The Long and the Short of it:

Testing the Conversion and Cuckold Strategies of Ancestral Human Outgroup Mating

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Joseph Frederick Salvatore

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Dedication

This manuscript is dedicated to my loyal and devoted dog, Gio.



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Abstract

The human social group likely aided in ancestral human's survival. However, the small-knit extended kin group in which human ancestors evolved posed a plausible reproductive threat in the form of inbreeding. The outgroup mating hypothesis (Salvatore, Meltzer, & Gaertner, under review) proposed that, as a solution to the inbreeding dilemma, ancestral females may have mated outside their social group. The current work examines two competing hypotheses by which ancestral females mated with outgroup males and balanced parental investment concerns. The conversion hypothesis posits that ancestral females mated with an outgroup male under the provision that he and his group would care for the offspring. The cuckold hypothesis proposes that ancestral females furtively mated with an outgroup male while retaining primary partner and group support for the offspring. The current work uses multiple methods and measures to test the competing hypotheses against one another. Study 1 manipulates women's motivational state to reflect a short-term sexual (i.e., one-night-stand) or long-term committed (i.e., marriage) mate-seeking strategy and measures attraction to ingroup and outgroup men. Study 2 uses a restricted response window and assesses evaluations of ingroup and outgroup men for sex and marriage partners. Study 3 uses a version of the affect misattribution procedure (Payne et al., 2006). Results of Study 1 indicated strong support for the conversion hypothesis. Results of Study 2 and Study 3 were inconclusive. I suggest that ancestral women who mated with an outgroup man and converted to his collective received a fitness benefit over ancestral women who did not. Implications of results and future directions are discussed.

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Chapter 1: Introduction

*"*At one extreme [outgroups] may be viewed as a common enemy to be defeated in order to protect the ingroup and strengthen its inner loyalties. At the other extreme the outgroup may be appreciated, tolerated, *even liked for its diversity*." (Allport, 1954; emphasis added)

Humans typically favor groups to which they belong (i.e., ingroups) over groups to which they do not belong (i.e., outgroups). Social science has demonstrated such a tendency via attitudes, beliefs, and behaviors. Overwhelmingly ingroup regard is characterized by positive responses whereas outgroup regard is characterized by tolerance, at best, or denigration, at worst, (Brewer & Brown, 1998; Brewer, 2007; Gaertner & Dovidio, 2010). Such ingroup bias has been demonstrated in both laboratory-formed minimal groups and more enduring naturally formed groups. Persons, for example, evaluate ingroups more favorably than outgroups (Brewer & Silver, 1978) and allocate more resources to ingroup than outgroup members (Gaertner & Insko, 2000, 2001; Tajfel, Billig, Bundy, & Flament, 1971). Ingroup bias has been suggested to serve motivations stemming from both individual level forces (Tafjel, 1972) and group level pressures (Campbell, 1965; Tafjel & Turner, 1979).

The current work, in contrast, draws from an evolutionary framework to elucidate and test a theory of systematic positive outgroup regard. In particular, I extend research by Salvatore, Meltzer, & Gaertner (under review) who hypothesized a nonlinear pattern of positive outgroup regard that manifests in women as a quadratic pattern (i.e., an inverted "U") of attraction to outgroup men across the menstrual cycle. The theoretical underpinnings of such a process are based in the idea that ancestral small group living

posed a challenge to genetic survival by restricting access to genetically diverse mates (i.e., inbreeding). Salvatore et al. hypothesized that one way ancestral females solved the inbreeding dilemma was to mate outside of their social group.

As I discuss subsequently, Salvatore et al. findings were consistent with the outgroup mating hypothesis such that human women evidence a quadratic pattern of attraction (i.e., an inverted "U") across the menstrual cycle to outgroup men (but not to ingroup men or women of either group). That research, however, raised several questions regarding the role of parental investment (Trivers, 1972) and tradeoffs between short-term sexual relationships and long-term committed relationships (see Gangestad & Simpson, 2000 for a comprehensive review on the balance between short-term and long-term mating). The current research employs a variety of methods and measures to directly explore attraction to outgroup men as short-term and long-term partners.

The Outgroup Mating Hypothesis

Theorists suggest that the group served as a selection environment for cognitive, emotional, and behavioral functioning (Caporael, 1997, 2007; Dunbar, 1993; Fiske, 2000; Sedikides & Skorwonski, 1997; Stevens & Fiske, 1995). A favorable orientation toward the ingroup plausibly functioned to maintain the viability of the social group (e.g., ingroup cooperation; Brewer, 1999; Brewer & Caporael, 2006; Caporael & Brewer, 1991; Gaertner, Iuzzini, Witt, & Oriña, 2006). Kindness, trust, and empathic concern, especially for those in one's social group, can all be viewed as adaptations to a social environment in which the group was integral to survival (Caporael, 2007; Brewer & Gardner, 1996; Fiske, 1992). Put simply, a positive orientation toward the ingroup likely aided in ancestral humans' biological and social success.

Theorists also suggest that avoidance and aggression toward outgroups played a pivotal role in early human existence (Neuberg & Cotrell, 2006; McDonald, Navarette, & Van Vugt, 2012). Disease avoidance (Schaller & Park, 2011), safety (Cottrell & Neuberg, 2005), and competition for scarce resources (Durham, 1976) were likely genuine threats posed by outgroups. As a result, these threats may have aided in the development of a generally negative orientation toward outgroups. Indeed, modern humans typical display of outgroup regard ranges from passively neutral to actively hostile (Allport, 1954; Brewer, 1999; Campbell, 1965, Sherif, 1966).

However, an invariantly negative orientation to the outgroup may not have been adaptive. As Salvatore et al. argued, a plausible challenge to the reproductive fitness of group-living ancestors was the avoidance of inbreeding and maximization of genetic variability. The ancestral human social group was defined by small close-knit kin bands ($n \approx 30$; Caporael, 2007), and as such the fitness benefit of heterozygous offspring (Charlesworth & Willis, 2009; Penn & Potts, 1999; Roberts & Little, 2008) may have been challenged by a restricted access to genetically diverse mates. It could be plausible that ancestral humans considered the outgroup for mating opportunities. Salvatore et al. postulated four strategies by which outgroup mating could have occurred. The strategies varied in respect to female choice and the management of parental investment concerns. As I subsequently discuss, two strategies involved female's choice. Salvatore et al. reasoned that if such choice based strategies solved the inbreeding dilemma, thereby providing a fitness benefit to those women who chose to mate with outgroup men relative to those who chose not, then as a function of natural selection current women should evidence a vestige of such a successful strategy.

Choice-obviated strategies. One strategy lacking female choice to mate with an outgroup male may have been an intergroup exchange of reproductively-able females (Caporael, 2007; Wobst, 1974). This strategy could have been dictated by the group via a passive socially normative process or through active imposition (e.g., "you must go"). As Salvatore et al. previously reasoned, to the extent that a group dictated intergroup exchange operated, current women would not likely demonstrate a positive orientation toward outgroup men. The other strategy lacking female choice could have been rape (Thornhill & Thornhill, 1992). However, for an inbreeding solution, rape would have had to been perpetrated more consistently against outgroup than ingroup females. As a counter-strategy, females may have formed fear toward outgroup men (McDonald, Asher, Kerr, Navarrete, 2011; Navarrete, Fessler, Fleischman, & Geyer, 2009; Navarrete, McDonald, Molina, & Sidanius, 2010).

Choice-based strategies. The two choice-based strategies account for the differential concerns of parental investment for females than males, but do so in different ways. The first choice-based strategy, the conversion hypothesis, suggests that ancestral females mated with an outgroup male and converted to his collective, thus relying upon her new collective to help care for and raise her offspring (Clutton-Brock, 1989). That is, females may have sought and mated with an outgroup male with the provision that he and his group would invest the necessary resources to ensure the survival of the offspring.[1]

The other choice-based strategy, the cuckold hypothesis, suggests that ancestral females *furtively* mated with an outgroup male and, retained her ingroup collective to help care for and raise her offspring. That is, ancestral females may have secretly sought

[1] This possibility, of course, assumes a willingness on behalf of the male and his collective group to invest in the female and her offspring.

and mated with an outgroup male in an act of cuckoldry against her existing partner and ingroup. The act would have had to been secretive because her partner and ingroup would have resisted investment in an outgroup offspring (Buss et al., 1992; Geary, 2002). To the extent that cuckoldry occurred, the latter effect may have influenced the development of a notable counter-strategy in males (e.g., jealousy, infanticide/ femicide; Buss et al, 1999; Wilson, Daly, & Scheib, 1997).

Thus, the conversion and cuckold strategies share in common the capturing of genes from an outgroup male as a solution to the inbreeding dilemma posed by a small-group lifestyle and the greater parental investment that was required by ancestral females than males (Buss, 1989; Buss & Kenrick, 1998; Trivers, 1972). The strategies differ, however, in regard to how ancestral females subsequently managed parental investment concerns. The conversion hypothesis posits that women relied upon an outgroup male's collective for childcare purposes, while the cuckold hypothesis posits that women relied upon their existing ingroup collective for help with childcare.

Salvatore et al. reasoned that the choice-based strategies of ancestral female mating would manifest in current human women during periods of higher fertility (i.e., near ovulation). Indeed, a growing body of research supports ovulatory effects on human sociality. During ovulation, for example, women evidence (a) heightened preference for masculine faces (Penton-Voak, & Perrett, 2000) and the scent of physically symmetrical men (Rikoski, & Grammer, 1999), (b) increased sexual attraction to socially dominant men (Gangestad et al., 2004), (c) stronger avoidance of male (not female) kin (Lieberman et al., 2011), and (d) decreased sexual responsiveness to and increased reports of own infidelity with romantic partners with whom they share genetic similarity on a vital

immune system mechanism (major histocompatibility complex; Garver-Apgar et al. 2006).

Given such ovulatory effects, Salvatore et al. hypothesized that if ancestral females maximized success by mating with outgroup males, current human females should experience increased attraction to outgroup men (but not ingroup men, or women of either group) as a quadratic (i.e., an inverted "U") menstrual cycle-moderated pattern. Specifically, women should experience heightened attraction to outgroup men at mid-cycle vs. early- or late-cycle.

To test their hypothesis, they used both a within-subject longitudinal method (Study 1) and a between-subject randomized controlled lab-based experiment (Study 2). In Study 1, women reported their desire to date a man of another race (and to ensure that responses were not an artifact of desire to merely go on a date, their desire to date a man) at three different time points of her menstrual cycle (early, middle, and late). In Study 2, women rated a standardized set of male and female photographed faces whose presumed ethnicity they experimentally manipulated to be the same (i.e., ingroup) or different (i.e., outgroup) than the woman's own ethnicity.

Both studies evidenced the predicted quadratic pattern: at mid-cycle women reported an elevated desire (relative to earlier and later cycle) to date an other-race man and rated ostensible outgroup men (but not ingroup men or women of either group) increasingly attractive. Their findings suggested that women become increasingly sexually selective and particularly attracted to outgroup men mid-menstrual cycle, presumably for mating opportunities designed to acquire genetically diverse contribution to offspring.

In Study 2, Salvatore et al. offered an initial test of the conversion and cuckold hypotheses by having women additionally rate the male photographed faces in regard to their perceived attractiveness as domain-specific mates (i.e., short-term and long-term partners). Specifically, they reasoned that if a successful strategy was for ancestral females to mate with an outgroup male and convert to the outgroup male's collective, then women should evidence a quadratic pattern of attraction to outgroup males for both evaluations of short-term sexual partners *and* long-term relationship partners. They reasoned that to the extent with which cuckoldry (and not conversion) solved the inbreeding dilemma, human women should evidence a quadratic pattern of attraction to outgroup males for *only* short-term sexual partners *and not* long-term relationship partners.

Results were consistent with the conversion hypothesis – women evidenced similar quadratic patterns of attraction to outgroup men for both short-term sexual and long-term relationship partners. However, there are alternative explanations for the results that undermine confidence in the preliminary support for the conversion hypothesis. In particular, I can offer three alternative explanations. These alternative explanations are not necessarily mutually exclusive, but differ in the conceptual and operational aspects that may have operated to produce results consistent with the conversion hypothesis.

Alternative interpretations for results consistent with the conversion hypothesis

A halo-effect. One possibility for the similar quadratic pattern of attraction to outgroup males for short-term sexual and long-term committed partners were that such ratings may have been the result of a halo-effect (Thorndike, 1929). In this scenario, one

domain specific evaluation influenced the other domain specific evaluation, and the true underlying motivation may have proved difficult for women to discriminate. Put another way, one possibility for the similar quadratic pattern of attraction to outgroup males as short-term and long-term partners is that the long-term ratings were the result of faulty introspective processes. Indeed, research has demonstrated that persons tend to inaccurately attribute the cause of their own psychological state or behavior (Nisbett & Wilson, 1977). By merely asking women how desirable outgroup men appeared for short-term sexual and long-term committed partners, women may have, on average, attributed a heightened general attraction to both domain-specific forms of attraction. In this scenario, if cuckoldry is more likely, then increased sexual attraction to outgroup men may have bled into long-term committed evaluations and artificially influenced the relationship between the two ratings**.**

Impression management; e.g., "Please don't think I'm promiscuous." Another possibility for the similar quadratic pattern of attraction to outgroup males for short-term sexual and long-term committed partners was that the long-term ratings were the result of underlying processes of impression management (Schlenker, 1980; Leary & Kowalski, 1990). Research has demonstrated that promiscuous individuals are socially stigmatized, and that people are aware of such biases (Crawford & Popp, 2003). The latter effect may have influenced women's ratings of outgroup men's long-term committed attraction through their heightened ratings of short-term sexual attraction. In this scenario, the desire to appear (to others) as non-promiscuous could have influenced (either consciously or unconsciously) the relationship between short-term sexual and long-term committed evaluations. Put another way, outgroup men may have been more positively regarded for

short-term sexual relationships, but through mechanisms of impression management, women may have inflated their long-term committed attraction ratings. That is, women balanced their elevated short-term ratings of outgroup men with similarly elevated long-term ratings to ward off the perception that they are promiscuous. If cuckoldry is more likely, then increased long-term committed attraction could have been the by-product of heightened sexual attraction to outgroup men.

Self-deception; e.g., "I'm not promiscuous, he will stick around." The third possibility for the similar quadratic pattern of attraction to outgroup males for short-term sexual and long-term committed partners is that long-term ratings were the result of self-deceptive processes. In this scenario women may be persuading themselves into perceiving an outgroup man as attractive as a long-term partner because he is attractive as a short-term partner. Put another way, women may self-justify short-term sexual relationships with a particular outgroup man by over-perceiving his long-term qualities. Indeed, Durante, Griskevicius, Simpson, and Li (2012) report that women over-estimate at mid-cycle (more so than earlier or later cycle) the fatherly quality of physically attractive and dominant men (i.e., men who ostensibly have "good-genes," but are less apt to maintain long-term relationships). If cuckoldry is more likely, then increased long-term attraction could have been a by-product of heightened sexual attraction to outgroup men. The self-deception and the impression management account both share the presumed short-term-influenced-long-term ratings, however in the current account deception is thought to be facilitated against the self more so than toward others.

Current Research

The current research uses methods and measures that address the alternative interpretations of the similar quadratic pattern of attraction to outgroup males for short-term and long-term partners. Three experiments aim to pit women's intergroup long-term committed and short-term sexual evaluations against one another in an effort to test the competing conversion and cuckold hypotheses. Particularly, if the conversion process is more strongly operating then we should expect similar short-term sexual and long-term committed patterns of preference for outgroup men (as demonstrated in an exploratory manner in Salvatore et al. previous work). If cuckoldry is more strongly operating than we should expect unique short-term sexual (and not long-term committed) effects on positive evaluations of outgroup men. That Salvatore et al. past research tested these differences in an exploratory manner, prompted the present research to attempt to systematically tease apart the operational differences between short-term and long-term mating with ingroup and outgroup men via multiple methods.

In Study 1, women explicitly rate the attractiveness of men whose ethnicity is manipulated to be the same or different than that of the woman. However, to address the halo-effect alternative, rather than solely measuring short-term and long-term attractiveness preferences, I experimentally manipulate women's motivation to seek a short-term and long-term mate (or not). In that merely measuring evaluations could have produced artificial correlations between short-term and long-term judgments, the rationale of Study 1 is that manipulating such underlying processes should produce differences among evaluations (to the extent that cuckoldry vs. conversion is operating).

Study 2 and Study 3 address the self-deception and impression management concerns in different ways. Study 2 uses a measure that aims to minimize cognitively slow and controlled judgments by encouraging rapid evaluations. Specifically, women in Study 2 completed a time-dependent forced-choice style task in which photographs of presumed (but experimentally manipulated) ingroup and outgroup men were presented and the participant's task was to indicate their gut-level reaction to the photographs as assessed for short-term sexual and long-term committed relationship partners. The rationale of Study 2 is that rapid responses should be less subject to slower controlled judgments.

In Study 3, I address the self-deception and impression management concerns by implicitly measuring women's short-term sexual and long-term evaluations. In particular, Study 3 utilizes the affective misattribution procedure (AMP; Payne et al, 2006). Women evaluate ambiguous symbols as meaning sex or marriage. Each symbol is quickly preceded by a photograph of an ingroup or outgroup male. The rational of Study 3 is the rapid succession of prime (ingroup/outgroup male; US) and target (Chinese symbol; CS) should facilitate projective spillover of semantic judgments of short-term sexual or long-term commitment associated with ingroup and outgroup men onto the ambiguous symbols' inferred meaning. In all 3 studies, women are sampled across the menstrual cycle. The following sections describe each study in detail.

Chapter 2: Study 1

To experimentally manipulate short-term and long-term mating motivations, I adapted a short-term sexual (i.e., one night stand) and long-term commitment (i.e., marriage) story prime used in Griskevicius, Cialdini, & Kendrick (2006 – Study 3). Griskevicius et al. (2006) provide evidence that the stories they used do not unconfound sex from relationships (and *vice versa*; see Study 2). As such, my aims in adapting the mating-context priming paradigm were to create a short-term mating prime that positively influences women's sexual desire, but not desire to engage in a long-term relationship, and to create a long-term mating prime that positively influences women's desire to engage in a long-term relationship, but not sexual desire. Indeed one-time sex can develop into a long-term relationship, and long-term relationships typically involve sex. The aim of adapting the separate story primes was to attempt to parse one construct out from the other and to manipulate each, uniquely and separately, as best as possible. To test the efficacy of the adapted story primes (see appendix for exact wording of the adapted stories), the subsequent two pilot studies were developed and employed.

Pilot Studies Overview

After adapting the short-term and long-term mating stories, I designed an experiment to test the unique effects of each story. Specifically, I employed one direct and one indirect method to test whether each story prime exclusively manipulated either short-term sexual (short-term story) or long-term committed (long-term story) desire. The direct method simply assessed women's current short-term sexual desire and desire for a long-term relationship (counter-balanced across participants) following the presentation of one of three conditions (Short-term story, Long-term story, or the No-story control

condition). The indirect method utilized a lexical decision task (LDT; Fischler, 1977). The LDT assessed latency to respond to one of four types of presentation words (Sex-related, Relationship-related, Filler, or Non-Word jumble) and, like the explicit ratings, followed the presentation of one of the three Story-types. The speed in which a participant responded to a given Word-type was operationalized as a measure of concept accessibility (e.g. Relationship-related or Sex-related vs. Control Filler words).

Pilot Study 1. To determine appropriate words for the LDT, I first chose words that connoted sex (n = 61), relationships (n = 47), and neither sex nor relationships sex (n = 61) for a total of 169 words to present to a representative sample of women for prejudgment. It was predetermined that words that are judged to be high in sex (but low in relationships), low in sex (but high in relationships), and low in sex and in relationships would be well suited for the purposes of the present LDT.

Participants were normally ovulating, heterosexual, Caucasian females (*n=18, Mean age=21.89, SD=2.47)* obtained using Amazon Mechanical Turk. Participants rated randomly presented words from each of the Sex, Relationship, and Filler (low in sex and low in relationship connotation) categories in 12 randomly presented blocks, three times. Specifically, in two blocks that were between-subject and counter-balanced, women rated all of the words (a) on the extent to which each described a one-time sexual encounter and (b) on the extent to which each described a long-term committed relationship. Following the two rating tasks, all women then re-rated all of the words (c) on the extent to which each word was associated with feeling good (i.e. positivity). All ratings were made on a 1(not at all) to 7(very) scale. Following the rating task, the participants were thanked and compensated USD $0.51 for their time.

Results. As can be seen in Table 1, based on the dual (Sex-related and Relationship-related) ratings, 12 final words were chosen for each Word-type (Sex-related, Relationship-related, and Filler). More specifically, twelve sex-related words were chosen that were high in their absolute value on the sex dimension ($M = 6.04$, $SD = .44$), but low on their absolute value of the relationship dimension ($M = 2.16$, $SD = .57$). Similarly, 12 relationship words were chosen that were high in their absolute value on the relationship dimension ($M = 6.72$, $SD = .21$), but low on their absolute value of the sex dimension ($M = 1.36$, $SD = .27$). Twelve filler words were chosen based on their lower absolute values on both Sex ($M = 1.66$, $SD = .24$) and Relationship dimensions ($M = 1.69$, $SD = .21$). Positivity ratings varied across all Word-types (the range was from 1-7 on most words). However, based upon the positive nature of words associated with long-term relationships and the occasionally negative nature of words associated with sex, the relationship words ($M = 6.18$, $SD = .24$), were perceived more positive than the sex words ($M = 3.42$, $SD = .24$), $t(22) = 21.16$, $p < .0001$. To attempt to control for the variation in positivity as a function of word type, I retained filler words that ranged in positivity from 2.33 to 5.38 ($M = 4.10$, $SD = 1.07$). By retaining filler words that vary in positivity, I can then test the unique effect of positivity on LDT reaction time without confounding the Sex or Relationship dimensions.

Pilot Study 2: Story prime assessments. For Pilot Study 2, I developed an experiment to test if the adapted short-term sexual and long-term committed stories uniquely influenced desire for a short-term sexual and long-term committed relationship, respectively.

Participants were normally ovulating, heterosexual, Caucasian females *(n* = 213*, M_{age}* = 22.60*, SD_{age}* = 2.77*)* obtained using Amazon Mechanical Turk. Participants completed all measures on a computer. First, participants were prompted with a question: " *How do people determine if a string of letters actually forms a word?*" which was followed by detailed instructions pertaining to the LDT. If a string of letters formed a word, the participant was asked to press the "j" key and if it did not, the participant was asked to press the "k" key. Next, participants completed a 4 trial practice block to better familiarize themselves with task. Between the practice block and the critical trials of the actual LDT, participants were exposed to one of the three conditions.

In the short-term sexual and long-term committed conditions, the participants were asked to read the associated story carefully for later recall of the story information (of course the No-story condition did not require reading any story; i.e., the control condition). Next, participants completed the critical trials of the LDT. Twelve Sex-related, Relationship-related, Filler, and Non-words (non-words consisted of randomly selected and jumbled sex words [*n* = 4], relationship words [*n* = 4], and filler words [*n* = 4],) were presented in random order, twice, across two separate blocks. A "+" symbol preceded each word for 1000ms followed by the target word. The target word remained on the screen until the participant indicated her response (word or non-word).

Following the LDT, participants indicated their overall current sexual arousal ("*During this survey, you may have felt sexually aroused. Using the following scale, please honestly indicate how sexually aroused you felt. Values closer to 0 indicate little to no arousal and values closer to 100 indicate a lot of sexual arousal"*) and desire for a long-term relationship (*During this survey, you may have felt desire for a long-term*

relationship. Using the following scale, please honestly indicate how much you felt desire for a long-term relationship. Values closer to 0 indicate little to no desire for a long-term relationship and values closer to 100 indicate a lot of desire for a long-term relationship), with the order of which counter-balanced across participants and condition.

Next, participants indicated information about their menstrual cycle (the first day of her last menstrual cycle and average cycle length) for later cycle day standardization. Additionally, participants completed measures of Socio-sexual orientation (SSO; Penke, L., & Asendorpf, J. B. 2008), the interpersonal reactivity – Fantasy subscale (Davis, 1980), and the Vulnerability to Sexual Coercion scale (VSC; Navarrete et al., 2010; assessed using the Fear of Rape Scale; Senn & Dzinas, 1996). Finally, basic demographic measures were collected, and participants were thanked and compensated USD $0.51 for their time.

Results - Explicit Ratings. Women's short-term sexual and long-term committed desire ratings constituted repeated measure assessment. As such, the data were arranged in the context of a multi-level structured data set in which each woman had two ratings of arousal and an associated indicator variable (Arousal-type; Sexual/Relational); thus, every participant had two lines of data. More specifically, level 1 of the dataset contained a woman's short-term sexual and long-term committed arousal ratings. Level 2 contained the story-type condition, and other individual differences (menstrual cycle day, SSO, VSC, Fantasy scale score). I accounted for the nesting of the observations using multi-level regression in PROC MIXED of SAS 9.3.

To test whether the story primes differentially influenced women's short-term sexual and long-term committed ratings, I regressed ratings onto Arousal-type (2:

Sexual/Committed-relational), story-type, and the factorial crossing of the two variables. An arousal-type main effect, $F(1,175) = 92.32$, $p < .0001$, indicated that women reported higher levels of long-term committed desire ($M = 55.17$, $SD = 35.75$), than short-term sexual desire ($M = 27.57$, $SD = 28.26$). Story-type had no overall effect on ratings, collapsing across Arousal-type, $F(2,175) = 1.83$, $p = .1637$. More importantly, however, a Story-type x Arousal-type effect, $F(2,175) = 9.90$, $p < .0001$, indicated that the arousal-type effect varied across conditions.

As can be seen in Figure 1, the interaction was such that ratings of long-term committed desire were significantly higher in the long-term story ($M = 67.22$, $SD = 33.88$), than in the short-term story (M = 48.84, SD = 36.35), $t(175) = 3.15$, $p = .0019$, and than in the no-story control condition (M = 51.14, SD = 35.11), $t(213) = 3.00$, $p = .0031$, and the latter two conditions did not differ, $t(175) = 0.04$, $p = .9718$. Furthermore, the interaction additionally indicated that ratings of short-term sexual desire were significantly higher in the short-term story (M=31.27, SD=29.71) than in the long-term story (M=20.07, SD=25.94), $t(175) = 2.16$, $p = .0319$, and than in the no-story condition (M=23.86, SD=28.23), $t(175) = 2.13$, $p = .0348$, and the latter two conditions did not differ, $t(175) = 0.00$, $p = .9968$. These finding indicate strong preliminary support that the story primes affected women's short-term sexual and long-term committed desires in the manner intended.

The next section describes the relationship between individual difference measures and women's explicit sexual and committed desires as a function of story prime. First I explore the effect of menstrual cycle day on arousal ratings and then the

other individual differences. Within the explorations of the individual differences, I additionally examine the possibility that menstrual cycle day moderates those effects.

Standardization of Day of Menstrual Cycle. In this study and all following studies presented, participants provided information about their menstrual cycle so I could standardize all participants to a 28-day cycle. To standardize the menstrual cycle measure, I used (a) the participant's reported cycle length, (b) the first day of her last menstrual cycle, and (c) the experimental study date (c.f., Gangestad & Thornhill, 1998; Gangestad et al., 2004; Garver-Apgar, Gangestad, & Thornhill, 2008). In the following analyses, I explore the potential for a quadratic pattern of menstrual cycle moderation.

Menstrual Cycle Analysis. Menstrual cycle day was distributed similarly across conditions, based upon multiple univariate analyses, suggesting sufficient power to detect a menstrual cycle effect. To test whether the previously reported arousal effect is moderated by cyclic menstrual shifts, I regressed arousal-ratings onto day (grand-mean centered), day^2 (the quadratic component), and each of the latter crossed with the factorial combination of arousal-type (2: Sexual/Committed) and story-type (3: Short-term/Long-term/No-story control). The Story-type x Arousal-type x Day^2 interaction was non-significant, $F(2,169) = 0.14$, $p = .8726$, suggesting the previously reported Story-type x Arousal-type interaction persisted similarly across menstrual cycle days. Indeed, in the context of the full model (Story-type x Arousal-type x Day^2), the Story-type x Arousal-type effect remained significant, $F(2,169) = 4.55$, $p = .0119$, and evidenced the same patterns, in terms of p-values and magnitude of effects. The absence of the Story-type x Arousal-type x Day^2 effect indicates that the efficacy of the stories does not vary across

menstrual cycle days. As such, the story primes seem well suited to manipulate women's explicit sexual and committed relational desires consistently across the menstrual cycle.

VSC: Vulnerability to Sexual Coercion (Fear of Rape). The VSC scale was administrated to determine if individual differences in perceived sexual vulnerability to men influenced women's sexual and committed relational desires, as a function of story-prime. In a model that allowed VSC (grand mean centered) to interact with Story-type and Arousal-type, a significant VSC effect indicated that as fear of rape increased, so to did overall ratings, B = 11.05, *SE* = 3.24, $t(172) = 3.41$, $p < .0001$. However, a VSC x Story-type x Arousal-type interaction, $F(1,172) = 2.86$, $p = .0601$, indicated that the Story-type x Arousal-type interaction differentially varied for those high and low in VSC. Specifically, the Story-type x Arousal-type effect was present for those low in VSC, $F(2,172) = 12.51$, $p < .0001$, but not for those high in VSC, $F(2,172) = 1.06$, $p = .3504$. In particular, for those low in VSC, committed relational ratings were significantly higher in the long-term story condition ($M = 67.94$, $SE = 5.08$) than in the short-term story condition ($M = 35.85$, $SE = 5.84$) $t(172) = 17.18$, $p < .0001$, or the no-story control condition ($M = 34.99$, $SE = 6.63$) $t(172) = 3.94$, $p = .0001$, and the latter two conditions did not differ, $t(172) = 0.10$, $p = .9218$. Similarly for sexual evaluations, ratings in the short-term story condition ($M = 34.89$, $SE = 5.84$) were significantly higher than in the long-term story condition ($M = 20.18$, $SE = 5.08$) $t(172) = 1.90$, $p = .0590$, and in the no-story control condition ($M = 11.87$, $SE = 6.63$) $t(172) = 2.61$, $p = .0100$, and the latter two conditions did not differ, $t(172) = 0.99$, $p = .3144$. Put another way, VSC varied across levels of story-type and arousal-type, such that the 2 way VSC x Arousal-type effect was present within the short-term story prime, $t(172) = 5.34$, p = .0220, but not the no-story

control, $t(172) = 1.14$, p = .2874, or the long-term story prime, $t(172) = 0.19$, p = .6608. Within the Short-term story prime, VSC positively predicted short-term sexual ratings, $B = 20.30$, $SE = 6.69$, $t(189) = 3.04$, p = .0028, but not long-term relational ratings, $B = 1.53$, $SE = 6.69$, $t(189) = 0.23$, p = .8189. The quadratic pattern of menstrual cycle day did not additionally moderate any effect of interest involving VSC (all *ps*>.*23*).

Socio-sexual orientation. To test how individual differences in socio-sexual orientation, a measure of openness to and previous sexual promiscuity, influenced arousal and condition effects, I regressed arousal ratings onto the factorial crossing of socio-sexual orientation (SOI; grand mean centered), story-type, and arousal-type. A three-way SOI x Story-type x Arousal-type interaction, $F(2,172) = 2.89$, $p = .0585$, indicated that the Story-type x Arousal-type effect varied across levels of socio-sexual orientation. Specifically, the Story-type x Arousal-type interaction was present for those high in SSO, $F(2,172) = 13.12$, $p < .0001$, but not those low in SSO, $F(2,172) = 1.52$, $p = .2224$. For those High in SSO, relational ratings were significantly higher in the long-term story condition (M = 69.80, SE = 5.38) than in the short-term story condition (M = 42.60, SE = 6.20), $t(172) = 3.21$, $p = .0015$, and than in the no-story control condition (M = 36.00, SE = 7.29), $t(172) = 3.51$, $p = .0006$, and the latter two conditions did not differ, $t(172) = 0.36$, $p = .5489$. Similarly for sexual evaluations, ratings in the short-term story condition (M = 46.35, SE = 6.20) were significantly higher than in the long-term story condition (M = 25.80, SE = 5.38), $t(172) = 2.44$, $p = .0154$, and in the no-story control condition (M = 25.17, SE = 7.29), $t(172) = 1.94$, $p = .0540$, and the latter two conditions did not differ, $t(172) = 0.09$, $p = .9291$. Put another way, SSO varied across levels of story-type and arousal-type, such that the 2 way SSO x Arousal-type effect was present within the

short-term story prime, $t(172) = 9.12$, p = .0029, the no-story control, $t(172) = 4.69$, p = .0316, but not the long-term story prime, $t(172) = 0.00$, p = .9602. Within the short-term story prime, SSO positively predicted short-term sexual ratings, $B = 5.60$, $SE = 2.56$, $t(172) = 2.19$, p = .0296, but non-statistically negatively predicted long-term relational ratings, $B = -3.45$, $SE = 2.56$, $t(172) = 1.35$, p = .1787. Within the no-story control, SSO was unrelated to short-term sexual ratings, $B = .9788$, $SE = 3.27$, $t(172) = 0.30$, p = .7647, but negatively predicted long-term relational ratings, $B = -7.33$, $SE = 3.27$, $t(172) = 2.24$, p = .0316. The quadratic pattern of menstrual cycle day did not additionally moderate any effect of interest involving SSO (all *ps* > .27).

Fantasy sub-scale. The Interpersonal Reactivity Fantasy subscale (Davis, 1980) was administered to determine if those that are more easily engaged in fantasy or stories would be differentially affected by the two story-types. To test this idea, I regressed arousal ratings onto Fantasy scores (grand mean centered), story-type, arousal-type, and the factorial crossing of the three variables. A Fantasy x Arousal-type interaction, $F(1,172) = 7.12$, $p = .0084$, indicated that the difference in women's short-term sexual and long-term relational ratings varied across levels of fantasy. Specifically, collapsed across condition, higher fantasy scores predicted higher long-term relational ratings, $B = 9.70$, $SE = 4.02$, $t(172) = 2.41$, $p = .0169$, but was unrelated to short-term sexual ratings, $B = 0.6890$, $SE = 4.02$, $t(172) = 0.17$, $p = .8641$. The quadratic pattern of menstrual cycle day did not additionally moderate any effect of interest involving Fantasy (all *ps*>.26). It appears that those women high in Fantasy Reactivity differentially desire long-term relationships in comparison to women low in Fantasy Reactivity. However, the effect

subsists similarly within each story-type condition (and across the menstrual cycle), and as such should not produce measurement error between manipulations of the story-types.

Results - Implicit Ratings (Lexical Decision Task). The LDT comprised two blocks of 48 trials each. Each trial constituted a discrete response evaluation (word or non-word) and an associated reaction time (RT) for each judgment. Each participant made a total of 96 judgments, thus the data were structured in such a way that each participant had 96 rows of data with each row containing information about whether the participant indicated a given string-of-letters was a word or non-word, if she was correct in her judgment (CORRECT: Correct or Not; i.e. independent correct judgments of words [Sex, Relationship, or Filler] and non-words [jumbled words]) and the participants latency to respond with such judgment (RT). CORRECT and RT made up level 1 of the hierarchically structured data set. Level 2 of the data set was composed of women's standardized menstrual cycle day, the Story-type condition assignment, and individual differences.

Reaction Time Reconstruction. Upon initial univariate analyses of the RT variable, not surprisingly, it appeared women's reaction time was non-normally distributed. The range of RT spanned from 5ms to 489,702ms (the short RT presumably a respondent auto-advancing through a set of given trials or perhaps a computer glitch, and the long RT presumably a respondent that failed to complete a given trial and left the item on their screen). Given the range of RT values, the initial levels of skewness (124.97) and kurtosis (17086.32) were exceedingly high. Examination of the univariate distribution and probability plots and practical grounding prompted me to redefine RT to reflect only responses between a .35s and 1.5s. For the lower end of the distribution,

responses less than .35 may not reflect a valid response (i.e., the rapidness of such a response was not statistically common). Less than 1% of all responses fell below this threshold, and given such, little data was discarded at this lower end of RT. Both practical and theoretical grounding suggests that responses greater than 1.5s may begin to reflect effortful processing (and thus more controlled vs. automatic processes). Only approximately 5% of all responses exceeded this upper level threshold. Upon this reconstruction of the RT variable (i.e., discarding the shortest 1% of the responses and the longest 5% of the responses), the skewness was reduced to 1.22 and the kurtosis to 1.50, both within acceptable normal levels. Thus subsequent analyses involving RT reflect this RT reconstruction.

Correct (vs. Incorrect) Responses. A secondary unit of analysis in the LDT involves the extent to which persons mistake a word for a non-word or *vice versa*. Based on univariate analysis of Correct vs. Incorrect, word/non-word judgments across the 96 trials, 99% of respondents (*n* = 224*)* were correct at least 82.2% of the time. Furthermore, the median percentage correct was 99% of trials (95 out of 96 of the trials) and 75% of persons were correct 96.9% of the time (93 out of 96 trials) or greater. Remarkably, 25% of the entire sample *never* indicated an incorrect response (96 out of 96 trials correct). Given the overwhelming unanimity in correct judgments in the present task, it is of the most practical sense, given the low variability in correct vs. incorrect word/non-word judgments, to subsequently analyze solely the correct responses. Put another way, there

were too few incorrect observations to analyze interpretable results[2]. Further, given the low-frequency of individuals with high-frequency incorrect-judgments, in the present analyses, I only analyze data of those individuals that were in, at minimum, the 25% percentile (i.e., respondents with a correct frequency of at minimum 93 out of 96 trials; or, more simply, I dropped data from participants that scored below the 25th percentile). In the context of this variable reconstruction, I am able to retain a reliable set of individuals that clearly attended to the task, made few mistakes, and, as such allow me to interpret reaction time in the context of unambiguous correct trials, given the presence of only their correct word-judgment responses. This transformation retained a final sample of 131 participants for subsequent RT/LDT analysis.

Treatment of Non-words in the LDT. The presentation of non-words in the LDT in the present sense was mainly for issues regarding the presentation of an LDT-type paradigm. Put another way, to mask the true purpose of the paradigm, participants were led to believe that the researchers were interested in word/non-word judgments. Given, reaction time and the correct judgment of non-words are of little theoretical interest or meaning in the current work, and for a cleaner subsequent test of sex-related words vs.

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[2] Analysis of an RT x CORRECT effect is of little theoretical interest in the present study, given the lack of description as to what incorrect word or non-word responses indicate in the presence of judging sex words, long-term words, filler-words, and non-words. For example, judging a sex-word as non-word when it is indeed a sex word is open to varied and perhaps contrived interpretations.

relationship-related words (vs. filler words), non-words were discarded from the data set. Since the present data are structured within a hierarchical multi-level dataset, this *did not* drop any participants, but rather only the particular rows of data associated with each participant's non-word judgments.

Basic Analysis. To test how the story-type condition influenced latency to respond as a function of word-type, I regressed participants RT onto the type of word-type (3; Sex-related, Relationship-related, or Filler word), story-type (3; Short-term story, Long-term story, or No-story control), and block (2; 1st or 2nd block to capture unique effects of practice or familiarity with the LDT) and the factorial crossing of those three variables. A story-type main effect did not emerge, $F(2,8754) = 0.14$, $p = .8677$, suggesting that overall reaction time did not differ across Story-types. A significant word-type (Sex, Relationship, Filler) effect indicated that RT varied as a function of type of word-type, $F(2,8754) = 62.23$, $p < .0001$ Replicating previous research on sexual-related responding and response latency (Spiering et al. 2002; Geer & Bellard, 1996 ; Geer & Melton, 1997; Wiegel, Scepkowski, & Barlow, 2007), pairwise comparisons indicated that RT was slower (i.e. longer) in judging sex-related words (M = .7466 , SE = .01077) than relationship-related words (M = .7081, SE = .7081), $t(8754) = 8.86$, $p < .0001$, and filler words (M = .7018, SE = .7018), $t(8754) = 10.32$, $p < .0001$, and the latter two types of words did not significantly differ, $t(8754) = 1.46$, $p = .1435$. The predicted Word-type x Story-type effect was non-significant, $F(4,8754) = 0.30$, $p = .8768$, and did not vary by Block, $F(4,8754) = 0.42$, $p = .7958$. These effects remain (in regard to relative magnitude of effects and p-values) when I retain only the sex and relationship words (i.e., remove the filler words), control for each individual's mean RT by entering each person's mean

RT *to the filler words* as a covariate (so as to not confound sex or relationship words in the covariate), control for the number of letters in each word, and control for the mean positivity rating (based off of Pilot Study 1's ratings). Each of the latter three covariates uniquely explains the variance in RT (all *ps* < .0001*)* but none interact to help in explaining person's RT.

Individual Difference Analysis. That the Word-type and Story-type did not vary across blocks, prompted my retaining the block variable simply as a covariate. All subsequent analyses collapse across block, but control for its unique main effects. The letter-count variable, person-level mean-RT score (based upon person-level mean RT to filler items), and mean positivity score for each word are additionally retained as covariates (as discussed in the previous set of analyses). Additionally, all subsequent analyses compare RT to sex-related words only with RT to relationship-related words. I first examine the quadratic pattern of menstrual cycle day and next, each individual difference, and its interaction with the quadratic pattern.

Menstrual Cycle Analyses. To test whether cyclic menstrual shifts influenced reaction times, I regressed RT onto day (grand-mean centered), day^2 (the quadratic component), and each of the latter with the factorial combination of story-type and word-type. Neither the Day^2 main effect, $F(1,5781) = 1.63$, p = .2020*,* or Story-type x Day^2, $F(2,5781) = 1.30$, p = .2716*,* or the three-way Story-type x Word-type x Day^2 interaction, $F(2,5781) = 1.75$, p = .2735*,* approached significance – although a non-significant Word-type x Day^2 interaction, $F(1,5781) = 2.44$, p = .1184, prompted further exploration. However, simple effects indicated that the Day^2 effect was neither significant for sex-related words, $B = -0.00010$, $SE = 0.000176$, $t(5781) = 0.56$, $p = .7202$, or relationship-

related words, B = 0.00013, SE = 0.000176, $t(5780) = .75$, $p = 4547$. It does not appear that women's reaction time is differentially affected across the menstrual cycle.

VSC – Vulnerability to Sexual Coercion (Fear of Rape). A significant VSC x Word-type x Story-type interaction, $F(2,5781) = 4.42$, p = .0121, indicated that the extent to which RT differed as a function of word-type and story-type varied across levels of VSC (no other main effects or interactions emerged, all other effect *p*s > .29). Simple effects indicated a Word-type x Story-type interaction for those high in VSC, $F(2,5784) = 3.82$, p = .0220, but not for those low in VSC, $F(2,5781) = 0.98$, p = .3769. For those high in VSC, a story-type effect did not emerge for sex-related words, $t(2,5784) = .30$, $p = .7419$, or for relationship-related words, $t(2,5784) = .36$, $p = .7008$. Examined another way however, the word-type effect did not emerge within the No-story condition, $t(5784) = 0.40$, $p = .5250$, the Long-term story condition, $t(5784) = 0.81$, $p = .3687$, or the Short-term story condition, $t(5784) = 0.67$, $p = .4119$. Although no simple effects approached significance, the descriptive patterns of means suggested that for those high in VSC, RT to sex words were faster in the short-term story condition ($M = .5065$, $SE = .03$), than in the long-term condition ($M = .5288$, $SE = .03$), $t(5784) = 0.59$, $p = .4408$, or the control condition ($M = .5180$, $SE = .0325$), $t(5784) = 0.42$, $p = .6741$ and RT to relationship words were faster in the long-term story condition ($M = .5084$, $SE = .03$) than in the short-term condition ($M = .5250$, $SE = .03$), $t(5784) = 0.33$, $p = .5664$ or the control condition ($M = .5250$, $SE = .03$), $t(5784) = 0.26$, $p = .7928$. For women low in VSC, RT did not seem to vary as a function of story-type and word-type. In a purely descriptive sense, it appears that for those high in VSC, the short-term story prime influenced faster judgments of the sex words, and the long-term story prime influenced faster judgments of

relationship words. The quadratic menstrual cycle pattern did not additionally moderate any previously reported effects (all *ps* < .29).

Sociosexual Orientation (SSO). The SSO x Word-type x Story-type interaction was non-significant, $F(2,5784) = .30$, $p = .8783$. SSO did not interact with Story-type, $F(2,5784) = 1.95$, $p = .1422$, but did interact with Word-type, $F(1,5784) = 5.48$, $p = .0193$. The word-type effect was non-significant for those low in SSO, $F(1,5784) = 0.01$, $p = .9273$, and for those high in SSO, $F(1,5784) = 0.80$, $p = .3699$. Simple effects of word-type within SSO indicated that SSO did not influence RT for relationship-related words, $B = 0.00824$, $SE = .0060$, $t(5783) = 0.93$, $p = .3524$, or sex-related words, $B = -0.00995$, $SE = .0087$, $t(5784) = 1.12$, $p = .2620$, although the interaction was such that the simple effects were in differential directions.

Fantasy sub-scale. The Fantasy x Word-type x Story-type interaction was non-significant, $F(2,5784) = 0.03$, $p = .9682$. All effects involving the fantasy variable were non-significant as well (all *ps* > *.42)*. Additional analyses involving the quadratic pattern of menstrual cycle day did produce any significant effects either (all *ps* < *.55)*.

Interactions involving Individual Difference Variables. The possibility of various individual difference variables interacting with one another was explored in the next set of analyses. It is of theoretical interest to examine, in particular, the quadratic menstrual cycle pattern within levels of those high or low in perceived vulnerability to sexual coercion (VSC) or within those most willing to engage in short-term sexual relationships (SSO). It is of further value to explore the possibility that the extent to which women engaged in the story (Fantasy) may have moderated the VSC pattern or the SSO pattern. Since the purpose of Pilot Study 2 is to determine the effects of the Story-type primes,

those theoretically plausible combinations involving Story-type and an interaction involving VSC, SSO, Fantasy, and Day^2 are subsequently analyzed.

The VSC x Word-type x Story-type x Fantasy interaction, F (2,5777) = 1.27, p = .2797, was non-significant. After introducing the day, and day^2 term to the model, the VSC x Word-type x Story-type x Fantasy x Day^2 interaction, F(2,5752) = 0.84, p = .4336, was also non-significant. Any additional effect involving the quadratic pattern of menstrual cycle day and the above variables did not reach significance (all *ps > .25)*.

A marginally significant Fantasy x SSO x Word-type x Story-type interaction, F(2,5777) = 2.78, p = .0618, indicated that the SSO x Word-type x Story-type effect varied across levels of Fantasy. In particular, the SSO x Word-type x Story-type effect was present at low-levels of Fantasy, F(2,5778) = 2.83, p = .0592, but not at high-levels of Fantasy, F(2,5778) = 0.55, p = .5758. For those low in Fantasy, neither the Word-type x Story-type effect emerged at high levels of SSO, F(2,5777) = 1.39, p = .2498, or at low levels of SSO, F(2,5776)=1.64, p=.1949. Alternatively, the Fantasy x Word-type x Story-type interaction was non-significant for those high in SSO, F(2,5777) = 2.05, p = .1286, and for those low in SSO, F(2,5777) = 0.77, p = .4621. Although no simple interactions approached significance, the general pattern reflected faster (i.e., shorter) responses to sex words following the short-term story prime for those high in fantasy and high in SSO (M = .4912, SE = .039) than for those low in fantasy and high in SSO (M = .5231, SE = .036), t(5776) = 1.04, p = .2968. See table 2 for the full crossing of marginal means.

Pilot Studies - Discussion

Taken as a whole, results obtained from Pilot Study 2 supported the implementation of the story primes for Study 1. Particularly, the explicit arousal findings

suggest that the story-primes achieved the primary goal of explicitly influencing women's desire to uniquely pursue a short-term sexual or long-term committed relationship. That the implicit measurements failed, in part, to capture the effects of the story primes should not detract from the efficacy of those manipulations. It is entirely plausible that the explicit nature of the effect could not be measured using the current implicit measure. Put another way, the LDT simply may not have been well suited to measure the story prime manipulations. Nonetheless, the story primes appear to be particularly well suited and are implemented subsequently. The following section describes the methods of Study 1 in detail.

Study 1 Overview

The purpose of Study 1 is to systematically test the conversion and cuckold processes against one another by expanding upon the original Salvatore et al. Study 2 paradigm. In that paradigm women evaluated presumed (but experimentally manipulated) ingroup and outgroup men's physical attractiveness, attractiveness as a short-term sex partner, and attractiveness as a long-term relationship partner. Findings suggested that mid-cycle normally ovulating heterosexual women found outgroup men (but not ingroup men or women of either group) increasingly attractive, and similarly so as both short-term sexual and long-term committed relationship partners. One possibility that could account Salvatore et al. previous findings that women reported similar quadratic patterns of attraction to outgroup men for short-term and long-term mates may be that such ratings were the result of faulty introspection (i.e., the halo-effect hypothesis). The current experiment offers a methodological improvement by manipulating, rather than solely measuring, the hypothesized underlying motivation(s) responsible for heightened

outgroup male attraction. By manipulating (vs. solely measuring) the psychological state responsible for short-term sexual and long-term committed evaluations, we can rule out that faulty introspection is occurring. Thus, Study 1's methods experimentally manipulate short-term sexual and long-term committed mating motivation and subsequently measure perceived intergroup attractiveness. Simply, general attractiveness ratings (i.e., ratings that are non-domain specific) following the manipulation of the psychological state responsible for heightened short-term sexual or long-term committed mating-desire should theoretically reflect each respective construct.

In Study 1, women were randomly assigned to either read the short-term sexual story, the long-term committed story, or no story at all (i.e., the control condition). I sampled across the menstrual cycle to ensure similar menstrual cycle day distribution in each condition. If the cuckold hypothesis is more likely then I expect to find increased attraction to outgroup men following the short-term, but not long-term, story condition. If the conversion hypothesis is more likely, then I expect to find increased attraction to outgroup men following the short-term *and* the long-term story condition, similarly. Regardless of the direction of the effects in support of the conversion or the cuckold hypothesis, the effects may operate solely within the fertile window (i.e., mid-cycle), could vary in magnitude as a function of the menstrual cycle, or to the extent that ovulation *is the cue* to heightened outgroup evaluations, could operate equally in magnitude across the menstrual cycle. At any rate, according to the choice-based outgroup mating hypothesis, women should evidence increased attraction to outgroup but not ingroup men in one or both of the manipulated conditions.

Participants and Design. Participants were 266 normally ovulating Caucasian heterosexual women collected via Syracuse University (*n* = 104, *Mean Age* = 18.51, *SD* = 0.78) and Amazon's Mechanical Turk (*n* = 162, *Mean Age* = 20.48, *SD* = 1.38). Participants at Syracuse were invited to participate in a computerized online study assessing interpersonal relations and awarded credit through their introductory psychology class. Participants via MTurk were invited to participate in a study entitled "Women's Health" and compensated $1.01 for their time.

After obtaining electronic informed consent, women were told that they would complete several tasks on their computer. Before any task began, women were randomly assigned to a Story-type condition (short-term sexual, long-term committed, or no-story control). Women randomly assigned to the short-term sexual or long-term committed story were asked to read the respective story with the expectancy that the story would be later recalled. Participants in the no-story control condition advanced to the primary task without any mention of reading a story.

In the primary task, participants were informed that the researchers were interested in obtaining a set of photographed Hispanic and Caucasian males that varied in perceived attractiveness. The participant was told that they would be shown several photographs of Caucasian and Hispanic men, and that the men's ethnicity would be denoted next to their photograph. Participants were told that their task was to rate the physical attractiveness of each photographed man (i.e., "*How physically attractive do you find the following individual?*"). Before the task began, a scale from 1(not at all attractive) to 9(extremely attractive) was presented to familiarize the participant with the scaling.

Target photographs were faces of 16 men who based on pilot testing, could pass for being either Hispanic or Caucasian (see Salvatore et al.). The labels "Hispanic" and "Caucasian" were randomly assigned to the photographs such that half the photographs were labeled "Hispanic" and the other half labeled "Caucasian." Following the physical attractiveness-rating task, participants were asked to recall the story they previously read by writing a short summary of the story (but of course only in the Story-type conditions in which a story was presented). Subsequently, participants rated the same set of photographs on their perceived attractiveness as a short-term sexual partner, and their perceived attractiveness as long-term committed partner, with the latter two rating-types counter-balanced across participant.

Following the rating tasks, participants provided information about their menstrual cycle (e.g., first-day of last menstrual cycle, typical cycle length), completed a set of individual-difference measures (e.g., SSO; Penke & Asendorpf, 2008;Vulnerability to Sexual Coercion - VSC; Navarrete et al., 2010; assessed using the Fear of Rape Scale; Senn & Dzinas, 1996, and the Interpersonal Reactivity Fantasy subscale; Davis, 1980), and basic demographic items (e.g., relationship status, age, etc.). Participants were subsequently debriefed, and thanked for their time.

Results. The story-recall measure (between the physical attractiveness rating task and the short-term/long-term attractiveness rating tasks) was used as a manipulation check to ensure that each woman read and comprehended the story prime (in the story prime conditions). Thirteen women were excluded from analysis for failing this manipulation check ($n_{MTURK} = 8$, $n_{SYRACUSE} = 5$) by incompletely (or incomprehensibly) recalling the story. Additionally 6 women ($n_{MTURK} = 5$ $n_{SYRACUSE} = 1$) were excluded for

indicating a date in the future (rather than past) as their response to the menstrual cycle question (*Indicate the first day of your last menstrual period*). Finally, for concerns regarding the accuracy of their reported menstrual cycle start date, nine women (n_{MTURK} = 7 $n_{SYRACUSE}$ = 2) were excluded for being 10 or more days late for their estimated next menstrual cycle start date. The preceding exclusions retained a final sample of 238 women (n_{MTURK} = 142 $n_{SYRACUSE}$ = 96).

The data were arranged in the context of a hierarchical multi-level structured dataset in which women's multiple ratings of the photographed male faces constituted repeated-measure assessments. As such, each repeated-measure-rating constituted one-row of data. To account for each rating's unique characteristics, an indicator variable was created to specify a given evaluation's randomly assigned group label (Hispanic or Caucasian), and the particular photograph number (1 through 16, to account for the idiosyncratic differences in discrete faces).

More specifically, Level 1 is made up of the dependent variable attraction-Rating (1-7, continuous), the unique photograph-target, and the group (Ingroup/Outgroup) of the target. Level 2 contains the story-type condition (Short-term, Long-term, or No-story), and all of the individual difference variables ("collection-site" [Mturk or Syracuse], standardized menstrual cycle day, VSC, SSO, and etc.). I accounted for the nesting of the observations using multi-level regression in PROC MIXED of SAS 9.3.

Before examining hypotheses relevant fixed-effects, I conducted model comparison tests (with restricted maximum likelihood estimation and chi-square distributed -2 log-likelihood differences) by estimating several random effects with rating as the response variable, and story-type (Short-term, Long-term, or No story) and group

(Ingroup/Outgroup) as the predictors. Multiple fit diagnostics suggested an overall model that estimated a random intercept, and a random group (In/Out) slope best fit the data. The subsequent analyses' fixed effect parameters are in the context of this random effects model.

Intergroup attraction as a function of Story-type. To first test for differences in Collection-site (Mturk/Syracuse), I regressed Attraction-Ratings onto Group (Ingroup/Outgroup), Story-type (Short-term sexual, Long-term relational, and No-story control), Collection-site (Mturk/Syracuse), and the factorial crossing of the latter 3 variables. Collection-site did not interact with Group, $F(1,3346) = 0.56$, $p = .4526$, Story-type, $F(2, 3346) = 0.14$, $p = .9712$, or the crossing of the latter two variables, $F(2, 3346) = 1.27$, $p = .2797$, suggesting similar overall effects as a function of Collection-site. A non-significant main effect of Collection-site, $F(1, 3346) = 2.55$, $p = .1104$, suggested that on average, Attraction-Ratings, collapsed across Group and Story-type, were descriptively (but not statistically) higher for Mturk respondents ($M = 4.77$, $SE = .20$) than Syracuse respondents ($M = 4.52$, $SE = .28$). However, given the marginal nature of the main-effect, in the hypotheses relevant subsequent analyses, Collection-site is retained as a covariate.

Next, to test for the effect of Story-type on women's ratings of ingroup and outgroup men, I regressed attraction-ratings onto the factorial crossing of story-type and group, and controlled for the effect of collection-site. The predicted Story-Type x Group interaction, $F(2,3346) = 3.18$, $p = .0415$, indicated that attraction-ratings varied as a function of the story-type condition and the target's presumed group membership. More specifically, and as can be seen in Figure 2, a group effect was present for the short-term

story, $F(1,236) = 10.27$, $p = .0015$, and the long-term story, $F(1,236) = 8.84$, $p = .0033$, but not the no-story control condition, $F(1,236) = 0.04$, $p = .8509$. Within the short-term story, women rated outgroup men ($M = 4.63$, $SE = .17$) as more attractive than ingroup men ($M = 4.24$, $SE = .17$). Similarly, within the long-term story, and consistent with the conversion hypothesis, women rated outgroup men ($M = 4.78$, $SE = .17$) as more attractive than ingroup men ($M = 4.42$, $SE = .17$). Within the no-story control, outgroup men ($M = 4.55$, $SE = .17$) were evaluated similarly attractive as ingroup men ($M = 4.54$, $SE = .17$).

Another way to decompose the Group x Story-type interaction is to examine the simple effects of story-type within levels of group. The overall story-type effect for the ingroup, $F(2,3346) = 1.07$, $p = .3419$, and the outgroup, $F(2,3346) = 0.65$, $p = .5227$, were, however, both non-significant. For the ingroup, neither mean differences between the short-term story and the long-term story, $B = .1814$, $SE = .2090$, $t(3346) = 0.87$, $p = .3856$, or the short-term story and the no-story control, $B = .2946$, $SE = .2017$, $t(3346) = 1.46$, $p = .1442$, or the no-story control and the long-term story, $B = -0.3391$, $SE = .1650$, $t(3346) = 0.57$, $p = .5712$, reached conventional levels of significance. Similarly, for the outgroup, neither mean differences between the short-term story and the long-term story, $B = .1480$, $SE = .2090$, $t(3346) = 0.71$, $p = .4790$, or the short-term story and the no-story control, $B = -0.0778$, $SE = .2017$, $t(3346) = -0.39$, $p = .6995$, or the no-story control and the long-term story, $B = -0.2259$, $SE = .2000$, $t(3346) = -1.13$, $p = .2588$, were significant either.

Another way to test the conversion hypothesis, given the similar pattern of outgroup (vs. ingroup) attraction for both women in the short-term sexual and long-term

committed conditions (as compared to the no-story control) is to test the orthogonal contrasts of the mean of the short-term and long-term conditions vs. the no-story control condition across levels of group. To do this, I regressed attraction-ratings onto a contrast comparing the mean of the short-term and long-term conditions with the mean of the control condition (Short/Long vs. Control: 1, 1, -2, respectively), a contrast comparing the mean of the short-term condition with the mean of the long-term condition (Short vs. Long: 1, -1, 0, respectively), the effect of group, each of the two contrasts with the factorial crossing of group, and the effect of collection-site. The hypothesis relevant Group x Short/Long vs. Control effect, $F(1,3346) = 6.34$, $p = .0119$, indicated that the difference between the mean ratings in the short-term condition and long-term condition vs. no-story control condition varied across levels of group. Although neither the simple effect of the contrast for the ingroup, $B = -0.068$, $SE = .057$, $t(3346) = -1.19$, $p = .2345$, nor the outgroup, $B = 0.051$, $SE = .057$, $t(3346) = 0.89$, $p = .3760$, reached conventional levels of significance, the effects were consistent with the conversion hypothesis such that attraction ratings of the outgroup *increased* in the short-term and long-term condition as compared with the no-story control condition, and attraction ratings of the ingroup *decreased* in the short-term and long-term condition as compared with the no-story control condition.

Cycle moderated shifts. Next, I tested whether the menstrual cycle moderated the previously reported patterns by regressing Attraction-Ratings onto Day (grand-mean centered), Day^2 (the quadratic component), Group (In/Out), Story-type (Short-term/Long-term/No-story), the interactions of the two latter variables with each of the former variables, and the between subject effect of Collection-site. Neither the Group x Story-

type x Day^2 interaction, $F(2,3344) = 1.09$, $p = .3364$, nor the Group x Day^2 interaction, $F(1,3344) = 0.21$, $p = .6489$, nor the Story-type x Day^2 interaction, $F(2,3344) = 1.17$, $p = .3364$, approached conventional levels of significance, which suggests that the previously reported effects remain consistent similarly across the menstrual cycle.

Individual Difference Analysis. The following analyses examine the relationship between the previously reported effects and individual difference variables (i.e., SSO, VSC, Fantasy subscale). First I examine the effect of each individual difference variable, and then the possible interaction of such individual difference with that of the quadratic pattern of menstrual cycle day (i.e., Day^2).

SSO. A marginally significant SSO x Group x Story-type effect, $F(2,3346) = 2.53$, $p = .0801$, suggested that the Group x Story-type varied across levels of SSO. Specifically, women high in SSO (1 SD above the mean of SSO) evidenced a significant Group x Story-type effect, $F(2,3346) = 4.12$, $p = .0163$, but not women low in SSO (1 SD below the mean of SSO), $F(2,3346) = 1.55$, $p = .2123$. For women high in SSO, in the Short-term story condition, a non-significant Group effect, $F(1,233) = 1.91$, $p = .1688$, indicated that outgroup men ($M = 4.57$, $SE = .25$) were perceived similarly attractive as ingroup men ($M = 4.31$, $SE = .25$). For women high in SSO, in the Long-term story condition however, a significant Group effect, $F(1,233) = 10.95$, $p = .0011$, indicated that outgroup men ($M = 4.97$, $SE = .23$) were perceived more attractive than ingroup men ($M = 4.40$, $SE = .23$). For women high in SSO, in the No-story control condition, as in the initial hypothesis relevant analysis, a non-significant Group effect, $F(1,233) = 0.31$, $p = .5754$, indicated that outgroup men ($M = 4.48$, $SE = .21$) were perceived similarly

attractive as ingroup men (M = 4.21, SE = .25). The quadratic pattern of menstrual cycle day did not moderate any of the reported effects, all ps > .6806.

VSC. A marginally significant VSC effect, $F(1,3346) = 2.82$, $p = .0934$, indicated that as perceived vulnerability to sexual-coercion increased, attraction-ratings decreased, B = -0.2317, SE = .14. No other meaningful or significant effect emerged. The quadratic pattern of menstrual cycle day did not moderate any effect (all ps > .4592).

Fantasy sub-scale. Neither a Fantasy x Group, $F(1,3332) = 0.47$, $p = .4926$, nor a Fantasy x Story-type, $F(2,3332) = 0.41$, $p = .6658$, nor the 3 way interaction, Fantasy x Group and Story-type, $F(2,3332) = 0.51$, $p = .5976$ reached conventional levels of significance. Indeed, in the context of the present analyses, the originally reported Group x Story-type effect remained significant, $F(2,3332) = 2.95$, $p = .0527$. The quadratic pattern of menstrual cycle day did not moderate any effect (all ps > .8470).

Short-term and Long-term Ratings following Short-term and Long-term Stories. After the physical attractiveness-rating task, women rated the same set of photographs on 2 additional dimensions – attractiveness as a short-term partner and attractiveness as a long-term partner. It was initially unclear how the short-term and long-term story primes would influence women's ratings of ingroup and outgroup men as short-term sexual and long-term committed partners (i.e., manipulating and measuring identical constructs). Notwithstanding, the subsequent set of analyses explores the unique effects of story primes on the latter dimensions of attractiveness ratings.

Similar to the physical attractiveness data organization, the data were structured in the context of a hierarchical multi-level dataset in which women's dual ratings of the photographed male faces constituted repeated-measure assessments. To account for each

rating's unique characteristics, an indicator variable was created to specify a given evaluation's randomly assigned group label (Hispanic or Caucasian), the particular rating-type (Short-term partner/Long-term partner) and the particular photograph number (1 through 16). More specifically, Level 1 is made up of the dependent variable attraction-Rating (1-7, continuous), the photograph-target, the group (Ingroup/Outgroup) of the target, and the rating-type (Short-term partner/Long-term partner). Level 2 contains the story-type condition (Short-term, Long-term, or No-story), and all of the individual difference variables (collection-site, standardized menstrual cycle day, VSC, SSO, and etc.).

Before examining hypotheses relevant fixed-effects, I conducted model comparison tests (with restricted maximum likelihood estimation and chi-square distributed -2 log-likelihood differences) by estimating several random effects model regressions with rating as the response variable, and story-type (Short-term, Long-term, or No story), rating-type (Short-term partner/Long-term partner) and group (Ingroup/Outgroup) as the predictors. Multiple fit diagnostics suggested an overall model that estimated a random intercept, a random rating-type slope (Short-term partner/Long-term partner), and a random photograph-number slope best fit the current data. The subsequent analyses' fixed effect parameters are in the context of this random effects model.

Domain-specific mate ratings as a function of story-type and rating-type. To test the effect of the story primes on women's evaluations of ingroup and outgroup men as short-term and long-term partners, I regressed attractiveness-ratings onto group (In/Out), story-type (Short-term/Long-term), rating-type (Short-term partner/Long-term partner),

the factorial crossing of the latter three variables, and the between-subject effect of collection-site (Mturk/Syracuse). A group main effect, $F(1,3582) = 5.28$, $p = .0217$, indicated that attractiveness-ratings of the ingroup ($M = 4.25$, $SE = .09$) were on average lower than the outgroup ($M = 4.39$, $SE = .09$). A significant rating-type effect, $F(1,236) = 5.63$, $p = .0184$, indicated that short-term sexual evaluations ($M = 4.26$, $SE = .09$) were on average lower than the long-term committed evaluations ($M = 4.39$ $SE = .09$). Overall ratings did not differ by story-type condition, $F(2,3582) = 0.45$, $p = .6349$. These effects, however, were qualified by a significant Group x Story-type x Rating-type effect, $F(2,3582) = 5.11$, $p = .0061$.

Specifically, within story-types, a Group x Rating-type effect emerged for the short-term story, $F(1,3582) = 7.69$, $p = .0056$, marginally for the long-term story, $F(1,3582) = 2.91$, $p = .0880$, but not for the no-story control condition, $F(1,3582) = 1.10$, $p = .2952$.

As can be seen in the top panel of Figure 3, within the short-term story condition, as short-term partners, outgroup men ($M = 4.53$, $SE = .20$) were deemed more attractive than ingroup men ($M = 4.10$, $SE = .20$), $F(1,3582) = 12.03$, $p = .0005$. However, as can be seen in the bottom panel of Figure 3, for long-term partners, outgroup ($M = 4.33$, $SE = .20$) and ingroup ($M = 4.21$, $SE = .20$) evaluations did not differ, $F(1,3582) = 0.88$, $p = .3481$.

Within the long-term story condition, for short-term partners (top panel, Figure 3), outgroup ($M = 4.03$, $SE = .20$) and ingroup ($M = 3.96$, $SE = .20$) evaluations did not differ, $F(1,3582) = 0.35$, $p = .5549$, but for long-term partners (bottom panel, Figure 3),

outgroup men (M = 4.31, SE = .20) were deemed more attractive than ingroup men (M = 4.04, SE = .20), $F(1,3582) = 4.61$, $p = .0319$.

Within the no-story control condition, evaluations neither differed for short-term partner evaluations (top panel, Figure 3) of outgroup men (M = 4.07, SE = .19) vs. ingroup men (M = 4.03, SE = .19), $F(1,3582) = 0.11$, $p = .7378$, nor for long-term partner evaluations (bottom panel, Figure 3) for outgroup men (M = 4.27, SE = .19) vs. ingroup men (M = 4.35, SE = .19), $F(1,3582) = 0.38$, $p = .5353$.

The previously reported effects remain consistent, in relation to magnitude of effects and p values, when analyzing rating-type as strictly a between person effect (all ps > .3181). Mid-cycle evaluations did not moderate the previously reported patterns (all ps > .5952).

Discussion

In Study 1 women were randomly assigned to experience an increased desire to pursue a long-term committed relationship, a short-term sexual relationship, or nothing at all. Consistent with the conversion hypothesis, results indicated that both long-term committed and short-term sexual motivational states were related to perceiving outgroup men more physically attractive than ingroup men. Indeed no differences between ingroup and outgroup men's perceived attraction were found in the control condition. Evidence that both short-term and long-term mate seeking are related to increased outgroup (but not ingroup) male attraction is consistent with Salvatore et al. prior conversion-hypothesis-consistent findings. However, improving upon their prior work, instead of merely measuring such constructs, the current research experimentally manipulated the short-term and long-term mate seeking motivational states.

The current findings, however, are not without alternative explanation. First, it is possible that the ratings of physical attraction are adulterated with sexual connotation (more so than may be adulterated with a long-term relationship connotation). Put another way, merely making an evaluation of a targets physical attractiveness could be in effect an exact judgment of sexual attractiveness. To the extent that each story influenced women's motivational mate seeking, the physical attractiveness ratings may have been, in effect, *sexual attractiveness* proxies. The absence of a control condition effect is consistent with the notion that women in the two story conditions were in a mate-seeking state (although within presumable discrete domains), and when confronted with evaluations of physical attraction, made strictly sexual evaluations. However, in this account, we would also expect higher mean outgroup ratings in the short-term story condition in comparison to mean outgroup ratings in the long-term story condition – this, however, was not the case.

Likewise, we can't rule out the possibility that women in the long-term committed condition were not *at all* thinking about sex when making their judgments of physical attraction. That is, although women in the long-term committed condition were likely thinking about marriage, marriage of course involves sex. However, similar to the alternative account in the preceding paragraph, any impact on thoughts or motivation to seek sex would have been qualified by a relative increase in ratings following the short-term story vs. the long-term story (the presumable presence of such an hypothesized effect was confirmed via pilot testing). That women in the short-term sexual condition found outgroup men equally physically attractive as women in the long-term committed condition is, again, inconsistent with this account.

Finally, the control condition in the present experiment failed to replicate a predicted quadratic pattern of attraction to outgroup men (previously reported in Salvatore et al.). There may be several reasons as to why such an effect did not emerge. One explanation may be simple sampling error. The other two explanations rely on methodological aspects of the current task in comparison to the methodology used by Salvatore et al. In particular, both explanations rely on the notion that the discrete blocking of rating-type judgments (physical, short-term, and long-term) led to impeding the detection of the effect, but differ in the specific conceptual aspects that may have contributed.

One possible explanation as to why the current study failed to replicate the predicted quadratic pattern of attraction to outgroup men is that participants in the Salvtore et al. task were in a distinct psychological state (as compared to the current experiment's participants) when making their 3 types of evaluations. In the previous Salvatore et al. task participants were aware of all of the judgment types prior to making any judgments. After learning that evaluations of physical attraction, short-term attraction, and long-term attraction were to be made, women may have made, in effect, only one type of evaluation. In the current study, women were explicitly aware of the singular type of rating they were making (given that I blocked the discrete rating types), and thus may have differentially readied themselves for each type of evaluation. Put another way, it is plausible that women in the previous Salvatore et al. experiment were in a different psychological state than women in the current Study 1.

The other possible explanation as to why the current study failed to replicate the predicted quadratic pattern of attraction to outgroup men still relies on the blocking

aspect, but specifically attributes the null effect to the small number of evaluations per block (n = 16). The previous Salvatore et al. task assessed multiple evaluations within one block with 48 hypothesis relevant trials. In effect, the previous method of assessment may have increased reliability and validity, relative to the current task. There is a possibility that a necessary component to the measurement of (positive) outgroup regard is a large frequency of evaluations in a given block of trials (i.e., perhaps repeated continuous measurement is necessary to break down the typical automatic associative *ingroup-good/outgroup-bad* concept). Given that outgroup attraction is likely riddled with social influence and persons *typical* psychology may, on average, weaken such an effect, it is entirely plausible the current task lacked reliability sensitive enough to track the quadratic pattern of attraction to outgroup men. Of course, additional research that empirically tests the differences between the two tasks would be necessary to understand the critical components that lead to detection of increased outgroup attraction.

Short-term and Long-term Ratings. Additionally in Study 1, women in all three conditions made intergroup evaluations of short-term sexual and long-term committed attraction. Results indicated, again, that increased attraction to outgroup men is both related to short-term sexual and long-term committed motivational states and evaluations.

A concern stemming from Salvatore et al. previous research was that heightened long-term committed attraction to outgroup men was a product of halo-effect engendered sexual attraction. Indeed, as in their previous research, ratings of short-term and long-term attraction in the present study were highly related (r = .65). However, that outgroup short-term ratings increased (relative to ingroup ratings) only in the short-term story condition, and outgroup long-term ratings increased (relative to ingroup ratings) only in

the long-term story condition is inconsistent with the notion that women are unable to explicitly distinguish between the two domains at the intergroup attractiveness level. Rather, but perhaps tautologically, an increased short-term mate seeking motivational state influenced short-term ratings and an increased long-term mate seeking motivational state influenced long-term ratings (again however, *only for outgroup men*). In that respect, and consistent with the conversion hypothesis, the current findings are among the first evidence that long-term mate seeking is *uniquely* related to increased attraction to outgroup men.

However, again, there is still the possibility that women may have been thinking about sex when making such long-term committed evaluations, or similarly thinking about marriage when making short-term sexual judgments. To the extent that sex is involved in marriage, it may become increasingly difficult to tap such an unadulterated evaluation. Yet, that I manipulated those motivational states (rather than solely measuring them) was a stricter test of the conversion hypotheses than in Salvatore et al. previous research attempt.

At first glance, it may seem that Study 1's findings could still be explained by the impression management and self-deception hypotheses. That is, the fact that outgroup physical attractiveness ratings were influenced similarly in the short-term sexual and long-term committed motivational states plausibly may advocate something artificial about the consensus in ratings. However, even though I was admittedly initially unaware how short-term and long-term ratings would be influenced following the mating-motivation story manipulating, it appears that the latter short-term/long-term findings of Study 1 refute the impression management and self-deception concerns. Both alternative

accounts suggest that long-term ratings would increase relative to increases in short-term ratings. That outgroup short-term ratings increased relative to ingroup short-term ratings following the short-term mating prime, but outgroup long-term ratings did not increase relative to ingroup long-term ratings, suggests that the impression management and self-deception concerns are invalid in the present data. Of course, further testing is necessary.

As a final note, in Study 1, I allowed the explicit processing of the experimental stimuli to naturally vary which may have introduced error into the measurement (i.e., some women likely took time making judgments, while other women made quick assessments). It is possible that if an artificial relationship occurs between short-term and long-term ratings, women may automatically or effortfully correlate the two rating types. To the extent that automatic processing drives an artificial relationship, it may prove difficult to decompose the two domain specific evaluations; however, to the extent that effortful processing occurs, methodological steps can be taken to decrease such a relationship

My aim in Study 2 is to reduce the effortful processing and restrict the time in which participants make evaluative judgments. In so doing, if the cuckold process is the underlying process, then Study 2 should evidence effects consistent with increased positive short-term sexual judgments, but not long-term committed judgments, of outgroup men. If the conversion process is the underlying process, then, as in Study 1 and Salvatore et al. has demonstrated, we should see increased short-term sexual and long-term committed evaluations of outgroup men. The following section describes Study 2 in more detail.

Chapter 3: Study 2

Study 2 employed a novel measure of women's evaluations of ingroup and outgroup men as sex and relationship partners. In particular, participants in Study 2 were shown photographs of presumed ingroup and outgroup men and the participant's task was to indicate whether a given male is attractive as a short-term sexual partner (or not) and attractive as a marriage partner (or not; the two judgment tasks counterbalanced between persons). However, two features of the current task differentiate it from other explicit rating tasks; (a) the participant is asked to make a dichotomous choice (attractive or not – as opposed to a continuous scaled rating) and (b) the judgments are facilitated to be extremely rapid (at or below 1250ms). The dichotomy of the task is meant to polarize the ratings of preference, while the rapid facilitation is meant to cut down on cognitively slow and controlled processing of judgments. Specifically, I expect to see, to the extent that cuckoldry underlies the outgroup mating hypothesis, more positive sex judgments with outgroup (relative to ingroup), compared to marriage judgments with outgroup (relative to ingroup); however, to the extent that conversion underlies the outgroup mating hypothesis, I expect to see similar heightened patterns of sex and marriage judgments related to the outgroup (relative to the ingroup). The following section describes Study 2's method in greater detail.

Participants and Design

Participants were 141 normally ovulating Caucasian heterosexual female undergraduates from the University of Tennessee (*Mean Age* = 18.52, *SD* = .90). Participants were invited to participate in a non-descript lab-based study entitled "Judgments." After obtaining informed consent, all participants began a computerized

task. The participants were told that the researchers were interested in obtaining a set of photographs of Hispanic and Caucasian men that vary in attractiveness, and that their subsequent judgments would help the researchers identify such a subset of photographs suitable for "a future study examining intergroup relations between Hispanic-Americans and Caucasian-Americans."

Participants were instructed that they would view photographs of men from both of these racial groups and that their job was to indicate whether a given photographed man was attractive (or not). For half the participants, they were informed that the relevant dimension of attractiveness was sex. For the other half of the participants, they were informed the relevant dimension of attractiveness was marriage. Participants ultimately completed both sets of evaluations, but the order in which the dimension-specific ratings were assessed was blocked and counter-balanced across participants.

More specifically, the participant was informed that in the "future study" the researchers would be testing "if women might be able to discern in a matter of seconds whether a man is potentially good for a short-term sexual relationship (*or* long-term committed relationship)." Women were then instructed that they would be presented with 16 photographed Hispanic-American and Caucasian-American male faces, in which each male's ethnicity would be noted next to their photograph. In actuality, each male's ethnicity was randomly paired within and between participants using the same photographs and random ethnicity-pairing paradigm from Study 1. The participant was instructed to press the "YES" key (i.e., the "Z" key with a small green stick-on label with the word "Yes") if the given photographed male "is desirable as a sex partner (*or*

husband)" or the "NO" key (i.e., the "/" key with a small red stick-on label with the word "No") if "you DO NOT think he is desirable as a sex partner (*or* husband)."

To alleviate social desirability concerns and prompt the respondent to make honest gut-level evaluations, the following instructions additionally indicated "*Of course, you might be thinking that it is difficult to determine whether a person is desirable as a sex partner (husband) when you do not know anything about him. That's OK. Just go with your gut in deciding whether each individual is desirable. Also, just because you may find a particular person desirable as a sex partner (husband) does not necessarily mean you would have sex with (marry) him.*"

Finally, the participant was informed that for each trial, they would see a series of "+" signs in the center of the screen to focus their eyes, then a photographed male's face with his ethnicity noted beside it, and they were to indicate, based on their gut reaction, whether he is desirable (YES) or not (NO) for sex (or marriage).

Participants rated each given photographed face (n = 16) twice, for both sex and marriage evaluations, for a total of 64 judgment trials. For each trial, the series of "+++" appeared on the screen for 1000ms, then a blank screen for 250ms, followed by the target stimulus. The target appeared on the screen until a response (Yes/No) was made. However, responses greater than 1250ms were subsequently prompted with a "warning screen" that indicated "*Please try to respond faster!*" This reactive prompt was constructed to help facilitate faster response latencies for subsequent trials, and to help discourage slower controlled responses.

Following the judgment task, participants indicated information about their menstrual cycle (e.g., first-day of last menstrual cycle, typical cycle length), completed a

set of individual-difference measures (e.g., SSO; Penke & Asendorpf, 2008; and Vulnerability to Sexual Coercion - VSC; Navarrete et al., 2010; assessed using the Fear of Rape Scale; Senn & Dzinas, 1996), and basic demographic items (e.g., relationship status, age, etc.). Participants were subsequently debriefed and thanked for their time.

Results

The data was arranged within the context of a hierarchical multi-level structured dataset in which women's multiple dichotomous evaluative (Yes/No) ratings of the photographed male faces constituted repeated-measure assessments. As such, each repeated-measure-judgment and its associated response latency constituted one-row of data. To account for unique characteristics of each stimulus, an indicator variable was created to specify a given stimulus' randomly assigned group label (Hispanic or Caucasian), and the particular photograph number (1 through 16, to account for the idiosyncratic differences in discrete faces). More specifically, Level 1 is made up of the dichotomous evaluation of a given face (Yes/No), and it's associated response latency (in milliseconds), the unique Photograph-number (1 through 16), and the Group (Ingroup/Outgroup) of the target. Level 2 contained all of the individual difference variables (standardized Menstrual Cycle Day, VSC, SSO, and etc.).

Given the novelty of the current procedure, there are several ways (though admittedly, no validly-confirmed techniques) to test for the hypothesis relevant effects. One way, given the response was time dependent, is to model a respondents RT as the dependent variable and predict the latency to respond via the absolute choice (Yes/No), the target's group membership (Ingroup/Outgroup), the given rating task (Sex/Marriage), and the participant's individual differences (menstrual cycle day, SSO, VSC). Another

way, given the response was binary, is to model the absolute choice (Yes/No) as the dependent variable and predict the probability to respond "yes" via the target's group membership (Ingroup/Outgroup), the given rating task (Sex/Marriage), and the participant's individual differences (menstrual cycle day, SSO, VSC). I explore each of these analytical approaches in the following section.

Reaction Time as a Dependent Variable. Before examining hypotheses relevant fixed-effects, I conducted model comparison tests (with restricted maximum likelihood estimation and chi-square distributed -2 log-likelihood differences) with RT as the response variable, and Group (Ingroup/Outgroup), Rating-type (Sex/Marriage), and Response (Yes/No) as the predictors. Multiple fit diagnostics suggested an overall model that estimated a random intercept, a random Rating-type (Sex/Marriage) slope, a random Response (Yes/No) slope, and a random Photograph-number slope (i.e., the unique between subject effect in which discrete photograph stimuli differentially influenced each individual's mean response) best fit the current data. The subsequent analyses' fixed effect parameters are in the context of this random effects model.

Response Latency as a function of Rating-type and Group. To determine if RT varies cyclically in relation to intergroup sex and marriage judgments, I regressed RT onto Day (grand-mean centered), Day^2 (the quadratic component), and each of the latter crossed with the factorial combination of Group (In/Out), Rating-type (Sex/Marriage), and Response (Yes/No). I accounted for the nesting of the observations using multi-level regression in PROC MIXED of SAS 9.3. A non-significant main effect of Group, $F(1,6176) = 0.02$, $p = .8869$, indicated that, on average, women responded with the same latency to both ingroup men (*Mean* = 752.16, *SD* = 222.82) and outgroup men (*Mean* =

746.94, *SD* = 217.14). A marginally significant main effect of Rating-type, $F(1,136) = 3.31$, $p = .0709$, indicated that, on average, women responded faster when making sex judgments (*Mean* = 730.44, *SE* = 217.90) than making marriage judgments (*Mean* = 768.74, *SD* = 220.46). A significant main effect of Response, $F(1,136) = 20.56$, $p < .0001$, indicated that, on average, women were faster to respond "yes" (*Mean* = 727.19, *SD* = 219.82) than "no" (*Mean* = 787.68, *SE* = 215.04) regardless of the mans group membership or the type of evaluation (sex/marriage). Neither the hypothesis relevant Group x Rating-type x Response x Day^2, $F(1,6176) = 0.12$, $p = .7314$ or the Group x Response x Day^2, $F(1,6329) = 0.07$, $p = .7895$, effects were significant. Exploratory decomposition of the simple effects revealed no meaningful or significant quadratic relationship between menstrual cycle, Rating-type, Group, and/or Response. SSO and VSC did not additionally moderate any previously reported pattern (all *p*s > .4509).

Response as a Dependent Variable. Before examining hypotheses relevant fixed-effects, I conducted model comparison tests (with restricted maximum likelihood estimation and chi-square distributed -2 log-likelihood differences) with Response (Yes/No) as the dependent variable, and Group (Ingroup/Outgroup) and Rating-type (Sex/Marriage) as the predictors. Multiple fit diagnostics suggested an overall model that estimated a random intercept, a random Rating-type (Sex/Marriage) slope, and a random Photograph-number slope (i.e., the unique between subject effect in which discrete photograph stimuli differentially influenced each individual's binary response) best fit the current data The subsequent analyses' fixed effect parameters are in the context of this random effects model, in which the logistic regression predicts the probability to respond "yes" on a given trial.

Probability of responding "yes" as a function of Rating-type and Group. I accounted for the nesting of the observations using multi-level logistic regression in PROC GLIMMIX of SAS 9.3. An initial intercept-only model revealed that 95% of the logits are expected to fall within -0.8494 and -0.5824, which correspond to predicted probabilities of .30 and .36, respectively.

The first hypothesis relevant test is whether the probability of indicating "yes" on a given trial is dependent upon the group membership of the photographed male stimuli, the type of rating, and a woman's menstrual cycle. To test this, I regressed the Response variable (Yes/No) onto Day (grand-mean centered), Day^2 (the quadratic component), and each of the latter crossed with the factorial combination of Group (In/Out), and Rating-type (Sex/Marriage). A significant Rating-type effect, $F(1,136) = 9.79$, $p = .0021$, indicated that the predicted probability to respond "yes" to marriage (35%) was higher than the probability to respond "yes" to sex (26%; rating-types regardless of the man's group membership). A significant Group effect, $F(1,6323) = 6.82$, $p = .0090$, indicated that the predicted probability of responding "yes" to ingroup men (34%) was higher than the probability of responding "yes" to outgroup men (27%). Neither the Group x Day^2 effect, $F(1,6323) = 0.53$, $p = .4659$, nor the Group x Rating-type x Day^2 effect, , $F(1,6323) = 0.19$, $p = .6608$, were significant, which suggested that the Group effect and Rating-type effect persisted similarly across the menstrual cycle.

Does RT predict responding "yes" as a function of Group and Rating-type? In an exploratory effort, I investigated the relationship between reaction time and responses, treating the former as an IV and the latter as the DV. In this way, I can estimate within and between person differences in the influence of RT on Responses. The

following section describes this effort, but a cautious reader should interpret the findings in light of an important point. The current paradigm was designed to elicit quick gut level evaluations in an attempt to minimize controlled effortful processing and, as such, artificially constrained responses to fall below 1250ms. With that in mind, the task was not necessarily designed to use latency to respond to a given stimuli as a predictor of how strong that association is, but rather use the time dependence to facilitate a less adulterated judgment as a measure of whether a given women preferred an ingroup or outgroup man. Moreover, the following analysis extends the data even further, perhaps past the scope of meaningful generalization, by using within person differences in latency to respond to predict the variance in intergroup preferences across the menstrual cycle. Notwithstanding, the following section describes the results of such an exploratory reaction time analyses.

Again, before examining hypotheses relevant fixed-effects, I conducted model comparison tests (with restricted maximum likelihood estimation and chi-square distributed -2 log-likelihood differences) with Response (Yes/No) as the dependent variable, and Group (Ingroup/Outgroup), Rating-type (Sex/Marriage), person-centered reaction time (PCRT ; a level 1 variable), and grand-mean centered reaction time (GRT; a level 2 variable) as the predictors, with the latter reaction time variables constructed according to Raudenbush and Bryk (2001). Multiple fit diagnostics suggested an overall model that estimated a random intercept, a random Rating-type (Sex/Marriage) slope, and a random Photograph-number slope (i.e., the unique between subject effect in which photograph stimuli differentially influenced each individual's mean response) best fit the current data. The subsequent analyses' fixed effect parameters are in the context of this

random effects model, in which the logistic regression predicts the probability to respond "yes" on a given trial.

Probability of Positive Evaluations as a function of Rating-type, Group, and RT. To test how latency to respond (i.e., RT) influenced women's intergroup sex and marriage judgments across the cycle, and to further test for hypothesis relevant patterns, I regressed the Response variable (Yes/No) onto Day (grand-mean centered), Day^2 (the quadratic component), Group (In/Out), Rating-type (Sex/Marriage), PCRT (person-centered reaction time), the interactions of the three latter variables with each of the two former variables, and a woman's average RT (GRT). A main effect of PCRT indicated that as a woman's RT increased (i.e., became slower), relative to her own average RT, the probability of responding "yes" increased as well, B = 0.000945, *SE* = .0002, $t(6310) = 4.26$, $p < .0001$. The only other notable effect was a Group x Rating-type x PCRT x Day^2 interaction, $F(1, 6310) = 3.34$, $p = .0678$. As seen in Figure 4, for relatively faster judgments (1 SD below the mean of PCRT), when women made sexual evaluations, the probability of responding "yes" was descriptively (but not significantly) quadratically related to the menstrual cycle for the outgroup, $B_{quadratic} = 0.001900$, $t(6310) = 1.48$, $p = .1397$, such that the probability to respond "yes" to outgroup men decreased mid-cycle, but was unrelated to the ingroup, $B_{quadratic} = 0.000373$, $t(6310) = 0.30$, $p = .7664$. When women made marriage judgments, the probability of responding "yes" was marginally quadratically related to the menstrual cycle for the outgroup, $B_{quadratic} = 0.002270$, $t(6310) = 1.68$, $p = .0928$, and significantly quadratically related to the menstrual cycle for the ingroup, $B_{quadratic} = 0.002849$, $t(6310) = 2.22$, $p = .0261$, such that for both groups the probability to respond "yes" decreased mid-cycle. Overall, for relatively faster RTs, the

meaningful pattern was a decreased mid-cycle probability to respond "yes" following ingroup men for sexual judgments, and outgroup men for sexual and marriage judgments. For relatively slower judgments (1 SD above the mean of PCRT), when women made sexual evaluations, the probability to respond "yes" was neither quadratically related to the menstrual cycle for outgroup ratings, $B_{quadratic}$ = -0.00063, $t(6310) = -0.48$, $p = .6294$, or for ingroup ratings, $B_{quadratic}$ = -0.00002, $t(6310) = -0.02$, $p = .9865$. However, when women made marriage judgments, the probability of responding "yes" was marginally quadratically related to the menstrual cycle for the outgroup, $B_{quadratic}$ = 0.002030, $t(6310) = 1.87$, $p = .0621$, such that the probability to respond "yes" to outgroup men decreased mid-cycle, but not quadratically related to the menstrual cycle for the ingroup, $B_{quadratic}$ = 0.000123, $t(6310) = 0.11$, $p = .9162$. Overall for relatively slower judgments, the meaningful pattern was a decreased mid-cycle probability to respond "yes" following outgroup men for marriage judgments.

The preceding analyses should be interpreted in light of an additional moderator. Again, the cautious reader should consider the nature of the paradigm and interpret the following findings and draw conclusions with such in mind. With that said, it is possible that the previously reported PCRT effect is driven, in part via, or moderated by, an overall average propensity to respond quickly or slowly to stimuli. That is, variability between persons in average latency to respond may lend additional insight to the within person PRCT effects. Put another way, women that on average responded quickly or on average responded slowly may evidence dissimilar patterns of cycle-moderated sex and marriage preferences as a function of individual variation in trial RT.

Again, before examining the fixed-effects, I conducted model comparison tests (with restricted maximum likelihood estimation and chi-square distributed -2 log-likelihood differences) with Response (Yes/No) as the dependent variable, and Group (Ingroup/Outgroup), Rating-type (Sex/Marriage), PCRT (a person-centered level 1 RT variable), and GRT (a grand-mean-centered level 2 RT variable) as the predictors. The fit diagnostics suggested that a model that estimated a random intercept, and a random Rating-type (Sex/Marriage) slope best fit the current data (i.e., with the addition of the GRT interaction, the random Photograph-number slope was unable to be estimated).

To test the idea that GRT interacted with previously reported Group x Rating-type x PCRT x Day^2 interaction, I regressed the Response variable (Yes/No) onto Day (grand-mean centered), Day^2 (the quadratic component), Group (In/Out), Rating-type (Sex/Marriage), PCRT (person-centered reaction time), and GRT (grand-mean-centered RT), and the interactions of the four latter variables with each of the two former variables. A significant Group x GRT effect, $F(1,8373) = 5.23$, $p = .0222$, indicated that the probability to respond "yes" to ingroup and outgroup men differed across persons as a function of average latency to respond. In particular, women who on average responded more quickly (1 SD below the mean of GRT) were no more likely to respond "yes" to ingroup men (29%) than outgroup men (27%), $F(1,8375) = 0.79$, $p = .3731$. However, women who on average responded more slowly (1 SD above the mean of GRT) were more likely to respond "yes" to ingroup men (45%) than outgroup men (35%), $F(1,8375) = 21.06$, $p < .0001$. A significant Rating-type x GRT effect, $F(1,8373) = 5.10$, $p = .0239$, indicated the Rating-type effect also differed across persons as a function of average latency to respond. In particular, women who on average responded more quickly (1 SD

below the mean of GRT) were more likely to respond "yes" to marriage evaluations (33%) than to sex evaluations (23%), $F(1,135) = 12.26$, $p = .0006$. However, women who on average responded more slowly (1 SD above the mean of GRT) were no more likely to respond "yes" to marriage judgments (40%) than to sex judgments (39%), $F(1,133) = 0.13$, $p = .7205$.

The only other notable effect was a Group x Rating-type x PCRT x RT x Day^2 interaction, $F(1,8373) = 3.56$, $p = .0593$. As can be seen in Figure 5, the interaction was such that only women who on average had slower RTs (1 SD above the mean of GRT), when making faster RTs relative to their average RT (1 SD below the mean of PCRT), evidenced a significant quadratic relationship between menstrual cycle and the probability of responding "yes" to marriage judgments for both outgroup men, $B_{quadratic} = 0.004032$, $t(8375) = 2.91$, $p = .0036$ and ingroup men, $B_{quadratic} = 0.002769$, $t(8375) = 2.00$, $p = .0453$, with the latter two effects not significantly differing from one another, $F(1,8375) = 0.67$, $p = .4116$. Indeed, both relative faster RT effects are significant when pooled, $F(1,8375) = 8.72$, $p = .0032$, are significantly different than the pooled quadratic relative slower RT effects, $F(1,8375) = 3.49$, $p = .0616$, and indicate that the probability to respond "yes" to marriage judgments decreased mid-cycle relative to early- and late-cycle.

Discussion

In Study 2, women, sampled across the menstrual cycle, were subjected to a novel "forced-choice" style paradigm in which binary evaluative short-term sexual and long-term committed judgments were made about ingroup and outgroup men. The results were clearly inconclusive. Of course, there is some evidence that women attended to the task.

For example, typical general ingroup preferences were displayed and women's marriage judgments, a relatively complex decision, took longer to make on average than sex evaluations. However, the lack of any meaningful cycle moderated effects (for either rating or for either group) suggested that the measure could have lacked sensitivity. That is, the current task might have been *too* controlled. Forcing a binary evaluative response left no room for discrepancy in women's judgments. Conversely, the advantage of using the continuous evaluative response (i.e., a scale) is that women are provided some latitude in their judgments. From an analytical perspective, this provides greater variance in responses, and as a result a more sensitive measure.

In the same respect, the presumed logic of utilizing such a speed-dependent forced choice (i.e., "yes" or "no") may have actually backfired on me. That is, the task may have proved difficult for women (e.g., hurry up and decide if this man is a good sex-partner/husband) and to solve such a task, women may have, to some extent, regarded societal standards to a greater extent than personal preferences. If such a process occurred than the use of speed-reliant social cognitive measurement to assess individual-level preferences should be taken into account when (a) designing experiments that examine intergroup attraction, and (b) interpreting previous research results that have utilized such measurement.

Additionally, the photographs that I used were all only of moderate attraction (≈ 5 on a 1(not at all) to 9(extremely) scale; as previously evidenced in pilot testing and experimentation [Salvatore et al.; and in the present investigation's Study 1]). That Salvatore et al. and the present work have detected hypothesized outgroup mating effects using the current set of standardized photographs (and of course a scaled response) may

suggest that the cycle moderated group preferences are strong enough to elicit differences at around the scale midpoint, but not enough so to influence differences in the absolute binary sense (i.e., "Yes, he *is* attractive to have sex with/marry!"). The previous point may seem like a restatement of the first point; however, the crux of the current account relies upon the moderate attractiveness of the photographed male stimuli. I envisioned that such a "floor effect" may occur within the current paradigm, but the converse of using extremely attractive photographed male stimuli (and of course still manipulating the group membership of each man) would likely result in the opposite "ceiling effect."

Alternatively, there is some evidence in the first exploratory reaction time analysis, when extending the data (though admittedly, perhaps past it's point of generalization), that when women's judgments slow down (relative to themselves), only the probability to positively evaluate outgroup men as marriage partners decreases mid-cycle. Of course the data also suggest when women speed up (relative to themselves), the probability to positively evaluate ingroup men for marriage partners, and outgroup men for both sex and marriage partners decreases mid-cycle. Indeed, for relatively faster judgments, positive evaluation of ingroup men for sex partners appears to remain stable across the menstrual cycle (although the positive estimate of the quadratic effect, $p = .77$, is in the same direction as the other "faster judgment" quadratic estimates). It is possible, however, that the latter null cycle-moderated ingroup-sex finding could indeed be sampling or measurement error, and all relatively faster judgments lead to a decreased probability to positively evaluate all men for all judgments mid-cycle (i.e., an increased probability to say "No" for relatively faster judgments mid-cycle).

It is only when women took their time (relative to their average response latency) that a more meaningful (and easily interpretable) finding emerged. Specifically, the only statistically reliable effect was a decreased probability to positively evaluate outgroup men as marriage partners (all other quadratic effects *p*s > .63). Considering only those relatively slower response latencies, this finding best reflects the logic of the cuckold hypothesis. Of course, if the cuckold process is operating, we would also expect to find an increased mid-cycle probability to positively evaluate outgroup men as sex partners too (note however that the outgroup-sex quadratic effect is in a consistent (negative) direction, though the estimate is not itself statistically significant, $p = .63$).

Finally, the latter most exploratory set of analyses (in light of the additional between-subject average latency to respond moderator), if anything, confused the previous analyses interpretation. Specifically, the only statistically significant finding belonged to women who were on average slower than other women, and only when such women sped up relative to themselves, and only when they made marriage judgments. The pattern was such that the likelihood to say "yes" decreased mid-cycle for both ingroup and outgroup men, consistent with neither the cuckold nor the conversion process.

However, according to Figure 5, it appears that women who were, on average, faster than other women evidenced, when slowing down relative to themselves, differential cycle-moderated preferences for ingroup and outgroup men as sexual vs. marriage partners, directionally consistent with the cuckold process. It is important to note that no simple effect is statistically significant (all *p*s > .17) and all pairwise differences fail to reach significance as well (all *p*s > .54). Nonetheless, in a purely

descriptive sense, the probability to positively evaluate sex partners mid-cycle for outgroup targets increased, but for ingroup targets decreased. Conversely, the probability to positively evaluate marriage partners mid-cycle for outgroup targets *decreased*, but for ingroup targets *increased*. That the effects are not statistically significant advocates that these findings deserve no further discussion, although the latter set of findings would be in line quite nicely with the cuckold hypothesis.

As a closing for Study 2, the findings within the current experiment clearly did not support (nor disconfirm) any of my initial hypotheses. However, the nature of the task should be taken into account when interpreting what exactly this means for the outgroup mating hypothesis. That the current design failed to detect meaningful cycle moderated differences only suggests that the measure should not be adopted to lend insight into similar future investigations. The null-findings are not evident of there being no choice-based outgroup mating phenomena – quite the contrary in that Salvatore et al. and Study 1 support this exact notion. Also, there is some evidence that findings from some time dependent measures diverge from those of controlled responses (Fazio et al., 1995; Dovidio et al., 1997), suggesting we may not see explicit effects using measures that rely upon reaction time. Moreover, in that regard, the current task was not an implicit measure at all, and could be better described as merely a time-constrained explicit measure. With that in mind, I designed Study 3 to attempt to implicitly measure women's preferences, using a psychometrically validated implicit paradigm. The following section describes Study 3 in greater detail.

Chapter 4: Study 3

Study 3 employs an indirect method to the current investigation by implicitly measuring women's evaluations of ingroup and outgroup men as sex or relationship partners across the menstrual cycle. In particular, Study 3's measure relies on the logic of the Affect Misattribution Procedure (AMP; Payne et al, 2006) in which participants are primed with an affect-laden stimulus and prompted to subsequently, as quickly as possible, make affective judgments of ostensibly neutral targets. That the targets are novel, and thus unconditioned stimuli, any evaluation of such targets is regarded as projective spillover from the prime stimulus. The AMP has been shown to be extremely internally reliable, even if participants know exactly how the task may influence their judgments and robust in regard to measures of individual differences. In the current use of the AMP procedure, each prime is a photographed Hispanic or Caucasian male (i.e., the unconditioned stimulus; US) and the target is a (previously unfamiliar) Chinese ideograph (the conditioned stimulus; CS). Unlike the AMP, however, instead of affectively evaluating each CS (i.e., good/bad), the participants evaluated each CS semantically (c.f., Imhoff et al., 2011). More specifically, each respondent indicated whether they considered the CS reflected a sexual-relational meaning (or not), and a committed-relational meaning (or not; in a series of counterbalanced blocks). The logic of the current task relies upon the USs (i.e., ingroup and outgroup men) to differentially (or similarly) influence semantic judgments of sex and marriage. To the extent to which the cuckold hypothesis is more likely, we would expect to observe more short-term sexual *but not* long-term committed relational concept associations with outgroup men (vs. ingroup men) as the prime, with such associations increasing mid-cycle compared to

early-and-late-cycle. To the extent to which the conversion hypothesis is more likely, we would expect to observe more short-term sexual *and* long-term committed relational concept associations with outgroup men (vs. ingroup men) as the prime, with, again, such associations increasing mid-cycle compared to early-and-late-cycle.

Participants and Design

Participants were 146 normally ovulating Caucasian heterosexual female undergraduates from the University of Tennessee (*Mean Age* = 18.49, *SD* = .87 *Range* = 18 - 21). Participants were invited to participate in a non-descript lab-based study entitled "Judgments." After obtaining informed consent, women became acquainted with the study details and instructions.

First, participants read that the researchers were interested in whether people could quickly infer word meaning from a language with which they are unfamiliar. The instructions went on to describe the task they would complete. The participant was told that they would judge whether or not a Chinese symbol means *sex* (or *marriage*; blocked and counter-balanced between subject). The participant was further informed that they would be presented with 16 Chinese symbols, and that each symbol would be preceded by photographed Hispanic-American or Caucasian-American face. The participant was told the photograph would serve as a signal for the onset of the Chinese symbol, and that they were to do nothing with the photographed face. Rather, the participant was instructed to only make judgments about the Chinese symbol.

If the participant thought the Chinese symbol meant *sex* (*marriage*) then they were instructed to press the "yes" key (i.e., the "Z" key with a small green stick-on label with the word "YES") and if they did not think the Chinese symbol meant *sex* (*marriage*)

then to press the "no" key (i.e., the "/" key with a small red stick-on label with the word "NO").

The duration of the stimulus onset asynchrony (SOA) was chosen based on results from Payne et al. (2006). The prime (US; photographed Hispanic or Caucasian male with accompanying text label) was presented for 650ms and subsequently, a blank screen for 125ms preceded the onset of the stimulus. Thus the SOA was 750ms.[3] The Chinese symbol (CS) was displayed for 100ms and following immediately was a black and white pattern mask that remained on the screen until the participant made a judgment.

Following the AMP-style procedure, participants indicated information about their menstrual cycle (e.g., first-day of last menstrual cycle, typical cycle length), completed a set of individual-difference measures (e.g., SSO; Penske & Asendorpf, 2008; and Vulnerability to Sexual Coercion - VSC; Navarrete et al., 2010; assessed using the Fear of Rape Scale; Senn & Dzinas, 1996), and basic demographic items (e.g., relationship status, age, etc.). Lastly, participants were fully debriefed, and thanked for their time.

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[3] The prime duration may seem long (i.e., 650ms); however given the stimuli comprises both a photograph and an accompanying text label, and that the misattribution effects rely upon participants attending to the text label in particular (arguably a secondary component to the prime). The seemingly long stimulus onset was chosen to facilitate processing of both components of the prime.

Results

On average women thought the Chinese symbol indicated the target concept (*sex/marriage*) about 46% of the time (*SD* = 14%). According to Payne et al. (2006), I plotted the responses and examined the patterns to identify respondents that had no variability in their responses (i.e., always pressed yes or no). Five participants responded "no" invariably, and as such their data was discarded. Next, for each participant I summed the frequency of "yes" responses to Chinese symbols as a function of the type of prime stimulus (Ingroup/Outgroup) and in the case of the present task, the target concept (Sex/Marriage), and divided by the number of judgments for each group of evaluations (i.e., Ingroup-Sex, Ingroup-Marriage, Outgroup-Sex, Outgroup-Marriage). This yes-ratio ranged from .00 to 1.00 for Outgroup-Sex and Ingroup-Marriage evaluations, from .00 to .81 for Ingroup-Sex evaluations, and from .00 to .88 for Outgroup-Marriage evaluations.

To account for the within-subject nature of the yes-ratio for each group of evaluations, I used a mixed-model ANOVA in PROC GLM of SAS 9.3. To test for hypothesis relevant effects, the yes-ratio was then regressed onto Day (grand-mean centered), Day^2 (the quadratic component), and each of the latter crossed with the factorial combination of Target Group (Ingroup/Outgroup) and Target Concept (Sex/Marriage). A marginally-significant Target Group main effect, $F(1,143) = 2.76$, $p = .0908$, indicated the yes-ratio for the ingroup ($M = .47$, $SD = .17$) was higher than for outgroup ($M = .45$, $SD = .19$). As can be seen in Figure 6, neither the Target Group x Day^2 effect, $F(1,143) = 0.08$, $p = .6837$, nor the Target Group x Target Concept x Day^2 effect, $F(1,143) = 0.08$, $p = .7788$, approached conventional levels of significance. VSC scores and socio-sexual orientation did not moderate any of the Target Group x Day^2 or

Target Group x Target Concept x Day^2 effects (all *ps* > .34). Treating the Target Concept variable as strictly a between-subject variable (i.e., retaining only observations in which the first rating-type [*sex/marriage*] was made) did not change the pattern of findings, in terms of magnitudes of effects or *p* values.

Discussion

Study 3 used a variant of the affect misattribution procedure (Payne et al., 2006) to test if women's automatic associations with sex and marriage, and ingroup and outgroup men, varied across the menstrual cycle. In particular, the logic of the current paradigm relied upon the systematic variation of ingroup and outgroup male primes to elicit spontaneous associations with semantic concepts (i.e., sex and marriage), and thus projective spill-over onto the neutral target symbols (and to do so differentially across the menstrual cycle). Results were inconsistent with any differential evaluations whatsoever. Although the AMP has been demonstrated to measure individual differences quite well (Payne, McClernon, & Dobbins, 2007; Gawronski, Peters, Brochu, & Strack, 2008), recent research on the semantic properties of AMP (Imhoff et al., 2011) offer mixed results. For example, Imhoff and colleagues (2011), using a known-groups approach, tested the incremental validity of such a semantic AMP (referred to as the '*semantic misattribution procedure*; SMP) using sexual as the target concept (similar to the current work) and, as the prime, varying degrees of sexually mature males and females (the 'Not Real People [NRP] picture set; Pacific Psychological Assessment Corporation, 2004). Participants were heterosexual men and women and homosexual men. Results indicated that the frequency of positive judgments increased as a systematic function of preceding

primes of the participant's preferred sex. These effects were obtained using the SMP, but not the AMP.

However, two findings from Imhoff et al. (2011) are discouraging in relation to the current work. All 3 studies demonstrated that male participants showed robust effects for the SMP. However, in Study 3, the sole empirical investigation into SMP effects in women, female subjects *did not* demonstrate any specific pattern of frequencies of semantic sexual indications following the photographed male (vs. female) primes. The authors suggest the effect is in line with research suggesting females are less specific in their preferred sex than are men (see Chivers et al., 2004; Chivers & Bailey, 2005; Chivers, Seto, & Blanchard, 2007), but also suggest that the null finding could be due to the measures inability to assess female's sexual interest. Secondly, in a strange pattern of results, females in Study 3 showed *opposite* than predicted patterns in the traditional AMP. That is, women showed a systematic pattern of higher frequencies of positive evaluative judgments (i.e., indicating "good") following photographed female (vs. male) primes.

There is another cause for concern and possible explanation as to why the semantic variant of the AMP has failed in the present sense. The logic of the current paradigm relied upon associations between ingroup and outgroup men with the concepts of short-term sexual and long-term committed relationship. To detect any such effects, a critical element is representations of such concepts (with such targets) in the individual's memory. That a psychological preference for outgroup male mates is present (as demonstrated in Salvatore et al. and Study 1), and presumed to be a product of natural selection, certainly does not presuppose that such selection mechanisms are additionally

stored in one's memory. To the extent that the latter is the likely, detecting differences between distal short-term sexual and long-term committed underlying motivations may be nearly impossible.

Chapter 5: Overall Discussion

The current work was an investigation into the underlying domain specific motivation behind women's heightened mid-cycle attraction to outgroup males. Salvatore et al. offered four hypothesized general strategies that may have been utilized to solve ancestral human's inbreeding dilemma. Two of such strategies obviated female choice (i.e., a group dictated exchange of females and rape); however two strategies were choice-based and thus, perhaps, may evidence in modern day human females. The two choice-based strategies account for the differential parental investment of women vs. men, but do so in different ways. Specifically, the conversion hypothesis posits that ancestral women mated with an outgroup male and converted to his collective, while the cuckold hypothesis suggests that ancestral women furtively mated with an outgroup male, cuckolding their primary ingroup partner and collective. The present work described a series of systematic tests that were designed and conducted in an attempt to uncover any such choice-based ancestral female mating strategies.

Specifically, in a methodological sense, the present work's aim was to disentangle human women's short-term sexual and long-term committed evaluations of ingroup and outgroup men. Results consistent with the conversion hypothesis indicated physical attraction to outgroup men increased relative to ingroup men, but only when women were in such short-term sexual or long-term committed mate-seeking motivational states (Study 1). My other attempts at detecting differences in women's intergroup domain-specific evaluations (Study 2 and Study 3) were clearly inconclusive. Nonetheless, Study 1 was certainly an informative empirical account and lends insight into the ongoing investigation of intergroup domain-specific mate evaluations.

More specifically, in Study 1, I observed that women's evaluations of outgroup men's physical attraction increased relative to ingroup men as a function of both short-term sexual and long-term committed mate seeking. A concern of Salvatore et al. previous work is that women's evaluations of outgroup men as attractive long-term mates were influenced by their presumed attraction to outgroup men as short-term mates (i.e., the halo effect). However, in particular, the latter set of exploratory findings in the current work's Study 1 suggest that a halo-effect engendered long-term attraction may not have been the case. Particularly, women's heightened short-term sexual and long-term committed outgroup evaluations increased *only* in those respective motivational states. That is, short-term attraction increased only in the short-term sexual mate-seeking state and long-term attraction increased only in the long-term committed mate-seeking state (but importantly, *only toward outgroup men*). If women were generally unable to introspectively explicitly report domain-specific motivational attraction between those two domains at the intergroup evaluation level, then we would have expected to see similar short-term and long-term committed ratings from both women in short-term sexual and long-term committed mate seeking motivational states.

Moreover, that the latter set of exploratory findings in Study 1 suggested differences in women's outgroup specific short-term sexual and long-term committed mate ratings in each of the two respective mate-seeking states additionally speaks to the impression management and self-deception concerns. Specifically, that long-term outgroup attraction ratings were not influenced in the short-term sexual mate-seeking motivational state suggests that women are able to explicitly distinguish between the two domain-specific intergroup evaluations. These findings suggest that Salvatore et al.

previous research findings are robust and indeed women's reports appear to accurately represent the underlying mate-seeking motivations. Certainly, these are some of the strongest data in support of the conversion hypothesis.

The latter most empirical explorations (Study 2 and Study 3) failed to detect effects (of any meaningful kind, whatsoever). Interpretations into why those studies may have failed include measure specificity, inaccurate reporting, and of course, sampling error. Naturally, the null-findings are, by definition, inconclusive. However discouraging null findings may be, the fact remains that the outgroup mating hypothesis has been confirmed within two separate empirical investigations (i.e., Salvatore et al. & the current Study 1). Future research should consider improving on the current work's methods from Study 2 and Study 3.

The current set of studies, specifically in that I am attempting to uncover human's evolutionary past, is particularly strong in regard to its methods. However, as theorists have noted, the evolutionary rationale for a particular psychological mechanism does not necessarily translate into detection of such effects within those domains today, just as observing a domain specific phenomena today, does not necessarily presuppose that the effect transpired via an evolutionarily selected adaptation (Confer et al., 2010; Sell, Hagen, Cosmides, & Tooby, 2003). Notwithstanding, the current work attempted to uncover domain specific mechanisms, hypothesizing such effects via the possible benefits afforded to ancestral humans. Some of the strictest tests of my ideas were found in Study 2 and Study 3. In particular, both experiments relied on the notion that modern-day women's psychology is congruent with an ability to distinguish between short-term sexual and long-term committed qualities of men at the intergroup level during periods of

higher (vs. lower) fertility. That effects were not detected in the latter two present investigations may suggest that intergroup short-term and long-term mating cognitive associations in memory are absent. Furthermore it is plausible that the mechanisms responsible for increased desire for outgroup men as domain specific mates may have become absent over evolutionary time. Or, the null-findings could reflect merely a failed attempt in testing. As discussed subsequently, future research can attempt to further decompose those domain specific mechanisms via additional direct and indirect methods.

Future Directions

One possibility for future investigations into women's domain specific intergroup evaluations could be to examine the patterns of attraction toward outgroup men resulting from increased *platonic* mate seeking. That is, the halo-effect alternative could be further evaluated by comparing women's short-term sexual, long-term committed, and platonic (i.e., friendship) attraction to ingroup and outgroup men across the menstrual cycle. If conversion is indeed an accurate account, then one might expect to find heightened evaluations of outgroup men to uniquely occur within heightened sexual and long-term committed mate seeking motivations, but not within a platonic mate seeking motivation. Of course outgroup attraction that similarly tracks the platonic mate seeking state would endorse an inability to confirm the specific domain responsible for positive mid-cycle outgroup regard.

There are several other promising lines of research that may be used to test the conversion and cuckold hypotheses. One line may be to explore additional measures of indirect or implicit measurement. That the current work's Study 2 failed to detect effects using reaction time as a dependent measure should not necessarily detract from using

response-latency to stimuli as an unobtrusive measure of interest. Future research should, however, consider simplifying such a task by removing from the task the complicated explicit decision to decide whether a man is suitable for a short-term sexual or long-term committed relationship. One method to simplify the task may be to manipulate women's domain-specific motivation (similar to the current work's Study 1) prior to general evaluative (good/bad) intergroup ratings. Another method to simplify the task may be to implicitly prime such underlying short-term sexual and long-term committed constructs prior to the presentation of ingroup and outgroup targets. In either method, women would be left merely with the explicit task of making simple evaluative judgments.

One caveat, however, given the proposed reaction-time task requires judgments that are sexual in nature, comes from the literature on sexual preference as studied within forensic psychology. In particular, forensic psychologists have solved a problem posed by sexual deviants' denial of abnormal sexual interest (given admitting such sexual interest could incriminate one's self) by relying upon viewing time measures as an indirect measure of sexual interest (Abel, Jordan, Hand, Holland, & Phillips, 2001). Through numerous empirical accounts a robust effect has consistently emerged for both clinical and non-clinical samples of men and women – specifically, persons' latency to respond is longer (i.e., slower) for sexually desirable (vs. less sexually desirable) targets.

In a theory of Sexual Content Induced Delay (SCID; Geer & Bellard, 1996), it was argued that the presentation of sexually desirable stimuli induces hesitancy in responses and thus longer (i.e., slower) reaction times. Theorists have postulated that such a phenomenon could be explained via a deliberate delay of response (i.e., staring at a desirable image) or an attentional disruption (i.e., distraction from the task at hand via

interest in such a desirable image). Indeed both accounts could be driven by hedonic and biological motivations (c.f., Singer, 1984) and may have evolutionary origins (Quinsey, Ketsetzis, Earls, & Karamanoukian, 1996; Redouté et al., 2000).

In a particularly relevant empirical exploration, Imhoff and colleagues (2010), using a known-groups approach, attempted to better understand the SCID phenomena by comparing both hetero- and homo-sexual men, and hetero-sexual women's preferences for males and females that varied in sexual maturity. The researchers presented a standardized set of photographs and asked each group to assess the perceived sexual desirability of such targets using scaled responses (sexually-unattractive to sexually-attractive; Study 1 and 2) and binary (potential sexual partner or not) responses (Study 3 and 4). To test whether persons deliberately delayed responding, participants were assigned to one of two experimental conditions. Participants either viewed stimuli and made simultaneous judgments (Standard Viewing) or viewed the target and made a judgment that followed viewing (Restricted Viewing). Further, additional participants were either given time to respond (Unrestricted Response) or constrained to make a response under 1000ms (Restricted Response).

Results were consistent with past SCID research in that prolonged response latencies occurred when rating the sexual attractiveness of targets belonging to the sexually preferred category for both participants in the Standard Viewing and the Restricted Viewing conditions, and for when those made both Unrestricted and Restricted responses. In fact, effects were largest (i.e., response latencies to sexually preferred targets longest) when person's judgments were time Restricted vs. Unrestricted. These findings suggest if the present investigation into women's domain specific intergroup

evaluations utilizes viewing time as a measure of women's preference for ingroup and outgroup men, that perhaps, seemingly divergent from a general social cognitive measurement perspective, women may display prolonged response latencies to outgroup men for short-term sexual and long-term committed attraction evaluations (to the extent that conversion is indeed an accurate account).

In Summary

Typical patterns of intergroup evaluation indicate persons regard outgroups neutrally or negatively, and ingroups positively. In contrast, the current work, coupled with Salvatore et al., demonstrate a contrasting counter-intuitive empirical account. My previous work and current findings indicate that increased attraction to outgroup males is associated with both long-term committed and short-term sexual mate seeking. I suggest that such a pattern of attraction is a vestige of an ancestral female solution to the inbreeding dilemma of a small-group lifestyle and such a finding may shed light on human's evolutionary past.

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Appendices

Appendix A: Tables

Table 1. Words used for the LDT. Means (and SDs) appear for Sex words, Relationship words, and Filler words.

Word	*Type*	*Sex Mean*	*Sex SD*	*Relationship Mean*	*Relationship SD*	*Positivity Mean*	*Positivity SD*
promiscuous	sex	5.71	1.49	1.95	1.66	2.71	1.95
booty call	sex	5.81	1.50	1.48	0.75	2.76	2.05
one night stand	sex	6.86	0.36	1.19	0.68	3.10	2.17
fling	sex	5.76	1.22	1.57	1.33	3.38	1.94
hookup	sex	6.52	0.87	1.62	0.74	3.43	1.91
boning	sex	5.71	1.62	2.52	1.78	3.48	2.34
shagging	sex	5.62	1.50	2.57	1.78	3.52	2.16
screwing	sex	6.19	1.25	2.57	1.83	3.67	2.27
bang	sex	6.10	1.37	2.67	2.01	3.67	2.29
getting laid	sex	6.76	0.44	2.19	1.54	3.76	2.10
humping	sex	5.67	1.35	2.86	1.85	3.76	2.21
quicky	sex	5.81	1.33	2.71	2.19	3.86	2.22
wife	relationship	1.29	0.90	6.86	0.36	5.90	1.64
husband	relationship	1.33	0.91	6.81	0.40	6.00	1.30
spouse	relationship	1.24	0.54	6.86	0.36	6.00	1.64
inseparable	relationship	1.48	0.81	6.24	0.83	6.05	1.07
marriage	relationship	1.33	0.80	6.57	0.98	6.05	1.36
wedding	relationship	1.19	0.51	6.76	0.54	6.10	1.48
bride	relationship	1.29	0.72	6.81	0.40	6.10	1.45
commitment	relationship	1.24	0.54	6.81	0.51	6.14	1.15
long term relationship	relationship	1.14	0.36	7.00	0.00	6.29	1.01
companionship	relationship	2.14	1.20	6.43	1.03	6.29	1.06
family	relationship	1.19	0.51	6.71	0.56	6.62	0.80
love	relationship	1.48	0.75	6.81	0.51	6.67	0.97
paperclip	filler	**1.48**	0.98	**1.43**	0.93	**2.33**	1.59
door	filler	**2.24**	1.61	**1.48**	1.08	**2.67**	1.71
calendar	filler	**1.43**	0.93	**1.81**	1.08	**2.90**	1.76
pony	filler	**1.71**	1.10	**1.62**	1.07	**3.71**	1.82
salsa	filler	**1.52**	0.98	**1.62**	1.07	**3.76**	2.19
potato chip	filler	**1.62**	1.12	**1.57**	0.98	**3.81**	2.16
cheeseburger	filler	**1.55**	1.10	**1.67**	1.06	**4.43**	2.04
radio	filler	**1.76**	1.30	**1.67**	1.11	**4.62**	1.75
shopping	filler	**1.67**	1.39	**2.00**	1.52	**5.05**	1.83
kitten	filler	**1.57**	0.98	**1.57**	1.08	**5.19**	1.66
sunshine	filler	**1.95**	1.47	**2.14**	1.56	**5.33**	1.85
cupcake	filler	**1.43**	0.93	**1.67**	1.49	**5.38**	1.99

Table 2. Reaction times (and Standard Errors) as a function of Story-type (No-Story, Long-term, and Short-term), Word-type (Sex-words and Relationship-words), Fantasy (High and Low) and Socio-sexual orientation (High and Low).

			Sex Words		Relationship Words	
			SSO		SSO	
			High	Low	High	Low
No-Story Prime	Fantasy	High	.4745 (.038)	.5667 (.043)	.5066 (.038)	.5540 (.042)
		Low	.4865 (.042)	.5637 (.032)	.5111 (.042)	.5663 (.032)
Long-Term Story Prime	Fantasy	High	.5058 (.031)	.4407 (.043)	.5186 (.031)	.4384 (.043)
		Low	.4741 (.045)	.5548 (.032)	.5162 (.045)	.5350 (.032)
Short-Term Story Prime	Fantasy	High	.4912 (.039)	.5709 (.039)	.5285 (.039)	.5672 (.038)
		Low	.5231 (.036)	.5225 (.034)	.5231 (.035)	.5376 (.034)

Appendix B: Figures

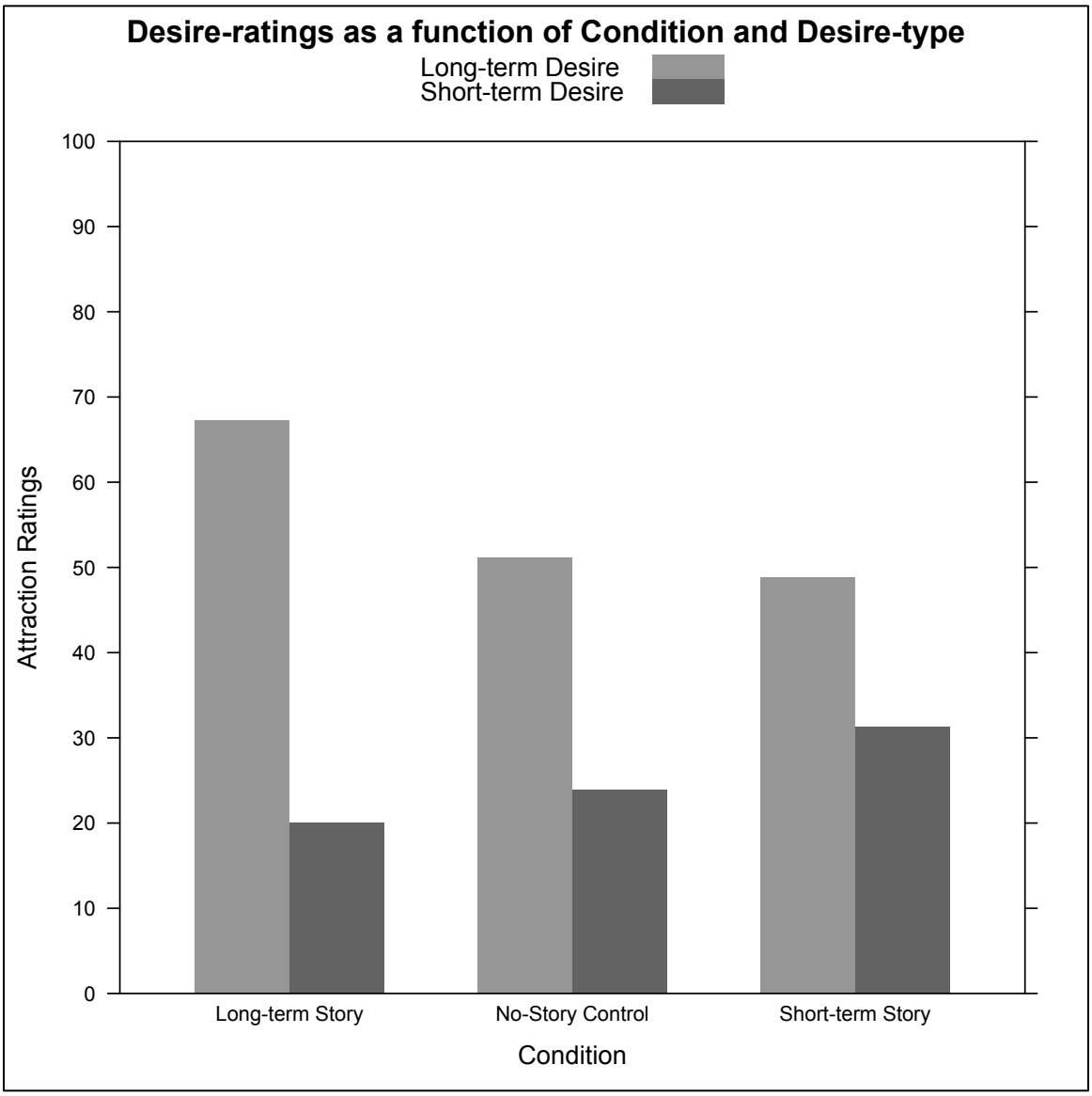


Figure 1. Women's reported level of long-term relational (light gray bars) and short-term sexual (dark gray bars) desire as function of story-type (Long-term Story, No-Story Control, and Short-term Story).

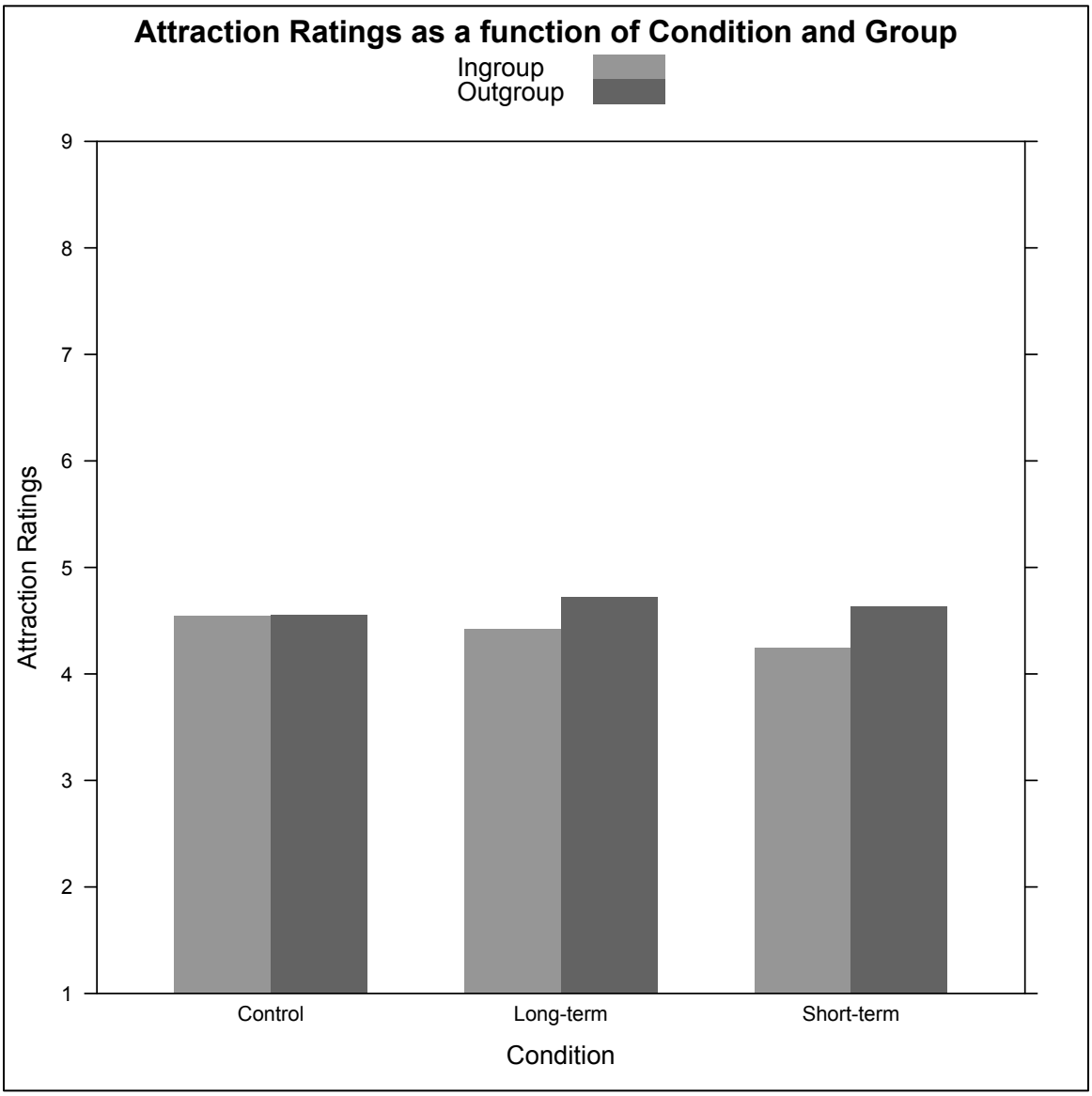


Figure 2. Women's perception of physical attractiveness of ingroup (light gray bars) and outgroup (dark gray bars) as function of story-type (No-Story Control, Long-term Story, and Short-term Story).

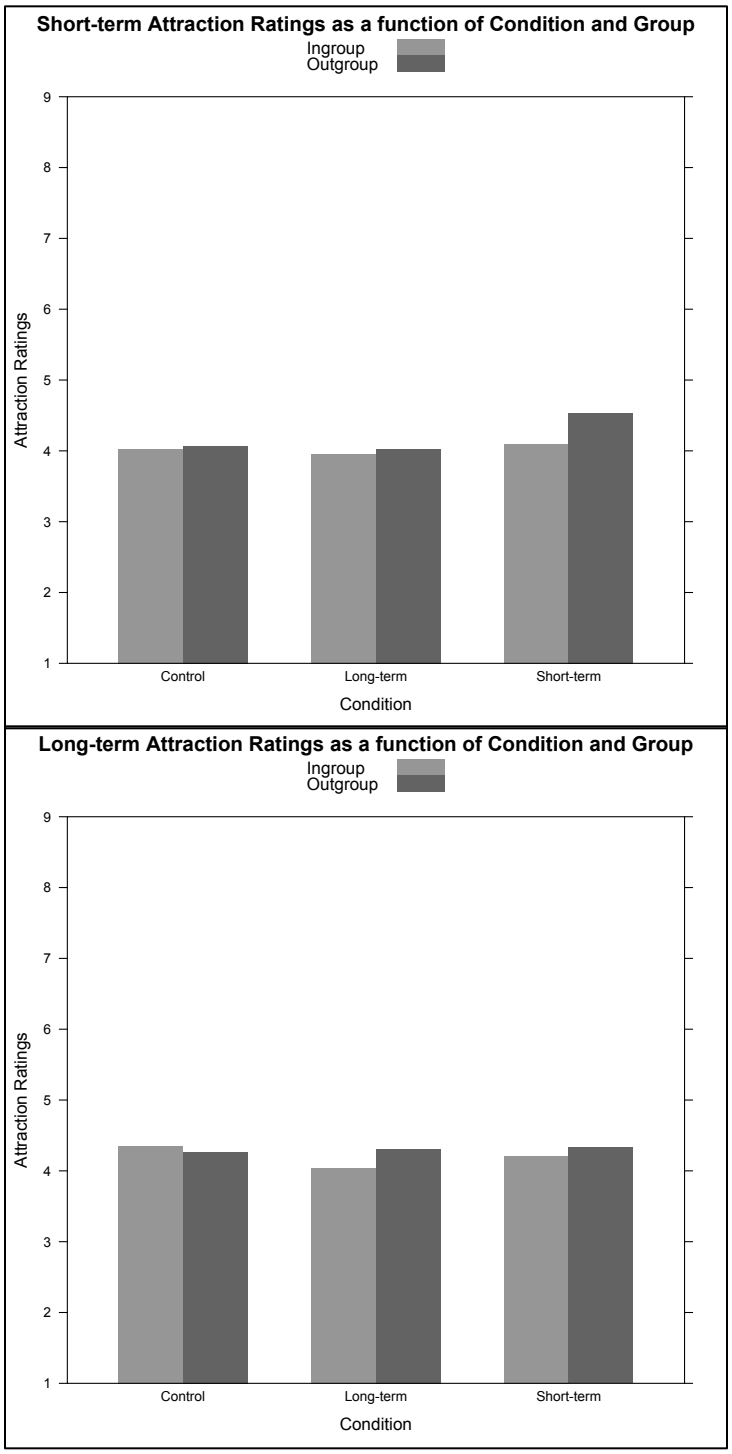


Figure 3. Women's perception of Short-term attractiveness (top panel) and Long-term attractiveness (bottom panel) of ingroup (light gray bars) and outgroup (dark gray bars) as function of story-type (No-Story Control, Long-term Story, and Short-term Story).

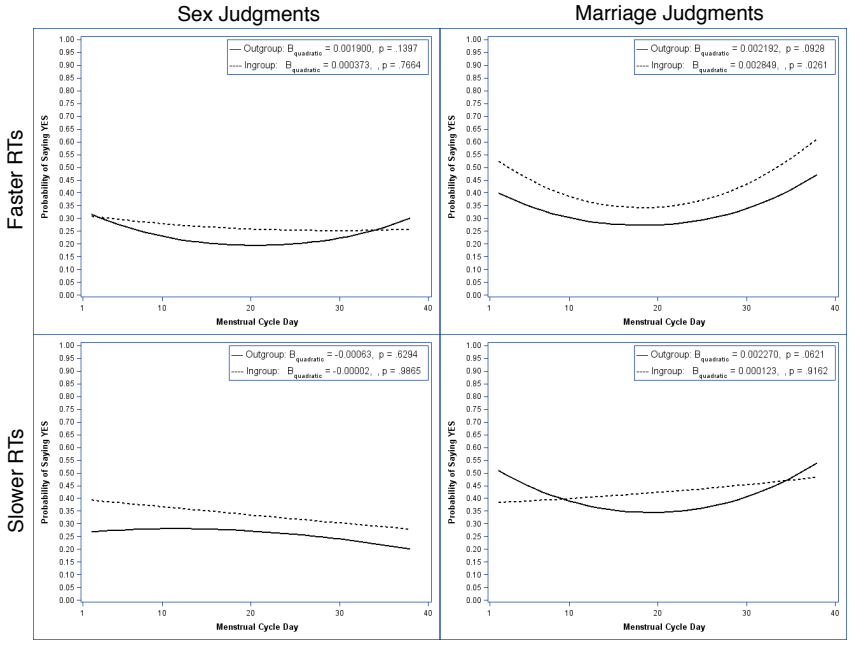


Figure 4. The probability of saying "yes" to a given target (y axis) across the menstrual cycle (x axis), as a function of faster (top row) and slower (bottom row) response latencies for short-term sexual judgments (left column) and long-term marriage judgments (right column) for ingroup targets (dotted lines) and outgroup targets (solid lines).

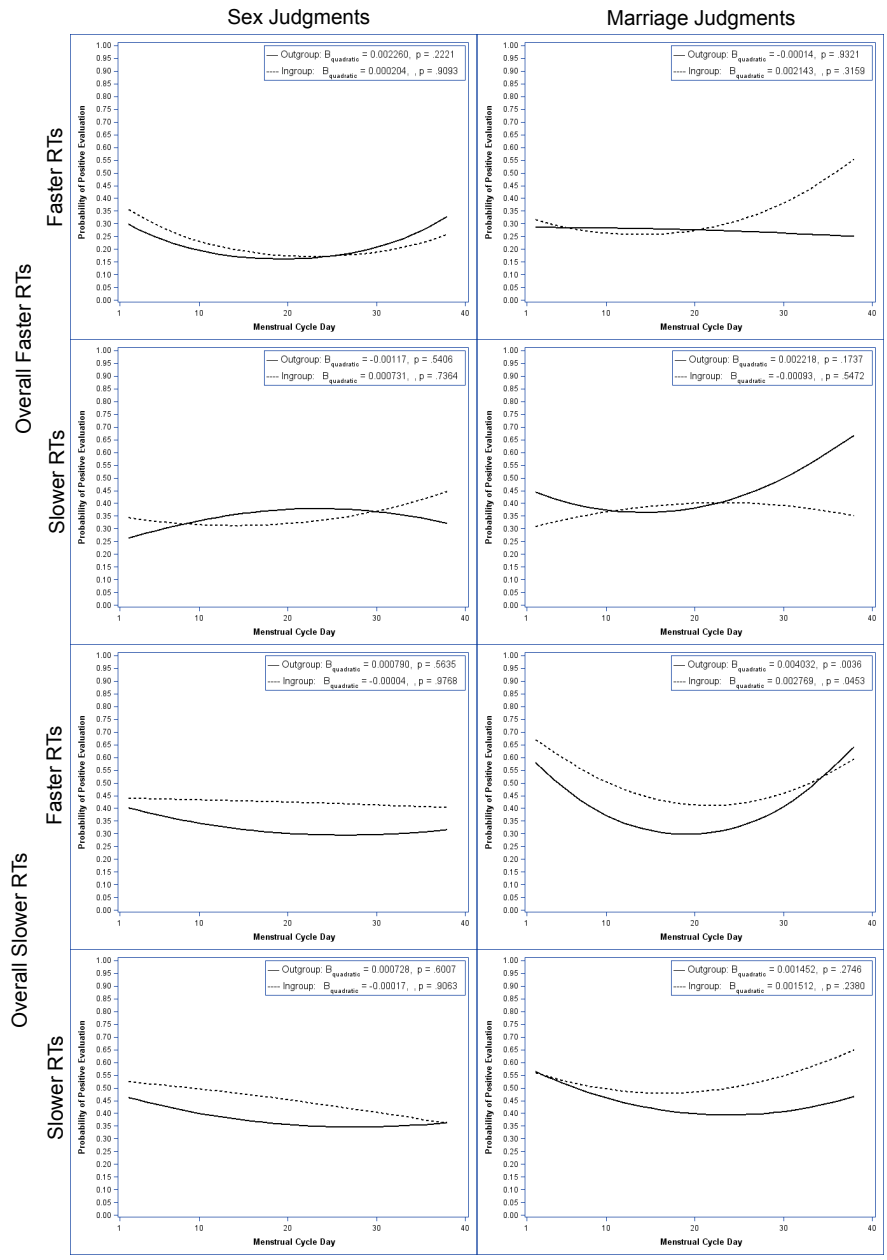


Figure 5. The probability of saying "yes" to a given target (y-axis) across the menstrual cycle (x-axis), as a function of between-subject overall faster (top two rows) and slower (bottom two rows) response latencies for within-subject relative faster (rows one and three) and slower (rows two and four) response latencies for short-term sexual judgments (left column) and long-term marriage judgments (right column) for ingroup targets (dotted lines) and outgroup targets (solid lines).

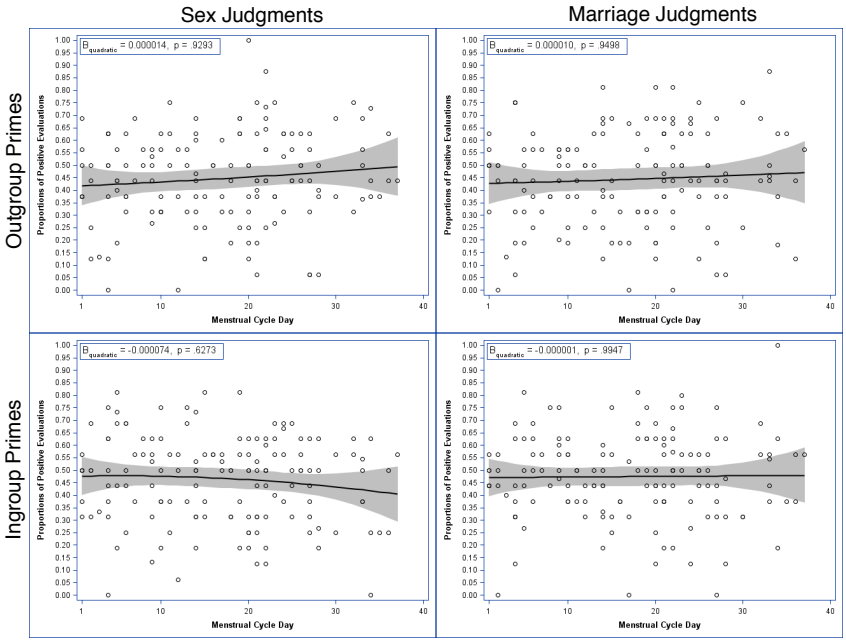


Figure 6. The "yes-ratio" (saying "yes"/total number of trials; y-axis) across the menstrual cycle (x-axis) as a function of Outgroup (top row) and Ingroup (bottom row) targets for Sex associations (left column) and Marriage associations (right column).

Appendix C: Long-term Story

Imagine that your maid-of-honor is helping with your dress and make-up before you walk down the aisle to join your fiancé. Knowing how truly attached you are to your fiancé, your maid-of-honor asks you to retell the story about how you met him. Thinking the story is sweet and special, you happily retell it:

There you are, sitting outside on a bench after class. It's a pleasant early spring day, and you can smell the blooming flowers in the breeze. You have a book open, but you're not really reading it. You look around, relaxed and daydreaming. As you watch the people strolling by in front of you, you notice that everyone seems to be in a particularly good mood.

From a short distance, you hear a voice say: "You don't look like you're studying very hard."

You're surprised to see a particularly handsome guy whom you remember noticing on the first day of class. Now he is standing right in front of you, and smiling warmly asks, "Mind if I join you for a few minutes?"

At first you feel a bit awkward, but as you begin to talk, you realize you feel incredibly comfortable with him. The two of you discover that you have a lot in common, including that both of you are currently single. When he hears this, he lights up. He is wonderful to talk to. You find everything he says somehow fascinating, and you notice that when you talk, he listens carefully to everything you say. He suggests that the two of you go grab something to eat.

You end up in a little restaurant near school. The two of you begin to talk a bit about your personal lives, and you realize that he is an especially kind and sensitive man who really cares about others. As he talks about his ambitions, you find yourself imagining what it would be like to be in a relationship with him. You feel so happy and comfortable with him.

Several hours go by and you realize, that being so consumed in conversation, you both accidentally skipped your class. Ending what was such a wonderful day, the two of you laugh about the missed class and make plans to see each other again.

Ever since that first date, the two of you have grown ever closer. Sharing similar hobbies, interests, and values, you thoroughly enjoy being together. During weekdays, you would make time to spend lunch together, and most weekends you would have fun taking short-trips and even running routine errands. Occasionally, he would join you along with your friends going to movies and out to dinner. Your friends always enjoy his company and frequently comment how lucky you are for finding such an amazing guy.

Having spent much time together and learning so much more about each other, you know in your heart that he is the right man for you. He is a kind, trustworthy, honest, and caring person who makes you feel happy and safe. You are amazed at what a wonderful man he is. Indeed, your parents genuinely enjoy his company and his parents always greet you with warmth and open-arms. The two of you developed a meaningful, important, and fulfilling connection. Your conversations have grown ever deeper with frequent discussions of your shared plans for where you will live and raise children Taking your first step down the aisle to join your fiancé, you feel your heart beating with happiness and excitement for your future life together.

Appendix D: Short-term Story

Imagine you are on vacation with your friends on a tropical island. It's the last day of your trip and you are sitting on the beach. The air is warm and pleasant, and you watch the waves as the sun sets. You look around, relaxed and daydreaming. As you watch the people strolling by on the soft sand, you notice that everyone seems to be in a particularly good mood.

From a short distance, you hear a voice say: "Wow, isn't that the most beautiful sunset?"

You are surprised to see that it's coming from a particularly handsome man. You remember noticing him a few days earlier at the hotel, when your eyes locked across the lobby. Now he is standing right in front of you. Smiling warmly he asks, "Mind if I join you for a few minutes?"

At first you feel a bit awkward, but as you talk, you realize that you feel incredibly comfortable with him. You share your thoughts about your week on the island. While you learn that he lives far away from you, it turns out that it's his last night on the island as well. Up close, he is even more attractive and charming than you remember. And he is wonderful to talk to.

An hour passes quickly and he notices that he's late for dinner with his friends. He suggests that he'll skip dinner with them and stay with you. After all, he sees them all the time, but the two of you only have one evening together. You are eager to prolong the conversation. It is clear that he is enjoying your company immensely.

He suggests that the two of you grab something to eat. Walking together, you notice that he's walking close to you and comfortably touching you on the arm when you say something that makes him laugh. Being with him, your senses are heightened. Even when his hand touches yours by accident, you feel a tingle and a rush of excitement. You quickly glance at his eyes, waiting for him to look at yours. When he does, both of you smile and look away.

You end up in a little restaurant, and the two of you sit in a romantic corner. As the evening goes on, you realize you are having an absolutely wonderful time. The two of you order a dessert and decide to share it. He suggests that after dinner, both of you should go for a walk on the beach in the moonlight. You have been dreaming about someone asking you that very question all week.

As you stroll on the sand, he reaches for your hand. You softly squeeze his hand in yours and your eyes meet once again. It's a little windy and you get closer to him. His body feels warm under the stars and you put your head on his bare arm. Your heart is beating faster, and you feel excited. The sand feels cool and soft against your feet. A wave comes crashing on the beach and you both lightly trip and fall. Sitting in the sand and still holding his hand, your eyes lock again and your heart feels like it's about to stop. As you look at his beautiful face in the moonlight, his hand moves up to caress the back of your neck. You feel your hairs begin to tingle. He leans in and the tip of his nose slowly touches yours as you continue to wander in each other's gaze. Finally, you close your eyes and his soft lips slowly touch yours. Although you know that you will never see him again, the kiss is filled with passion. Your embrace is flowing with a desire that you have never felt. You squeeze his body tighter, and feel yourself getting excited as you begin to think of how to make this night be one of the most memorable of your entire life.

VITA

Joseph F. Salvatore attended Florida Atlantic University in Boca Raton, Florida, earning a Bachelors degree in Psychology with departmental honors, and graduating *summa cum laude* in 2010. After accepting the Newton W. and Wilma C. Thomas Graduate Fellowship, Joseph began his doctoral training in experimental psychology under the guidance of Dr. Lowell Gaertner at The University of Tennessee. At UT, Joseph designed, implemented, and interpreted results for several research projects examining social factors and decision-making. In 2012 Joseph earned a Masters degree in Psychology. In an attempt to further explore his interests in human behavior, experimental research design, psychological measurement, and statistics, Joseph completed additional advanced analytic courses and implemented several commercial-based applied research projects. In 2013, under the guidance of Dr. Russell Zaretzki, Joseph completed a comprehensive exam that explored multi-level modeling in a psychological experiment, ultimately earning an additional Masters degree in Statistics. In 2013 and 2014 Joseph taught statistics at the undergraduate level and conducted his dissertation research - a multi-site, multi-study synthesis examining the mechanisms of intergroup regard. In April 2014, Joseph satisfied all requirements for his doctoral program, earning a PhD in experimental psychology. Joseph is preparing for the next chapter of his professional development in which he will provide internal and external research consulting, data science methods, and applied psychology to matters of consumer behavior.