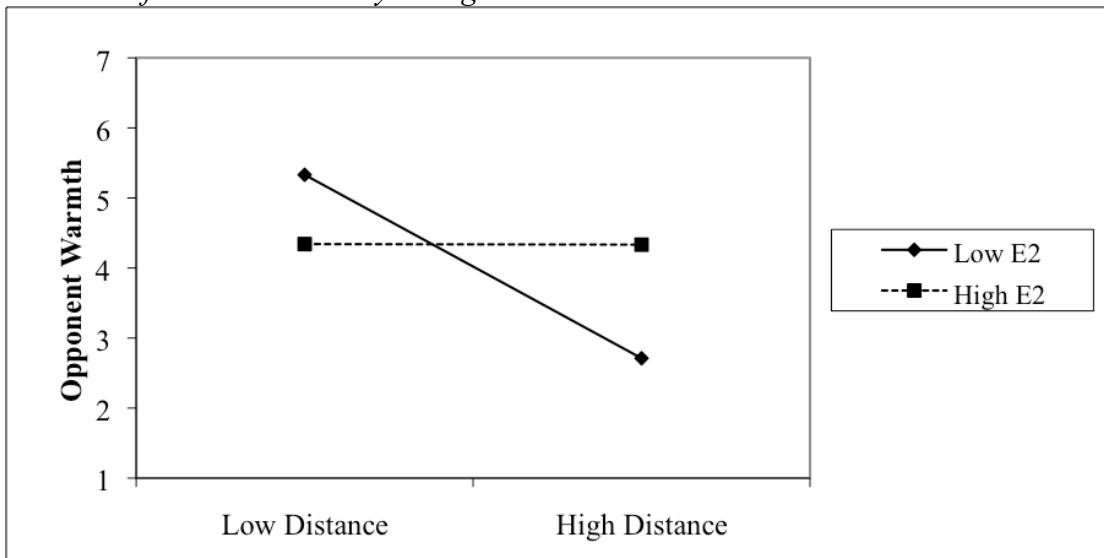


Figure 14

Graph Depicting Perceptions of Opponent Strength for Male Opponents as a Function of Estradiol and Psychological Distance.

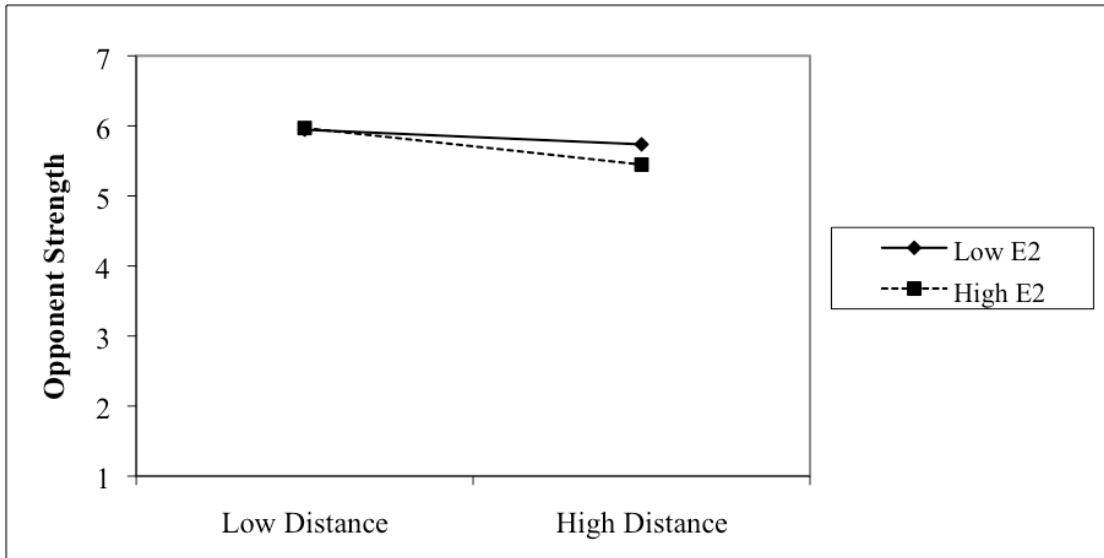


Figure 15

Graph Depicting Perceptions of Opponent Strength Made to Female Opponents as a Function of Estradiol and Psychological Distance.

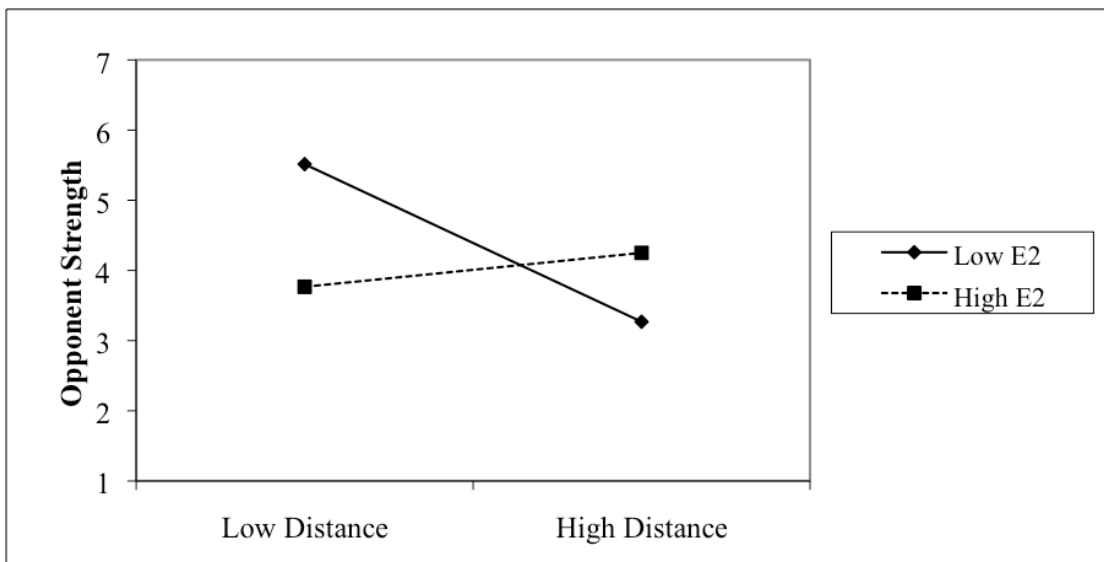


Figure 16

Graph Depicting Desired Contact with Male Opponents as a Function of Estradiol and Psychological Distance.

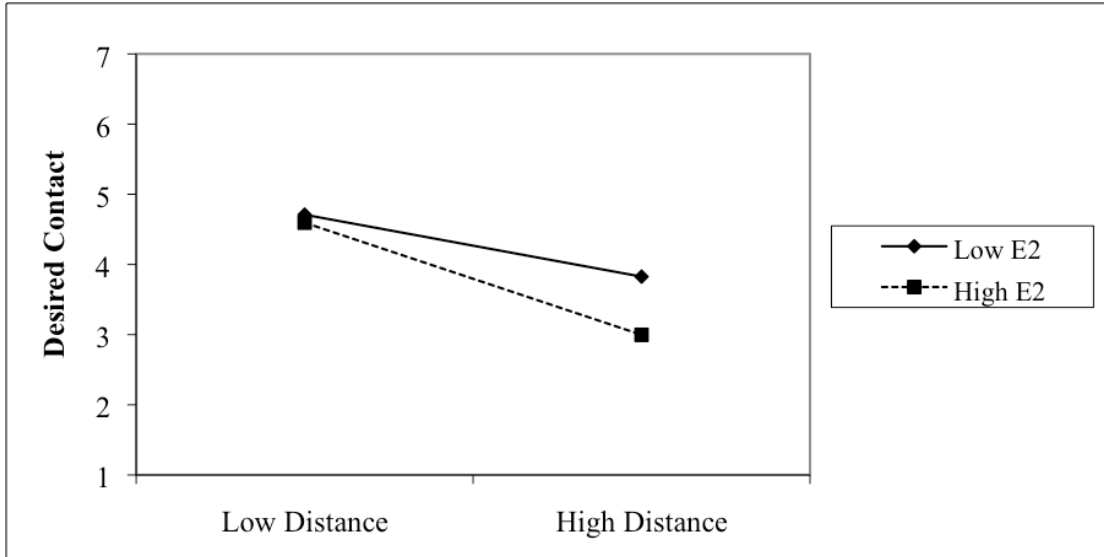
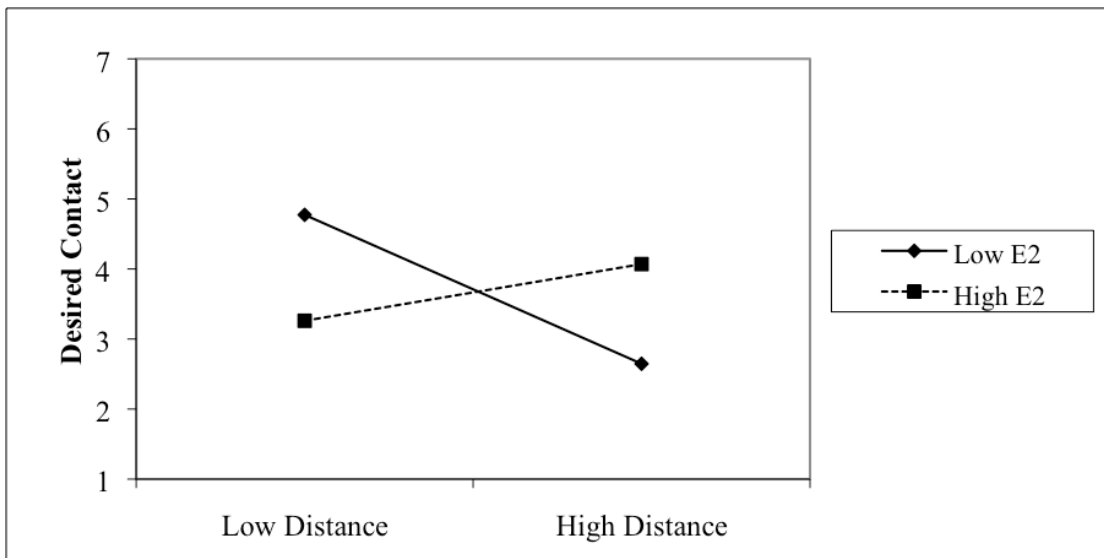


Figure 17

Graph Depicting Desired Contact with Female Opponents as a Function of Estradiol and Psychological Distance.



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