University of Tennessee, Knoxville
Trace: Tennessee Research and Creative Exchange

Masters Theses | Graduate School

5-2012

Strangers with Benefits: Ovulation and Attraction to Outgroup Men

Joseph Frederick Salvatore
University of Tennessee - Knoxville, jsalvato@utk.edu

Recommended Citation
Salvatore, Joseph Frederick, "Strangers with Benefits: Ovulation and Attraction to Outgroup Men. " Master's Thesis, University of Tennessee, 2012.
http://trace.tennessee.edu/utk_gradthes/1201

This Thesis is brought to you for free and open access by the Graduate School at Trace: Tennessee Research and Creative Exchange. It has been accepted for inclusion in Masters Theses by an authorized administrator of Trace: Tennessee Research and Creative Exchange. For more information, please contact trace@utk.edu.

To the Graduate Council:

I am submitting herewith a thesis written by Joseph Frederick Salvatore entitled "Strangers with Benefits: Ovulation and Attraction to Outgroup Men." I have examined the final electronic copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Arts, with a major in Psychology.

Lowell Gaertner, Major Professor

We have read this thesis and recommend its acceptance:

Gordon Burghardt, Jim McNulty, Michael Olson

Accepted for the Council:
Carolyn R. Hodges

Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)

Strangers with Benefits:

Ovulation and Attraction to Outgroup Men

A Thesis Presented for

the Master of Arts

Degree

The University of Tennessee, Knoxville

Joseph Frederick Salvatore

May, 2012

Copyright © 2012 by Joseph F. Salvatore

All rights reserved

Dedication

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

Abstract

The tendency for humans to behaviorally and attitudinally favor ingroups over outgroups is robust and pancultural. An evolutionary framework, however, provides reason to expect a systematic tendency toward outgroup-favoritism in a particular context. Ancestral females may have mated furtively with outgroup-males and returned to their cuckolded ingroup-male partner for child rearing, as a means of both maximizing genetic variability and promoting the long-term welfare of an offspring. The footprint of such a process may evidence in human females via increased physical attraction to outgroup (but not ingroup) males as ovulation approaches (conception-risk increases). Two studies of normally ovulating women tested this hypothesis. I procured via pilot testing photographs of ambiguously-Hispanic men, which enabled me to randomly assign the presumed race (Caucasian/Hispanic) of those men. In Study 1, Caucasian females rated the attractiveness of the photographed men, with each photograph randomly assigned the label "Caucasian" or "Hispanic." A Conception-Risk x Group-Membership interaction indicated women deemed outgroup (but not ingroup) males to be increasingly attractive as conception-risk increased. Study 2 replicated the interaction using different social groupings (In-state, Out-of-state student). These data provide rare (but theoretically derived) evidence of outgroup attraction and imply an evolved psychology resulting from plausibly furtive ancestral outgroup-mating.

Table of Contents

Chapter 1: Introduction 1
Ovulation and Potential Attraction to Outgroup Males? 2
Selection Pressures for Monogamy and Cooperative Child Care 3
Intersexual Selection and Adaptations to Ovulation 5
Exploring Infidelity as a Solution to an Adaptive Problem 6
Exploring Furtive Outgroup Mating as a Solution to an Adaptive Problem 7
Ethological Evidence 8
The Outgroup-Mating Hypothesis 9
Current Research 10
A New Paradigm 11
Chapter 2: Study 1 12
Pilot Testing 12
Study 1 13
Participants 13
Design 13
Treatment of estimation of conception-risk 14
Chapter 3: Results 15
Discussion 16
Chapter 4: Study 2 19
Participants and Design 19
Chapter 5: Results 20
"Latin-Lover" Hypothesis 20
Replication of Study 1 21
Alternative Explanation? 22
Discussion 23
Chapter 6: Overall Discussion 24
Limitations 27

List of References 29
Appendix 38
Vita 41

Introduction

"Loyalty to the group, sacrifice for it, hatred and contempt for outsiders, brotherhood within, war likeness without - all grow together…" – American Sociologist William Graham Sumner, 1906; Folkways

Favorable actions and attitudes toward one's ingroup are a robust and pancultural phenomenon (Brewer, 2007; Brewer, 2001). For example, humans are more apt to trust ingroup members (Insko et al. 1990), allocate more resources to ingroup members relative to outgroup members (Gaertner & Insko, 2000, 2001), evaluate ingroup members more favorably than outgroup members (Brewer, 1979), and do so even in the absence of a relative outgroup (Gaertner et al., 2006). Research indicates that individuals identify with and favor the ingroup for self-promoting reasons (Tafjel , 1974), to understand the world around them (Turner et al., 1987), and because people like others that are similar to them (Newcomb, 1961). Intergroup bias research further supports the ingroup favoritism heuristic by suggesting that individuals view outgroups negatively, while ingroups, in turn, are viewed more positively. (Sherif, 1966; Pratto et al.,1994).

Evolutionary social psychology too has lent theoretical and empirical support for an evolved psychology for persons to prefer ingroups. Ingroup preferences have been suggested to serve an adaptive function for ancestral humans. An obligatory interdependence (Brewer, 1997; Caporael, 1997), strong selection pressures for group versus solitary existence, likely aided in positive ingroup biases. Ancestral humans likely relied on coalitional groups to provide welfare for its members via pooling resources

(Brewer, 1999). As such, humans possess psychological adaptations that aid in identifying "social-cheaters," those that take from the group, but fail to give (Tooby & Cosmides, 2005) Also, since humans lack physical weaponry such as fangs and talons, the group likely provided safety in numbers from potential predators. Further aiding in ingroup preferences, from an immunological perspective, outgroup members may have posed threats to health. Outgroup members might have carried pathogens that would have been difficult for other coalitional groups to stave off, in turn resulting in favoring ingroup members and avoiding outgroup members (Schaller & Park, 2011). Finally, since human offspring are slow to mature and metabolically costly to raise, it has been suggested that the coalitional group helped to raise offspring via cooperative child rearing.

As the opening quotation implies, ingroup favoritism is the empirical rule and outgroup regard the rare exception. However, borrowing from an evolutionary framework, there is reason to predict increasingly favorable outgroup attitudes in a very specific social context. The current paper defines such a context and empirically explores the possibility of an outgroup preference.

Ovulation and Potential Attraction to Outgroup Males?

Ancestral females that mated with outgroup males may have experienced higher reproductive success. This may have been due in part by an adaptive advantage of creating genetically heterogonous offspring and a certain protection against harmful inbreeding. Outgroup members may have been immunologically dissimilar to one's coalitional ingroup members (Schaller et al., 2011). Ancestral females that copulated with

outgroup males, at periods of high fertility, would have created genetically heterogeneous offspring, presumably strengthening reproductive success. These offspring may have held an adaptive advantage evidenced by a decreased mortality rate via superior immunological defenses. Moreover, offspring resulting from outgroup mating would in turn be deemed superior reproductive partners themselves and ensure gene-level survival. Outgroup mating would have offered both proximal and distal success. Natural selection may have created a selection pressure for outgroup mating during the ovulatory phase. The following sections outline the relevant literature grounding such a claim.

Selection Pressures for Monogamy and Cooperative Child Care

Early Hominids likely relied heavily on bipedal travel and tool use (Johnson & Earle, 1988). As apes came down from the trees and began walking upright, lost was mother's back as a "platform" for which juveniles grasped onto. Instead, hominid mothers likely were required to hold infants in their arms for transport. This "maternal burden" may have resulted in two important differentiations between humans and their primate cousins. Ancestral infants were likely held in mother's arms. As a result, mothers were unable to protect themselves from potential attacks. Paternal support would have provided protection and safety to both mother and infant during maturation (Fisher, 1989).

Additionally, both infant (through, at minimum, maturation) and mother (through, at minimum, lactation periods) would require nutritional resources to ensure survival of the offspring. However, neonates require constant care, as demonstrated in modern

humans, and thus may have hindered mother's role in gathering food. Paternal support would ensure mother and infant, as well as father, were fed.

Another important distinction of hominid infants is their extended juvenile stage. Hominid infants are thought to have required parental care for perhaps 8 to 10 years (Zihlman, 1978). Even though human children can walk independently much sooner than age 8 or 10 (for short periods), they must be carried for three to five years, as their metabolism won't allow for extended travel. Complex tool use (which likely characterized early hominids) would have also been difficult for young children. This is evidenced in chimpanzee research showing chimpanzee offspring cannot use tools until about age 5 (Teleki, 1974) and thus require maternal assistance in "termiting," a process in which a stick is used to "fish" for termites for nutrition.

As evidenced, strong selection pressures for dual-caregiving, essentially monogamous units with a common goal, versus single caregiving resulted in decreased mortality rate in early human offspring. Simply put, infants of dual caregivers fared better in the era of evolutionary adaptiveness (EEA) than did infants of single caregivers. Ancestral females were likely required to pair with an ancestral male for reproductive concerns and long-term child care. Through theories of sexual-selection and parental investment, however, research indicates that female's preferences for long-term and short-term mates differ, and is additionally moderated by oestrus, the ovulatory cycle.

Intersexual Selection and Adaptations to Ovulation

Extant research in human mate-preferences indicate males and females differ in minimum reproductive investment and thus, females have evolved to be more discriminating when choosing a mate (Trivers, 1972; Buss, 1989). For example, females evidence less sexually promiscuity (Schmitt, 2003), are more exacting in their preferences for short-term reproductive partners (Gangestad et al., 2007), and value resources and social-status for long-term mates (Buss, 1989) much more so than do males. Additionally, recent research shows female's preferences dramatically fluctuate as a function of their ovulatory cycle.

For human females, sex results in conception about 20% of the cyclical month – during the ovulatory phase. During this critical period, females particularly prefer indices of high genetic quality such as facial masculinity (Penton-Voak & Perret, 2000), displays of social dominance indicating alpha-male qualities (Gangestad et al., 2004), and creativity over wealth (Haselton & Miller, 2006). Further, as a suggested means to maximize genetic variability and the ultimate welfare of offspring, females in a relationship demonstrate increased interest in extra-pair males (Garver-Apgar et al., 2006). The effect is moderated by genetic similarity between a female and her current partner and the ovulatory cycle, such that, as genetic similarity with a current partner increases, interest in extra-pair males (males who are *not* their primary partner), and reporting of extra-pair copulations during current, but not previous, relationships increases, and sexual satisfaction with her current partner decreases, at high, but not low,

fertility periods. These effects provide evidence for the adaptive advantages of inbreed avoidance (van den Berghe, 1983) and creating genetic variability in one's lineage (Greiling & Buss, 2000). Natural selection seems to have selected for female's desires for high-quality genetically dissimilar reproductive partners to occur at high-fertility. And to solve an adaptive problem, namely pairing with genetically similar males, selection pressures may have influenced paired female's propensity toward infidelity to boot.

Exploring Infidelity as a Solution to an Adaptive Problem

Not all males are of high genetic quality, and some men make better long-term providers than gene contributors and vice versa. Additionally, since the sex ratio is roughly 50/50, not all females can pair with high quality males. Evidence exists that shows highly desirable males are more discriminating when evaluating potential mates (Waynforth & Dunbar, 1995), speaking to the possibility that high quality males, providing high quality genes, would be more difficult to retain as a long-term partner. And retaining a long-term partner would be necessary to ensure long-term survival of offspring.

Infidelity and cuckolding techniques may have developed as a means to obtain high-quality genes for offspring (short-term contribution) and retain a primary partner for caring for such offspring (long-term contribution). In fact, it has been suggested that males have developed psychological adaptations to combat caring for non-genetically related offspring. Male Sexual jealousy and mate-guarding techniques, particularly

during partner's high-fertility periods, have been suggested to have emerged as a response to avoid being cuckolded (Buss, 1989; Shackleford et al., 2002; Buss, 2002).

From a selfish-gene perspective, it makes little sense to care for non-genetically related offspring and likely men would have developed psychological and behavioral responses to the discovery of infidelity. Indeed, sexual infidelity is associated with decreased partner support (Shackleford et al., 2002). Moreover, infanticide and femicide is more likely in families where step-children versus only-biologically-related children are present (Wilson et al., 1995; Wislon & Daly, 1995, Wilson & Daly, 1996). This provides evidence for some behavioral responses of caring for non-genetically related offspring, presumably a by-product of a cuckolding response in deceived males. However, ancestral females may have found a way to help conceal acts of infidelity…

Exploring Furtive Outgroup Mating as a Solution to an Adaptive Problem

Ancestral women who committed infidelity must have exercised great care not to be discovered. Through circumstantial evidence, infidelity may have resulted as a solution to an adaptive problem (Garver-Apgar, 2006); paired women who are genetically similar to their primary partner may attempt to locate a genetically dissimilar extra-pair partner with whom to reproduce. If infidelity and cuckolding techniques developed as a means to obtain high quality genetically diverse genes for offspring and still retain primary partner support, and acts of infidelity that were discovered resulted in decreased partner support or even homicide, females had to be secretive when committing acts of

infidelity. Extra-pair copulations within the coalitional group would have been too risky. Perhaps furtive *outgroup* mating could have solved this problem.

Soliciting genetically dissimilar members of the ingroup would have proved difficult because group units for early hominids were likely bands of extended kin (Kameda & Tindale, 2004). Even if a high-quality genetically dissimilar mate was within the coalitional ingroup, soliciting that member for copulation may have resulted in discovery of infidelity by a female's primary partner. On the other hand, discovery of infidelity with a member of an outgroup presumably would have been less likely assuming lesser contact and communication of ingroup males with outgroup males. So, seeking sperm from a genetically diverse outgroup male may have been a safer strategy than seeking it from an extra-pair ingroup male. Ancestral females could have secured a long-term mate, necessary for successfully rearing of offspring, through an ingroup male and procured a high-quality genetically dissimilar contribution to offspring (short-term mate) through an outgroup male.

Ethological Evidence

Primate research yields evidence consistent with this outgroup-mating hypothesis. Chimpanzees live in social units similar to humans (Itani & Suzuki, 1967, Schaik, 1983). Moreover, female chimpanzees evidence ovulatory effects similar to that of human females, except conspicuous swellings are evident during oestrus. Gagneux et al. (1997) genotyped 21 mother-infant dyads and 11 potential fathers from a social unit of chimpanzees in West Africa. For 13 infants, all potential community fathers were tested

for paternity and in seven cases *all* fathers could be excluded from siring the offspring. The researchers conclude the infants must have been sired by outgroup males. All seven of the chimpanzee mothers left the group during periods of high fertility. However, in 17 years of research, the researchers had *never* seen an adult female approach a neighboring tribal male. This is not to suggest female chimpanzees do not obtain genetic contribution to offspring from outgroup males; rather, they must be highly secretive about it.

Reichard (1995) studied white-handed gibbons in the mountains of Thailand. He observed three separate social units of the once thought "monogamous" species. Over a four-month period, 12% of copulations were extra-pair (EPC) versus 88% intra-pair (IPC). Moreover, the EPCs occurred mostly during periods of oestrus suggesting reproductive motivations were at work. Perhaps, most relevant for the present study, is the occurrence of *intergroup* EPCs. Three occurrences of EPCs were actually observed (but perhaps more took place). Importantly, white-handed gibbons were thought to have been sexually monogamous prior to the data collection. Also relevant, the vast majority of intra-group copulations observed occurred close to or between neighboring groups borders, perhaps suggesting that females were soliciting sex from neighboring group members, but being discovered by ingroup males patrolling the border.

The Outgroup-Mating Hypothesis

The latter pieces of ethological evidence support the outgroup-mating hypothesis. If an ancestral human female were to have successfully reproduced with an extra-pair outgroup male, the act would be most likely undetected, and ostensibly her primary-pair

partner would have been cuckolded. The female would have gained both the adaptive advantage of high quality genetically heterogeneous offspring and the primary partner care necessary for raising such offspring into maturity. Addressing the possible skeptic, phenotypic markers of race are thought to be a modern day phenomenon (Stringer & McKie, 1997), so the secrecy of the extra-pair mating could still be retained following childbirth.

Further, since females' basic reproductive motivations (high quality, genetically dissimilar genetic contributions) occur at high-fertility, copulations with outgroup members need not occur for roughly 80% of the month. Typical ingroup favoritism biases could be retained for most of the cyclical month, while as more fertile periods approach, outgroup evaluations, as pertains to reproductive partners, could become heightened.

In sum, theoretical underpinnings give reason to predict that attraction to outgroup males increases as conception risk increases, and such a pattern may be particularly strong for women-in-a-relationship (versus single) when evaluating strictly short-term (reproductive) versus long-term mates. The following section describes the present studies used to test the outgroup-mating hypothesis.

Current Research

The current research consists of two studies. Study 1 directly tests an outgroup male preference at high-fertility and Study 2 rules out alternative explanations, and conceptually replicates Study 1. To test the outgroup-mating hypothesis, I presented photographed males in which I randomly assigned indication of group membership

(Hispanic or Caucasian; Study 1) or assessed perceptions of group membership (In-State or Out-of-State; Study 2). In both studies I had normally ovulating females rate the photographs on attractiveness and later indicate information about their menstrual cycle to estimate fertility. To avoid confusion of how I manipulated group membership in Study 1, I will present a brief conceptual and methodological overview of the paradigm used.

A New Paradigm

Presenting discrete ethnically unambiguous photographed persons for evaluations may result in photograph or group main effects; a systematic biases due to idiosyncratic features of the separate photographs. To avoid such effects, I developed a new paradigm to assess person's preferences for two ethnic groups, using the *same* photographs for each ethnic group. All participants rate all photographs, with group-membership randomly varying across photographs between-person. That is, a given photograph that is presumed to be Hispanic to one participant is presumed to be Caucasian to another. Using this method, I can assess persons' perceptions of the individual, based upon group membership, without confounding photographic features.

If evolution has selected for furtive outgroup mating at fertile periods, then I would expect attraction to outgroup, but not ingroup, males to rise as conception risk increases.

Method

Pilot Testing

To create the paradigm I used to test the outgroup-mating hypothesis, I first obtained 102 photographs of persons that I believed to look "ambiguously Hispanic." Next, I pilot tested the photographs for perceived ethnicity. Participants were Caucasian females (*n=16, Mean age=22.44, SD=3.27)* obtained using Amazon Mechanical Turk (MTurk). Participants rated perceived ethnicity of the photographs on scale by indicating the extent to which a given photograph *Could only be Hispanic* (1) to *Could only be Caucasian* (9) in which the mid point was labeled *Could either be Hispanic or Caucasian* (5). Overall ratings of photographs ranged from 1.10 to 7.75 *(M=5.23, SD=1.90)*.

Next, in a separate pilot study, I tested the same 102 photographs in terms of perceived attractiveness. Participants were Caucasian females *(n=21, Mean age=24.42, SD=1.50)* obtained using Amazon Mechanical Turk (MTurk). Participants rated attractiveness of the photographs on a 1 *Extremely Unattractive* to 9 *Extremely Attractive* scale. Overall ratings of photographs ranged from 2.62 to 7.62 (*M=5.41, SD=1.06)*.

Based on the dual ratings of perceived ethnicity and perceived attractiveness, I chose 16 photographs from the set of 102 photographs. Photographs I chose to present as stimuli in the paradigm were based on their mean perceived ethnicity rating of 4.00 – 5.95, *(M=5.22, SD=.64),* and mean attractiveness rating of 4.00 – 7.07, *(M=5.48, SD=.86)*. In other words, the subset of photographs I chose was deemed suitable to manipulate presumed ethnicity (Hispanic or Caucasian).

Study 1

Participants

Seventy-six Caucasian female undergraduate students not using hormonal contraceptives (*Mean age=18.08, SD=.28)* at the University of Tennessee participated in a 1-hour experimental session for credit in an introductory psychology course. Of these participants, 20 were excluded from analysis because of computer malfunctions *(n=9)* or reporting menstrual cycles of aberrant length *(<40 days or >20 days; n=11).*

Design

An experimenter seated participants in a computer cubicle upon arrival to the laboratory. After obtaining informed consent, participants began a computerized photograph-rating task.

Participants were informed the researchers were interested in obtaining a set of photographs of Hispanic-Americans and Caucasian-Americans that varied in terms of attractiveness for a "*future study examining interpersonal relations between the two ethnic groups*." Instructions indicated to judge photographs on 3 dimensions of attractiveness: *how physically attractive the photographed male appears, how attractive the photographed male is for a short-term (i.e. one-night stand) partner*, and *how attractive the photographed male is for a long-term partner*. Following the instructions, 16 photographed males were randomly paired with a text-label under the photograph – "Hispanic" or "Caucasian." The random pairing was achieved using MediaLab and

DirectRT computer software, in an initial "ghost-block" in which the participant sees only a white screen for approximately 30 seconds. The order of the presentation of the photographs additionally randomly varied between persons. For each photograph, the type of evaluation (i.e. physical, short, and long) also randomly varied between persons. Each photograph was rated on 1 *Extremely Unattractive* to 9 *Extremely Attractive* scale.

Next participants completed a set of individual-difference measures. Socio-sexual orientation (SSO; Simpson & Gangestad, 1991), Perceived vulnerability to Disease (PVD; Duncan et al., 2009), Vulnerability to Sexual Coercion (VSC; Navarrete et al., 2010; assessed using the Fear of Rape Scale; Senn & Dzinas, 1996), Right-Wing Authoritarianism (RWA; Altemeyer, 1988), Social Dominance Orientation (SDO; Pratto et al., 1994), and Internal and External Motivation to Respond without Prejudice (Plant & Devine, 1998) were all assessed.

Finally participants indicated the first day of their last menstrual cycle and their typical cycle length and completed a set of demographic measures. Information about participants' menstrual cycle was used to estimate conception-risk on the day of the experiment.

Treatment of estimation of conception-risk

Participants provided the first day of their last menstrual cycle and their typical cycle length. Using actuarial medical data (Jochle, 1973; Wilcox et al., 2001), I employed two methods for estimating conception risk. First, I estimated each participant's probability of conception by counting forward from the first day of her last menstrual

cycle to the day of the experimental session (forward counting method). Second, I used the participant's reported cycle length to put her on a 29-day cycle based on the actuarial data (backward counting method; see Gangestad & Thornhill, 1998 or Gangestad et al., 2004 for a review of the method). Both estimates were correlated, $r=.68, p<.0001$. As done in previous studies, I formed a composite estimated conception risk (Gangestad & Thornhill, 1998; Gangestad, et al., 2004). The backwards-counting method results in less error (taking into account each participants typical cycle length), so I report predictive analyses based on this estimation. However, all estimations produce similar results.

Results

I tested the outgroup-mating hypothesis using multi-level modeling with PROC MIXED of SAS 9.2. I regressed attractiveness ratings on a factorial crossing of Rating-Type (physical, short, & long), Group (ingroup/outgroup), and Conception-Risk (mean-centered) and estimated random effects for the intercept, group, rating-type, and each photo (to capture variability across persons in the perceived attractiveness of each photograph). A Conception-risk x Group interaction, $F(1, 1735)=4.31, p=.0381,$ indicated that attraction to the ingroup and outgroup males differentially varied as a function of conception-risk. In particular, conception-risk positively predicted ratings of attraction to outgroup males, $B=15.47, SE=5.54, t(1735) =2.80, p=.0052$, and was unrelated to attraction to ingroup males, $B=5.37, SE=5.45, t(1736)=.97, p=.3315$. Viewed from another angle, females at low conception risk were more attracted to ingroup, $M =4.55$, than outgroup males, $M=4.04, t(56)=6.47, p=.0138$, and females at

high conception risk were non-significantly more attracted to outgroup, $M=4.91$, than ingroup males, $M=4.85$, $t(56)=.15$, $p=.6966$. See figure 1 in appendix.

The Rating-type x Group x Conception-risk interaction was not significant, $F(2,1735)=.98$, $p=.3770$, indicating that the latter two-way interaction was consistent across the three rating types. Indeed the three rating types were highly correlated. Ratings of physical attractiveness were related to ratings of short-term attractiveness, $r=.78$, and long-term attractiveness, $r=.82$, and ratings of short-term attractiveness were related to ratings of long-term attractiveness, $r=.79$. Separate analyses of each attraction-type evidence the same pattern (based on means and p-values) of the latter Group x Conception-risk effect. An exploratory analysis indicated the latter results hold even when collapsing across all within-subject ratings of photographs and forming an average ingroup rating and outgroup rating for each individual subject.

The latter 2-way interaction was not moderated by female's relationship status, $F(1,1731)=1.14$, $p=.2853$, indicating both females in a relationship and single demonstrated the same patterns. Individual difference measures did not moderate any of the effects either.

Discussion

I designed the current experiment to test whether attraction toward outgroup versus ingroup men increases as fertile periods approach. Results were consistent with the outgroup-mating hypothesis. Attraction to outgroup (but not ingroup) males systematically increased as a function of rising conception-risk.

The latter two-way Group x Conception-Risk interaction was not moderated by rating-type(s). That is, evaluations of photographed males for short-term versus long-term versus physical attractiveness did not differ. This is a curious finding, as other studies have found differences in female's evaluations of long-term versus short-term mates (Stewart et al., 2000, Little et al., 2002). Women in the current study were able to distinguish between the rating-types, when I collapsed across evaluations of group members and conception-risk, however. Overall, attractiveness ratings made of short-term partners were less than ratings of long-term partners or ratings of physical attractiveness.

Extant research that demonstrates the short-term/long-term differentiation may perhaps utilize a more psychologically salient independent variable. Displays of social dominance, which are preferred for short-term mates (Gangestad et al., 2004) for example, may be easier to distinguish desirable for a short-term versus long-term mate than simply evaluating the *same* photographed persons I presented which varied solely by the text-label indicating group membership. Also, failing to find a short-term/long-term differentiation may be the result of the photographs I chose to use. Since research indicates women distinguish between short- and long-term mates on the basis of perceived attractiveness, particular so at high-fertility, the photographs I chose may not have been objectively attractive *enough*. Perhaps if I were to use photographs that were objectively attractive (instead of only moderately attractive males), then I may have discovered the latter two-way interaction moderated by rating-type. Future research

should examine at what levels of attractiveness do women distinguish between short-term and long-term mates between levels of group membership.

The latter two-way interaction was not moderated by female's relationship status. Two possibilities emerge. The outgroup-mating heuristic may generalize to all women, not just women in a relationship. Or perhaps I didn't discover the effect due to my choice of participants, college undergraduate females. I asked participants if they were in a relationship or not. I then used their response (yes or no) as a proxy to test the idea that paired ancestral females sought genetic contribution from someone other than their primary mate. This may have been an overstretch. College undergraduates, most of whom are without children or married, may not differentially evidence a propensity for outgroup men at high-fertility. Perhaps using older married women with children versus older single women would produce the hypothesized effect. Future research is necessary to test such an idea.

Although the current data are consistent with the outgroup-mating hypothesis, my choice of Hispanic men as the outgroup suggests an alternative explanation. Perhaps women, particularly women approaching ovulation, contemplated the possibility of a "Latin Lover" stereotype. That is, Hispanic males may have been presumed to make better sex partners than would their Caucasian counterpart. Study 2 tested this alternative explanation and attempted to conceptually replicate evidence for the outgroup-mating hypothesis using different social groups.

Study 2

Study 2 was conducted to examine female's perceptions of various social and ethnic groups and to conceptually replicate the findings of Study 1. I assessed females', not-using-hormonal-contraceptives, perceptions of various stereotypes associated with ethnic and social groups. That is, I aimed to rule out the possibility that the effects from Study 1 were due to spurious effects of social norms and influence. I also intended to conceptually replicate Study 1 using a non-racial social group. Participants completed two tasks described below.

Method

Participants and Design

Participants were 74 Caucasian In-State female undergraduate students' (*Mean age=18.57, SD=.95)* not-using-hormonal-contraceptives at the University of Tennessee. Women showed up to a group setting study titled "Evaluations." After obtaining written consent, participants read about stereotypes and the purpose of the study. Next, participants began a packet of questionnaires, namely evaluating Hispanic, Black, and White Males, on a variety of stereotypes (*Competent, Good-Natured, Intelligent, Highly-Sexual, Competitive, Good-in-Bed, Sincere, Tolerant, Aggressive)*. Participants were asked to indicate the extent to which each following trait describes a particular group on a 1 *not at all* to 7 *extremely* scale. The order in which the participants completed the evaluations of the ethnic groups randomly varied between-subjects.

Next, participants viewed 40 photographed males, each for 20s (2s break between photographs) in successive order. Similar to the pilot rating task for the ethnically ambiguous photographs from Study 1, participants rated the extent to which each photographed male appeared to be an In-State or an Out-of-State student on a 1 *Definitely Out-of-State* to 9 *Definitely In-State* in which 5 *Could be either In-State or Out-of-State* was the midpoint. The same 40 photographs were presented again and participants rated the photographs in terms of physical attractiveness on a 1 *Extremely Unattractive* to 9 *Extremely Attractive* scale.

After the attractiveness-rating task, participants made group-level evaluations about In-State and Out-of-State students on the stereotypes earlier assessed regarding the three ethnic groups. The order in which participants evaluated the two social groups randomly varied between-subject. After completing the final stereotype-rating task, participants indicated the first day of their last menstrual cycle and typical cycle length along with various other demographic items. Finally, participants completed the fear of rape scale (Senn & Dzinas, 1996) and were debriefed.

Results

"Latin-Lover" Hypothesis

I created a sexuality-index by compositing the two variables of interest, *Highly Sexual* and *Good in Bed*. Analysis suggested the two items were internally consistent, $a=.74$. Ratings of stereotypes were analyzed through multilevel regression using SAS (9.2 PROC MIXED). I regressed stereotype ratings on a factorial crossing Ethnic Group

(Hispanic, Black, & White) and Conception-Risk (mean-centered). Subjects' intercepts were treated as a random variable.

There was a significant Ethnic Group Main effect, $F(2, 451)=15.01, p<.0001$. Significant differences were found in ratings of Hispanics and Blacks, $t(421)=25.95, p<.0001$, and Hispanics and Whites, $t(421)=17.95, p<.0001$. Descriptive statistics indicated Hispanics *(M=4.27, SE=.1156)* were seen as *less* sexualized than both Blacks *(M=4.90, SE=.1156)*, $t(421)=25.95, p<.0001$ and Whites *(M=4.79, SE=.1156)*, $t(421)=17.95, p<.0001$. These effects were not moderated by conception-risk, $F(2,421)=.64, p=.5294$, suggesting that women evaluate Hispanic men as less sexualized consistently across the menstrual cycle . See figure 2 in appendix.

Replication of Study 1

Descriptive statistics indicated photographs were viewed on average as *Could be In-State or Out-of-State, M=5.21, SD=1.77*. However scale range was maximized across the photographs as the range was from 1 to 9.

I again tested the outgroup-mating hypothesis using multi-level modeling with PROC MIXED of SAS 9.2. I regressed attractiveness ratings on a factorial crossing of Group (ingroup/outgroup) and Conception-Risk (mean-centered) and estimated random effects for each subjects' intercept. A Conception-risk x Group interaction indicated that attraction to the ingroup and outgroup males differentially varied as a function of conception-risk, $F(1, 2793)=15.81, p<.0001$. I used the Johnson-Neyman technique (Johnson & Neyman, 1936; Preacher et al., 2006) to decompose the overall interaction.

The statistical technique essentially works backwards to calculate at what levels or regions a given variable's beta is significant within another variable at a specified p-value ($p=.05$) and given degrees of freedom. The technique produces upper and lower bound levels of a moderator (in the current study, evaluations of in-state and out-of-state) in levels of a focal predictor (in the current study, conception-risk). The values that fall outside of the levels of the lower-bound and upper-bound regions are the values in which the simple slope of y on x is significantly different than zero at $p=.05$. In particular, conception-risk positively predicted ratings of attraction to outgroup males, $B=6.46$, $SE=3.2936$, $t(2793)=1.96$, $p=.05$ and negatively predicted ratings of attraction to ingroup males, $B=-6.35$, $SE=3.24$, $t(2793)=-1.96$, $p=.05$. Simple slopes diverge at values of 2.3 (1.63 standard deviations below the mean) and 7.9 (1.52 standard deviations above the mean) on the *In-State/Out-of-State* scale, such that at ratings at or below 2.3, conception-risk positively predicts ratings of attractiveness and at ratings at or above 7.9, conception-risk negatively predicts ratings of attractions. See figure 3 in appendix.

Alternative Explanation?

I again created a sexuality-index by compositing the two variables of interest regarding group-level evaluations of In-State and Out-of-State students. Analysis suggested *Highly Sexual* and *Good in Bed* were internally consistent, $a=.82$. Ratings of stereotypes were analyzed through multilevel regression using SAS (9.2 PROC MIXED). I regressed stereotype ratings on a factorial crossing Social Group (In-State/Out-of-State)

and Conception-Risk (mean-centered). Subjects' intercepts were treated as a random variable.

Results indicated ratings of sexuality did not differ between Out-of-State students, *M=4.74, SE=. 0873*, and In-State students, *M=4.79, SE=. 0879, F(1, 249)=.44, p=.5080.* The effect was not moderated by conception-risk, *F(1,249)=.06, p=.8003*.

Discussion

I tested for the possible alternative explanation that women were imagining a highly idealized "Latin-Lover" when evaluating Hispanic men in Study 1. Study 2 provided evidence that the ethnic groups used in Study 1 did in fact differ in perceived sexuality. However, Hispanics were actually seen as *less* sexualized than Caucasians, perhaps providing further merit to the effects discovered in Study 1. Finding evidence for the outgroup-mating hypothesis using Hispanics as an operationalization of the outgroup and Caucasians as the ingroup was a stringent test of the hypothesis. Perhaps using racial groups perceived equally sexualized would produce stronger outgroup preference effects.

Study 2 also conceptually replicated Study 1 using non-ethnic social groups to operationalize ingroup and outgroup membership. The findings of the conceptual replication suggest that the effects I discovered from Study 1 may be an evolved adaptation and a product of group living and sexual selection. The Conception-Risk x Group interaction evidenced using both racial and non-racial social groups demonstrates that this effect is not unique to solely racial groups. Using a non-racial social group suggests that the proposed furtive outgroup mating heuristic generalizes for females

evaluating any non-familiar male. In-State and Out-of-State students and Caucasians and Hispanics are certainly not genetically dissimilar, but are distinct enough groups that they are both psychologically salient in regards to markers of group-membership and both groups produce differential patterns of evaluations based on group-membership and, in the current studies, fertility.

Overall Discussion

The outgroup-mating hypothesis makes specific predictions about womens' preferences for males during high-fertility as a function of the male's group membership. Specifically the hypothesis predicts that women should prefer outgroup men (but not ingroup men) at periods of high (but not low) fertility for reproductive purposes. The hypothesis proposes there may have been an adaptive advantage for ancestral females that mated with outgroup men; namely assurance of creating genetic variability in one's lineage and inbreed avoidance, and higher success in cuckolding of one's primary partner by lessening the possibility of one's partner actually discovering the infidelity.

The results of Study 1 and Study 2 show support for the outgroup-mating hypothesis. Conception-risk positively predicts attraction to outgroup men but not ingroup men. No differences in women's evaluations of short-term versus long-term partners were found however. Perhaps because the males I used were only moderately attractive, it was difficult for women to discern between objectively good short-term or long-term mates. Had I used photographed males of higher attractiveness levels, I may

have found differences in women's evaluations of short-term versus long-term mates as a function of conception-risk and possibly the male's presumed group membership as well.

At first glance, the current studies' findings seem at odds with previous research indicating conception-risk positively predicts prejudice to outgroup but not ingroup men (Navarerete et al., 2010; Navarette et al., 2009_a; Navarette et al., 2009_b McDonald et al., 2011). However, the researchers that demonstrated such effects conclude that the effect generalizes to a *sexual-coercion/avoidance* mechanism that aided ancestral women to choose ingroup but not outgroup males as reproductive partners. Researchers may be overgeneralizing these results.

Moreover, the researchers claiming such a *sexual-coercion/avoidance* mechanism to intergroup prejudice are assessing prejudice toward groups, and not individuals per se, using such measures as the IAT (Greenwald et al., 1998). My studies assess womens' preferences at the individual-level and do indeed diverge from the implications of the *sexual-coercion/avoidance* hypotheses.

A better explanation of both my data and the data researchers claim supports the *sexual-coercion/avoidance* hypothesis may be that women become more conforming to group norms as fertility increases as a way to avoid conflict within the group *and* increasingly attracted to individual outgroup men as fertility rises to promote genetic heterogeneity as well. It's quite possible dual motivations are at work during periods of high-fertility. Group-level motivations may drive prejudice to increase as fertility increases but individual-level motivations may be driving attraction toward individuals of

the very same outgroup! However, the individual level motivation to reproduce with outgroup men may be executed or displayed secretly to preserve one's membership/role within the group.

Findings specifically from Study 2 demonstrate as conception-risk increases, attraction to ingroup men *decreases.* These findings may seem curious at first. However post hoc theorizing has led to a possibility of why such effects would emerge. Perhaps, there were group-level selection pressures selecting specifically against infidelity within the ingroup. If sexual infidelity were to have occurred within the ingroup, and discovered, the act could have impacted the cohesiveness of the group. As the group was a necessary element for survival for early hominids (Johnson & Earl, 1988), any loss of cohesion and cooperation could have been the difference between life and death. Evolutionary selective pressures at the group level may possibly be at work, selecting specifically against infidelity within the ingroup to maintain intragroup harmony and preservation of a unified unit.

Moreover, if paired ancestral females were motivated to cuckold their primary mate, engaging in infidelity with members of their ingroup to satisfy such a motivation could have been easily discovered, resulting in decreased partner support or even death (Wilson & Daly, 1995; Shackelford et al., 2002). Perceiving individual ingroup men as less attractive as reproductive partners at periods of high-fertility could have guarded against ancestral females potentially extra-pair mating with ingroup males and risking their position within the group.

Limitations

This research extends our understanding of how females' reproductive biology interacts with their evaluations of ingroup and outgroup males. In doing so, it provides rare, albeit theoretically derived, evidence of systematic outgroup preferences.

However the current research should be interpreted within light of some limitations. I cannot be certain that what I propose, an adaptation for outgroup-mating, did actually occur, or in fact resulted in higher reproductive success in ancestral females. Nonetheless, it does seem plausible that intersexual selection could have selected specifically for ancestral women that mated furtively with genetically dissimilar high-genetic quality ancestral men. It also makes sense the offspring that would have resulted from such copulations would have themselves been selected as superior mates at reproductive age, thus ensuring genetic survival, a basic human motivation. Presently, I do not imagine there is better explanation of the present data and pattern of findings. Even in the absence of direct observation of ancestral humans, I am suggesting that no other causal influence other than evolution could have shaped females reproductive biology to interact with psychological processes to influence differential patterns of preferences for ingroup and outgroup men.

A second limitation, of Study 1 namely, may be a product of the photographs I chose to use. All the photographs presented were ambiguously Hispanic. That is, the individual could have been perceived as either being Hispanic or Caucasian. There might be something unique to this type of person when being evaluated for a potential

romantic/reproductive partner. This ambiguously ethnic person may be preferred because they are not explicit in their perceived race. Social norms may dictate that its OK to be attracted to those who are dissimilar to one, but not extensively so. Perhaps the discovered effect would disappear when evaluating unambiguous photographed males. Future research is necessary to test such an idea.

In conclusion, this set of studies tested for the possibility of an outgroup preference as a function of fertility. This is one of the first studies to have tested for such systematic shifts of outgroup favoritism. These data provide some of the best data and causal experimental methods to date demonstrating outgroup preferences. Understanding women's preferences for reproductive partners as a function of group membership and fertility can help shed light on ancestral human's motivations, cognitions, and behaviors in an evolutionary era otherwise unknown.

List of References

Altemeyer, B. (1988). Enemies of freedom: Understanding right-wing authoritarianism. (pp.378), San Francisco, CA: Jossey-Bass.

Brewer, M. B. (1979). In-group bias in the minimal intergroup situation: A cognitive-motivational analysis. *Psychological Bulletin, 86, 2,* 307-324.

Brewer, M. B. (1997) On the social origins of human nature. In C. McGarty & S. A. Haslam (Eds.), *The Message of Social Psychology* (pp.54-62). Oxford, UK: Blackwell.

Brewer, M. B. (1999). The psychology of prejudice: ingroup love or outgroup hate? *Journal of Social Issues, 55,* 429-444.

Brewer, M. (2001). Ingroup identification and intergroup conflict. In R. D. Ashmore, L. J. Jussim, & D. Wilder (Eds.), *Social identity, intergroup conflict, and conflict reduction*

Brewer, M. B. (2007). The importance of being we: Human nature and intergroup relations. *American Psychologist*, 728-738.

Buss, D.M. (1989). Sex differences in human mate preferences: Evolutionary hypotheses tested in 37 cultures. *Behavioral and Brain Sciences, 12, 1,* 1-49.

Buss, D. M (2002). Human mate guarding. *Neurodendocrinology Letters Special Issue, 4, 23,* 23-29.

Caporael, L. R. (1997). The evolution of truly social cognition: The core configurations model. *Personality and Social Psychology Review, 1,* 276-298.

Cosmides, L., & Tooby, J. (2005). Neurocognitive adaptations designed for social exchange. In D. M. Buss (Ed.), *The Handbook of Evolutionary Psychology* (pp.584-627). New York: Wiley.

Duncan, L. A., Schaller, M., & Park, J. H (2009). Perceived vulnerability to disease: Development and validation of a 15-item self-report instrument. *Personality and Individual Differences, 47, 541-546.*

Fisher, H. E. (1989). Evolution of human serial pairbonding. *American Journal of Physical Anthropology, 78,* 331-354.

Gaertner, L, & Insko, C. A. (2000). Intergroup discrimination in the minimal group paradigm: Categorization, reciprocation, or fear? *Journal of Personality and Social Psychology, 79, 1,* 77-94.

Gaertner, L., & Insko, C. A. (2001). On the measurement of social orientations in the minimal group paradigm: Norms as moderators of the expression of intergroup bias. *European Journal of Social Psychology, 31, 2,* 143-154.

Gaertner, L., Iuzzini, J., Witt, M. G., Guerrero, M., & Oriña, M. M. (2006). Us without them: Evidence for an intragroup origin of positive in-group regard. *Journal of Personality and Social Psychology, 90, 3,* 426-439.

Gagneux, P., Woodruff, D. S., & Boesch, C. (1997). Furtive mating in female chimpanzees. *Nature, 387, 358-359.*

Gangestad, S. W., Simpson, J. A., Cousins, A. J., Garver-Apgar, C. E., & Christensen, P. N. (2004). Women's preferences for male behavioral displays change across the menstrual cycle. *Psychological Science, 15, 3,* 203-207.

Gangestad, S. W., Garver-Apgar, C. E., Simpson, J. A., & Cousins, A. J. (2007). Changes in women's mate preferences across the ovulatory cycle. *Journal of Personality and Social Psychology, 92, 1,* 151-163.

Gangestad, S. W., & Thornhill, R. (1998). Menstrual cycle variation in women's preferences for the scent of symmetrical men. *Proceedings of the Royal Society, 265,* 927-933.

Garver-Apgar, C. E., Gangestad, S. W., Thornhill, R., Miller, R. D., & Olp, J. J. (2006). Major histocompatibility Complex Alleles, sexual responsivity, and unfaithfulness in romantic couples. *Psychological Science, 17,* 830-835.

Garver-Apgar, C. E., Gangestad, S. W., & Simpson, J. A. (2007). Women's perceptions of men's sexual coerciveness change across the menstrual cycle. *Acta Psycholigica Sinica, 39, 3,* 536-540.

Greenwald, A. G. , McGhee, D. E., & Schwartz, J. L. K. (1998). Measuring indicidual differences in implicit cognition: The implicit association test. *Journal of Personality and Social Psychology, 74, 6,* 1464-1480.

Greiling, H., & Buss, D. M. (2000). Womens sexual strategies: The hidden dimension of extra-pair mating. *Personality and Individual Differences, 28*(5), 929-963. doi:10.1016/S0191-8869(99)00151-8

Haselton, M. G. & Miller, G. F. (2006). Women's fertility across the cycle increases the short-term attractiveness of creative intelligence compared to wealth. *Human Nature, 17,* 50-73.

Insko, C. A., Scholpler, J., Hoyle, R. H., Dardis, G. J., & Graetz, K. A. (1990). Individual-Group discontinuity as a function of fear and greed. *Journal of Personality and Social Psychology, 58, 1,* 68-79.

Itani, J. & Zuzuki, A. (1967). The social unit of chimpanzees. *Primates, 8,* 355-381.

Jochle, W. (1973). Coitus induced ovulation. *Contraception, 7, 6,* 523-564.

Johnson, A.W., & Earle T. (1988). The evolution of human societies: From foraging group to agrarian state. Stanford: Stanford University Press.

Kameda, T., & Tindale, R.S. (2004). Groups as adaptive devices: Human docility and group aggregation mechanisms in evolutionary context. In M. Schaller, J. Simpson, & D. Kenrick (Eds.), *Evolution and social psychology* (pp. 318-341). New York: Psychology Press.

Little, A. C., Jones, B. C., Penton-Voak, I. S., Burt, D. M., & Perrett, D. I. (2002). Partnership status and the temporal context of relationships influence human female

preferences for sexual dimorphism in male face shape. *Proceedings of the Royal Society, 269,* 1095-1100.

McDonald, M. M., Asher, B. D., Kerr, N., L, & Navarrete, C. D. (2011). Fertility and intergroup bias in racial and minimal-group contexts: Evidence for shared architecture. *Psychological Science, x, x,* 1-6.

Navarrete, C. D., Fessler, D. M. T., Fleischman, D. S., & Geyer, J. (2009). Race bias tracks conception risk across the menstrual cycle. *Psychological Science, 20, 6,* 661-665.

Navarrete, C., D., McDonald, M. M., Molina, L., E., & Sidanius, J. (2010). Prejudice at the nexus of race and gender: An outgroup male target hypothesis. *Journal of Personality and Social Psychology, 98, 6,* 933-945.

Navarrete, C. D., Olsson, A., Ho, A.K., Mendes, W. B., Thomsen, L., & Sidanius, J. (2009). Fear extinction to an out-group face: The role of target gender. *Psychological Science, 20, 2,* 155-158.

Newcomb, T. M. (1961). *The acquaintance process*. New York, NY, US: Holt, Rinehart & Winston.

Penton-Voak, I.S., & Perrett, D. I. (2000). Female preference for male faces changes cyclically: Further evidence. *Evolution and Human Behavior, 21,* 39-48.

Plant, E. A., & Devine, P. G. (1998). Internal and external motivation to respond without prejudice. *Journal of Personality and Social Psychology, 75*(3), 811-832.

Pratto, F., Sidanius, J., Stallworth, L. M., & Malle, B. F. (1994). Social dominance orientation: A personality variable predicting social and political attitudes. *Journal of Personality and Social Psychology, 67*(4), 741-763.

Preacher, K. J., Curran, P. J., & Bauer, D. J. (2006). Computational tools for probing interactions in multiple linear regression, multilevel model, and latent curve analysis. *Journal of Educational and Behavioral Statistics, 31, 4,* 437-448.

Reichard, U. (1995). Extra-pair copulations in a monogamous gibbon (hylobates lar). *Ethology, 100*(2), 99-112.

Schaik, C.P.V. (1983). Why are diurnal primates living in groups? *Behaviour, 87, 1,* 120-143.

Schmitt, D. P. (2003). Universal sex differences in the desire for sexual variety: Tests from 52 nations, 6 continents, and 13 islands. *Journal of Personality and Social Psychology, 85, 1,* 85-104.

Schaller, M., & Park, J. H. (2011). The behavioral immune system (and why it matters). *Current Directions in Psychological Science, 20,* 2, 99-103.

Senn, C. Y., & Dzinas, K. (1996). Measuring fear of rape: A new scale. *Canadian Journal of Behavioural Science/Revue Canadienne Des Sciences Du Comportement, 28*(2), 141-144.

Shackelford, T. K., Buss, D. M., & Bennett, K. (2002). Forgiveness or breakup: Sex differences in responses to a partner's infidelity. *Cognition and Emotion, 16, 2,* 299-307.

Sherif, M. (1966). In Common predicament: Social psychology of intergroup conflict and cooperation. Houhton Mifflin: Boston, MA.

Simpson, J. A., & Gangestad, S. W. (1991). Individual differences in sociosexuality: Evidence for convergent and discriminant validity. *Journal of Personality and Social Psychology, 60*(6), 870-883. doi:10.1037/0022-3514.60.6.870

Stewart, S., Stinnet, H., & Rosenfeld, L. B. (2000). Sex differences in desired characteristics of short-term and long-term relationship partners. *Journal of Social and Personal Relationships, 17,* 843-853.

Stringer, C., & McKie, R. (1997). *African exodus: The origins of modern humanity.* London, England: Cape.

Tafjel, H. (1974). Social identity and intergroup behavior. *Social Science Information, 13, 2,* 65-93.

Teleki, G. (1974). Chimpanzee subsistence technology: Materials and skills. *Journal of Human Evolution, 3, 6,* 575-584.

Trivers, R. L. (1972). Parental investment and sexual selection. In B. Campbell (Ed.), *Sexual Selection and the Decent of Man, 1871-1971* (pp.136-179). Chicago, IL: Aldine.

Turner, J. C., Hogg, M. A., Oakes, P. J., Reicher, S. D., & Wetherell, M. S. (1987). Rediscovering the social group: A self-categorization theory. Basil Blackwell: Cambridge, MA.

van den Berghe, P. L. (1983) Human inbreeding avoidance: Culture in nature. *Behavioral and Brain Sciences, 6,* 91-102.

Waynforth, D. & Dunbar, R. I. M. (1995). Conditional mate choice strategies in humans: Evidence from 'lonely hearts' advertisements. *Behavior, 132,* 755-779.

Wilcox, A. J., Dunson, D. B., Weinberg, C. R., Trussell, J., & Baird, D. D. (2001). Likelihood of conception with a single act of intercourse: providing benchmark rates for assessment of post-coital contraceptives. *Contraception, 63,* 211-215.

Wilson, M., Daly, M., & Danielle, A. (1995). Familicide: The killing of spouse and children. *Aggressive Behavior, 21,* 275-291.

Wilson, M. I., & Daly, M. (1995). An evolutionary psychological perspective on male sexual proprietariness and violence against wives. *Violence and Victims, 8,* 271-294.

Wilson, M. I., & Daly, M. (1996) Male sexual proprietariness and violence against wives. *Current Directions in Psychological Science, 5,* 1, 2-7.

Zihlman, A. L. (1978). Women in evolution, Part II: Subsistence and social organization among early hominids. *Women, Science, and Society, 4, 1,* 4-20.

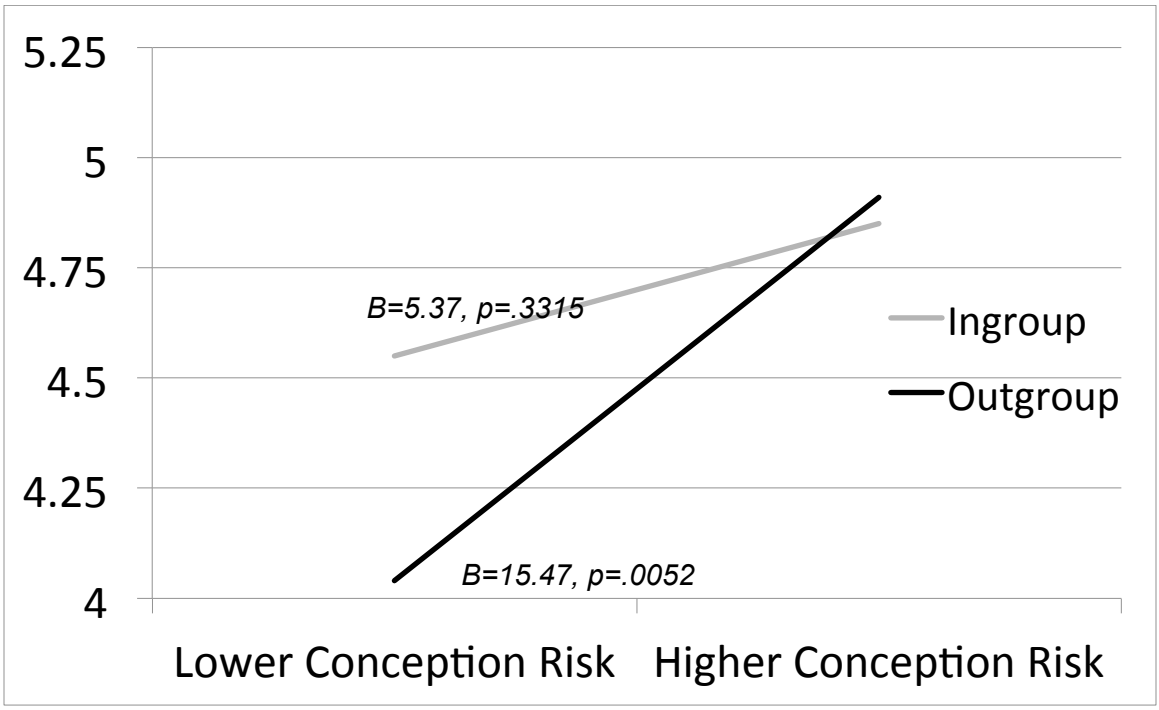

Figure 1. **Group x Conception-Risk** *F(1,1734)=4.31, p=.0381*

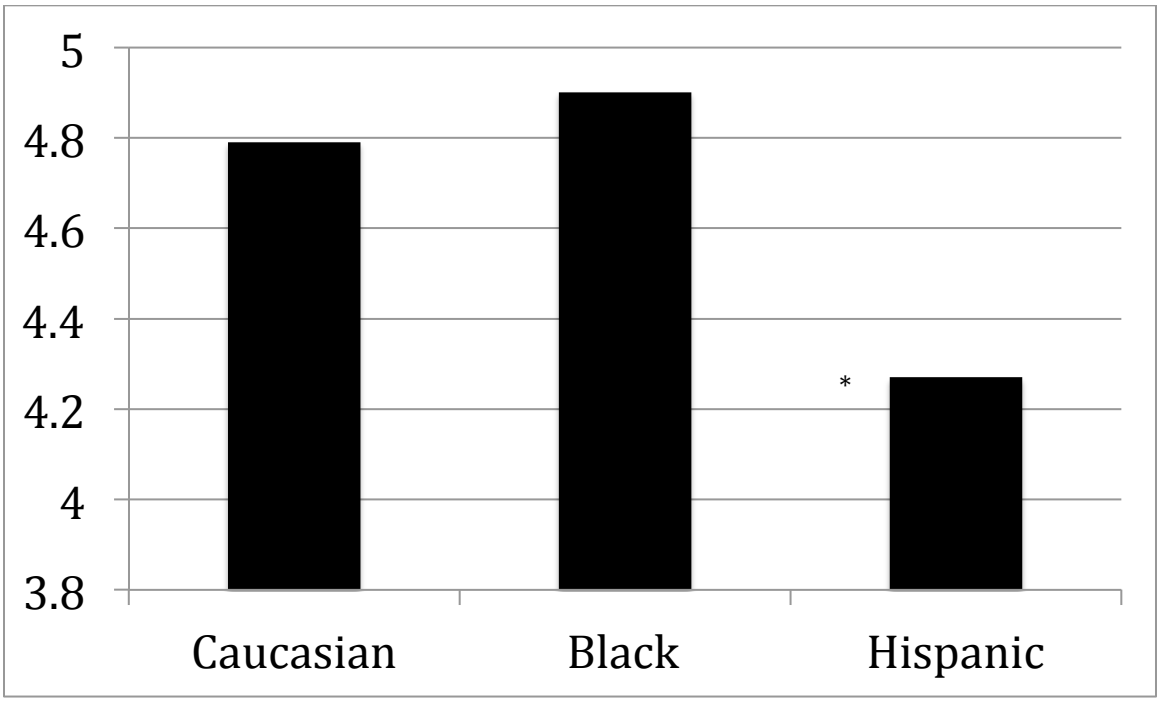

Figure 2. **Group Main Effect – Sexuality index** *F(2,451)=15.01, p<.0001*

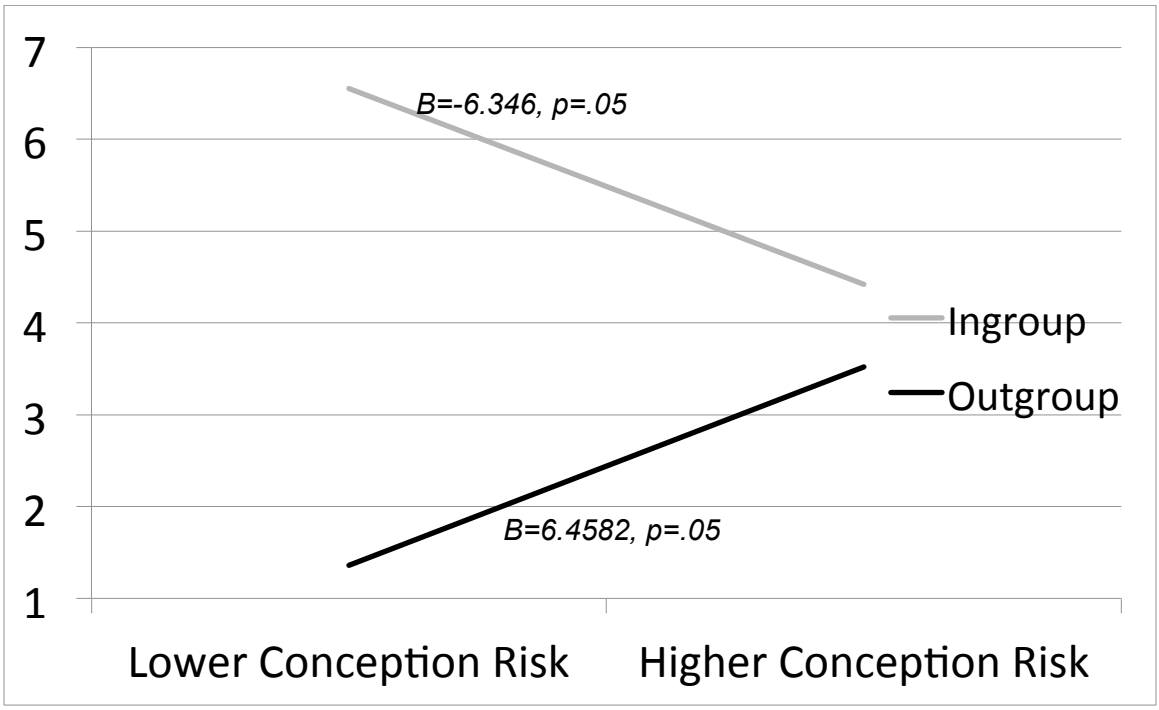

Figure 3. **Group x Conception-Risk** *F(1,2793)=15.81, p<.0001*

VITA

Joseph Frederick Salvatore was born in Stamford, Connecticut in 1983. After completing high school at Martin County High School in Stuart, Florida, he worked for his family in their restaurant businesses. Joseph decided the restaurant business was not for him and took a job with Dr. Alan Pratt at his beachfront property in Vero Beach, Florida. A desire to pursue a higher education degree coupled with moral and financial support from Dr. Pratt, prompted Joseph to enroll in Florida Atlantic University in Boca Raton, Florida and complete a Bachelor of Arts in Psychology, graduating *summa cum laude* and with Departmental Honors. In August 2010, he entered the graduate school at The University of Tennessee and began working on a Ph.D. in Experimental Social Psychology.