



Life History Strategy Predicts Individual Differences in Sexually Selected Traits

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Life History Strategy Predicts
Individual Differences in Sexually Selected Traits

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A Thesis in the Field of Psychology
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Abstract

Humans, like all other organisms, have succeeded over evolutionary time by tackling only two basic problems: survival and reproduction. Organisms that reproduce sexually utilize specially-evolved mechanisms of sexual selection when addressing the latter problem. These mechanisms, intrasexual competition and intersexual selection, often occur differently between males and females. While these differences between men and women of our own species are well-researched, little is known about the sources of variation in these behaviors *within* each sex. The current study tested a novel hypothesis that utilizes life history theory to explain individual differences in sexually selected traits and behaviors. The relationship between life history strategy and both intrasexual competitiveness and intersexual choosiness was investigated, along with the effects of fertility across the menstrual cycle as a potential moderating variable in these relationships for women. It was predicted that both men and women with slower life history strategies would be less intrasexually competitive and more intersexually choosy, while those with faster strategies would be more competitive and less choosy, but that sex would moderate these relationships, as men were predicted to be more competitive and less choosy than women. Fertility across the menstrual cycle was also predicted to moderate these relationships for women, as they were predicted to be more competitive and choosy while in the fertile phase of the menstrual cycle. As predicted, there was a significant correlation between life history strategy and both competitiveness and choosiness. Increasingly faster strategies correlated with increased competitiveness and

decreased choosiness. However, sex did not significantly moderate the relationships, and nor did fertility across the menstrual cycle for women. Thus, life history strategy appears to influence individual differences in intersexual and intrasexual selection for both men and women.

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Chapter I

Introduction

Our hominin ancestors faced countless adversities throughout the evolution of the human species: disease, famine, injury, predation, and a rapidly changing, harsh climate. Modern *Homo sapiens* invented agriculture, industry, technology, and medicine to combat the ails of hunter-gatherer life (to various degrees of success), but one of the most prominent difficulties that early humans faced has changed very little over hundreds of thousands of years of evolution: finding, attracting, and keeping a mate.

It is important to consider modern romantic relationships in an evolutionary context because the challenges of mating are ancient ones, shaped by natural and sexual selection, and shared by all people (indeed, all sexually reproducing organisms) throughout history. On average, the majority of human beings share common sexually selected traits that address the adaptive problems of reproduction, because these are the traits that led to the reproductive advantage and subsequent survival of our species over evolutionary time.

Research on sexual selection in humans has increased in recent years, but has often focused on differences between the sexes (Buss, 1994). While these differences are important, and play an integral role in the present study, there has been very little work devoted to understanding the sources of individual differences that occur *within* each sex. All people tackle the problems of mating in incredibly diverse ways, and there has thus far been very limited research that delves deeper into why and how these intricacies may

have evolved. The present study explores the hypothesis that a person's unique life history may be one factor that contributes to individual variation in sexually selected traits and behaviors.

Sexual Selection

Charles Darwin first coined the term "sexual selection" to describe a complimentary force to natural selection that drives the evolution of traits related to mating and subsequent reproductive success (1871). Darwin described sexual selection as occurring in two modes: *intersexual* and *intrasexual* selection.

Intersexual selection is the choosing of a mate by the opposite sex, and occurs due to the traits that make a mate attractive in that species. The quintessential example of intersexual selection is the peahen choosing the peacock with the gaudiest and most beautiful feathers. The peacock makes himself vulnerable to predation by growing such vibrant plumage, but the risk is worth the reward of attracting the best peahens. The brilliance of the feathers may also be an indicator of higher genetic quality, which a peahen should prefer in order to produce offspring with the greatest chance of surviving and reproducing themselves (Darwin, 1871).

Intrasexual selection is competition that occurs between members of the same sex to attract and gain access to mates of the opposite sex. Intrasexual competition can take many forms, but Darwin noted that males are the sex that more commonly engage in physical and social competitions with other males to gain access to females, ideally the greatest number of females as possible (1871). For example, male deer will spar with other male deer during the rutting period to gain access to a harem of females to breed

with; only the most successful and dominant bucks will be allowed to mate with the group of does.

According to Robert Trivers' (1972) parental investment theory, the sex which devotes more energy to parenting should be the more intersexually selective sex, in order to choose the best genes to pass on to their offspring, while the other sex should be the more intrasexually competitive, to gain access to the most mating opportunities with members of the selective sex. This is generally true of most sexually-reproducing species (Bateman, 1948).

In humans, women devote considerably more energy to parenting, simply through the long and taxing process of pregnancy, birth, and lactation (Ellison, 2003). Thus, according to parental investment theory, women are expected to be more choosy, while men are expected to be more competitive (Geary, 2002). This is precisely what research in humans has found (Buss & Barnes, 1986; Buss, 1988; Buss, 2006).

However, due to the complex human social system, a man can often devote considerable investment to parenting as well, typically by providing resources, protection, and care for his mate and their children, and thus men can also benefit from being choosy about their mates (Buss, 2006; Buss & Barnes, 1986).

Likewise, women can benefit from being intrasexually competitive with one another, primarily to gain access to the highest quality long-term mate, with the best genes and most resources to invest in her and her offspring (Buss, 2006; Buss, 1988; Rosvall, 2011).

While there is much evidence to support these sex differences in human mating behaviors, the factors that contribute to variation in these behaviors within each sex are

not well understood. Life history theory (Gadgil & Bossert, 1970) is one lens that could help to explain the diversity in intrasexual competitiveness and intersexual choosiness among both men and women.

Life History Theory

Life history theory is a theoretical framework that emphasizes the importance of ecological variation in how energy is allocated to important life events involved in development and reproduction (Del Giudice, Gangestad, & Kaplan, 2016). Like a financial budget, humans (and all other living organisms) have limited “energy budgets” to devote to their survival and reproduction. Also like financial budgets, it pays to invest different amounts of energy into different life events at different times, depending on the circumstances of the environment.

Just as natural selection shapes species to be adapted to their evolutionary environment, it also shapes them to be flexible to the variation that occurs within that environment (Kaplan & Gangestad, 2005). Thus, organisms have evolved the phenotypic plasticity to invest their energy differentially based on changing ecological cues throughout their lifetime (Del Giudice, 2014).

It is generally accepted that these differing investments are not the result of conscious choices in energy allocation, but rather from automatic, unconscious, bodily and cognitive processes that result from a cascade of critical developmental events (West-Eberhard, 2003).

There are three fundamental life history tradeoffs in energy allocation that every organism experiences across its lifespan: growth vs. reproduction, quantity vs. quality of

offspring, and mating vs. parenting effort (see Del Giudice, Gangestad, & Kaplan, 2016, for an overview). These three factors interact and influence each other, leading to overarching strategies that are often characterized on a fast-slow continuum (Promislow & Harvey, 1990; Pianka, 1970).

The growth-reproduction tradeoff – also called the tradeoff between current and future reproduction – is essentially characterized by the length of time an organism takes to reach sexual maturity (Stearns, 1977). By investing energy into growth and development, an organism can increase its fertility in the future; but the longer an organism takes to mature, the longer it will have to survive in the environment before passing on its genes. Thus, most organisms spend a period of time in a juvenile phase of growth until the point in development that it increases fitness to reproduce instead of continue growing (Del Giudice, Gangestad, & Kaplan, 2016).

In human females, this point is typically defined as menarche, or a woman's first menstrual period, which marks the ability to begin to reproduce (Presser, 1978). In males, this point is more difficult to determine, but is sometimes defined as spermarche – commonly measured as a man's first seminal emission – which is also a signal of impending fertility (Kim & Smith, 1999).

The length of the juvenile period is partly determined by the stability of the organism's developmental environment. If the environment is dangerous or has unpredictable amounts of food and other energy resources, then it pays to begin reproduction earlier, but if it is a stable, plentiful environment then an organism can develop itself further, in order to produce higher-quality offspring later in the lifespan (Del Giudice, 2014).

There is evidence that human children who grow up in unstable home environments tend to reach puberty earlier than those in more stable environments. For example, girls who develop in more dangerous neighborhoods, have lower family incomes, or who come from father-absent households, tend to reach menarche earlier than their peers (Amir, Jordan, & Bribiescas, 2016; Hoier, 2003; Brumbach, Figueredo, & Ellis, 2009).

Once an organism reaches the reproductive stage, it must then make a further tradeoff between quality and quantity of offspring (Stearns, 1977). Organisms have limited energy to invest in caring for their offspring. On one end of the spectrum, an organism can produce as many offspring as it is physically capable of birthing, but it is likely that the organism will not be able to provide adequate care to keep all of these offspring alive long enough that they may reproduce themselves. On the other end of the spectrum, the organism can significantly limit its number of offspring. Although the organism will be able to devote plenty of energy into keeping these few offspring alive, the organism may not be reaching its full reproductive potential (Del Giudice, Gangestad, & Kaplan, 2016).

Again, the optimal amount of offspring is partly determined by an organism's environment. In an unstable environment it is preferable to produce a large number of offspring in the hopes that at least some will survive and reproduce themselves, but in a stable environment an organism can invest more in fewer, higher-quality offspring (Del Giudice, 2014).

Indeed, research has shown that humans who develop in more stable environments tend to have fewer pregnancies and subsequent children, compared to those

from more unstable environments (Brumbach, Figueredo, & Ellis, 2009; Amir, Jordan, & Bribiescas, 2016).

The final tradeoff, between mating effort and parenting effort, often overlaps with the quantity-quality tradeoff. When an organism already has offspring, it can either invest its energy into parenting or into finding and attracting additional mates (Trivers, 1972). This tradeoff often leads to sexually dimorphic characteristics due to differing parental investment demands (Kokko & Jennions, 2008). However, organisms of both sexes that develop in a more stable environment tend to invest more in parenting effort, while those that develop in less stable environments tend to invest more in mating effort (Del Giudice, 2014).

In humans, several studies have found that adults who grew up in less stable developmental environments tend to have more open sociosexual orientations, engage in riskier sexual behaviors, and have more extra-pair copulations (McDonald, Donnellan, & Navarrete, 2012; Brumbach, Figueredo, & Ellis, 2009; Chisholm, 1993; Figueredo, et al., 2006).

Life History Strategy

Especially when applying life history theory to the human species, these tradeoffs are often collapsed into single strategies on a fast-slow continuum (Figueredo, Vásquez, Brumbach, & Schneider, 2004; Brumbach, Figueredo, & Ellis, 2009).

Fast life history strategy is characterized by earlier maturation, greater numbers of offspring, decreased parental investment in offspring, and more short-term sexual partners (Stearns, 1977). Additionally, common behavioral traits associated with fast life

history strategies include impulsivity, increased risk-taking, lack of altruism, and increased aggression (Figueredo, et al., 2006).

Slow life history strategy is characterized by delayed reproduction, greater investment in fewer offspring, and fewer, longer-term sexual partners (Stearns, 1977). It is also associated with increased risk-aversion, increased altruism, and long-term planning (Figueredo, et al., 2006).

It should be noted that humans as a species tend to have relatively slow strategies on the whole: we do not have multitudes of offspring at one time, we have an extremely long juvenile phase of development, we typically tend to seek long-term monogamous relationships, and we have a relatively lengthy lifespan. However, there remains considerable variation in life history strategies within human populations, which is theoretically due to differential investment in life history tradeoffs that are dependent on one's developmental ecology (Kaplan & Gangestad, 2005).

Individual Differences in Intrasexual Competition

It follows that it would be adaptive for an individual to tailor their intrasexual competitiveness based on their life history strategy. I predict that if an individual developed in an unstable environment, leading to a faster life history strategy, it would be advantageous to be *more* competitive, in order to gain access to the most mating opportunities possible. On the other hand, I predict that an individual that developed in a stable environment, with a subsequently slower life history strategy, would be *less* competitive overall, as this would help to preserve vital cooperative partnerships within one's social group.

Sex is also predicted to interact with competitiveness, as parental investment theory predicts that males will be more competitive than females, in general (Trivers, 1972). Previous studies have shown this to be the case (Buss, 1988).

To my knowledge, only one pair of studies has found preliminary correlations between intrasexual competitiveness and life history strategy. The studies both found significant correlations between disordered eating behavior, intrasexual competitiveness, and faster life history strategy (Abed, et al., 2012; Salmon, Figueredo, & Woodburn, 2009).

The first of these studies (Salmon, et al., 2009) only reported an indirect relationship between life history strategy and intrasexual competitiveness. Slow life history strategy predicted higher executive function ($\beta = 0.23, t = 2.38, p < 0.05$), and higher executive function predicted lower intrasexual competitiveness for mates ($\beta = -0.24, t = -2.46, p < 0.05$). The second study (Abed, et al., 2012) reported a direct negative effect of slow life history strategy on overall competitiveness ($\beta = -0.29, p < 0.05$), however, competitiveness was measured using a combination of intrasexual and general competitiveness measures.

While these two studies provide preliminary support for the hypothesis that individuals with slower life history strategies are predicted to be less intrasexually competitive, there are several limitations to these findings.

Foremost, these studies were only conducted on women, so no conclusions can be drawn about male intrasexual competitiveness. Secondly, competitiveness was measured using a combination of scales that the authors designed, instead of using any standardized scales that are commonly used to measure intrasexual competitiveness. The scales were

designed to measure intrasexual competitiveness for mates, for status, and general competitiveness, but no validation data was presented for the scales. Finally, the moderately significant relationships were not direct correlations between life history strategy and intrasexual competitiveness, as they were part of models testing the relationship of both variables to eating disorder behavior. Thus, a study that directly tests the relationship between life history strategy and intrasexual competitiveness is necessary to draw any firmer conclusions.

Individual Differences in Intersexual Mate Choice

I also predict that life history strategy will affect an individual's level of choosiness regarding the qualities they look for in a potential mate. Those with fast life history strategies should be less selective, allowing for the most possible mating opportunities. While those with slower strategies should be more selective, opting to find a mate with high genetic quality, and with greater ability to care for and provide resources for offspring.

Parental investment theory also predicts that sex will interact with intersexual selection, as females are predicted to be more choosy and males less choosy overall (Trivers, 1972). Previous studies have also shown this prediction to be true (Buss & Barnes, 1986; Kenrick, Sadalla, Groth, & Trost, 1990; Kenrick, Groth, Trost, & Sadalla, 1993).

Research has shown that those with faster life history strategies tend to engage in behaviors related to increased mating effort, such as riskier sexual behaviors, less restrictive sociosexual orientations, earlier sexual debut, and more extra-pair copulations

(McDonald, Donnellan, & Navarrete, 2012; Brumbach, Figueredo, & Ellis, 2009; Chisholm, 1993; Figueredo, et al., 2006). However, there have been no studies, to my knowledge, that have tested the direct relationship between intersexual choosiness and life history strategy.

Fertility

To further complicate the complexities of sexual selection, several studies have shown that fertility across the menstrual cycle may affect competitiveness and choosiness among women of childbearing age.

Women are only able to possibly become pregnant by having sexual intercourse during approximately the 5 days prior to ovulation and 1-2 days during and after ovulation (Jones & Lopez, 2013). This short period of time, that occurs only once every menstrual cycle, is sometimes known as the fertile window. It has been demonstrated that women experience several unconscious psychological and behavioral changes during this fertile window, typically relating to intersexual and intrasexual selection (Gangestad & Thornhil, 2008).

Regarding intrasexual competitiveness, normally ovulating women in the fertile phase of their menstrual cycle engage in more derogation of their competitors, such as describing other women using dehumanizing words and rating them as less attractive (Piccoli, Foroni, & Carnaghi, 2013; Fisher M. L., 2004). Women also use more self-promotion tactics when they are more likely to conceive, such as wearing revealing clothing and purchasing products related to enhancing their appearance (Durante, Griskevicius, Hill, Perilloux, & Li, 2011; Durante, Li, & Haselton, 2008). Additionally,

women in the fertile phase are more demanding and less likely to cooperate with other women when playing the ultimatum game – an economics game that measures cooperation and bargaining (Lucas & Koff, 2013; Eisenbruch & Roney, 2016). However, the research in this area is limited and sometimes contradictory (Cobey, Klipping, & Buunk, 2013).

Regarding intersexual choosiness, there is support for the claim that women's preferences for certain mate characteristics shift across the menstrual cycle (Gangestad, Garver-Apgar, Simpson, & Cousins, 2007; Gildersleeve, Haselton, & Fales, 2014; Gangestad & Thornhill, 1998). At high fertility, women are more likely to rate features such as masculinity (Penton-Voak, et al., 1999; Little, Jones, & Burriss, 2007; Puts, 2006), symmetry (Gangestad, Garver-Apgar, Simpson, & Cousins, 2007; Gangestad & Thornhill, 1998; Gildersleeve, Haselton, & Fales, 2014), and dominance (Gangestad, Garver-Apgar, Simpson, & Cousins, 2007) as attractive. These are features that are theorized to indicate high genetic quality, a crucial consideration for a woman who is likely to become pregnant (Gildersleeve, Haselton, & Fales, 2014; Gangestad & Thornhill, 1998). However, there is some controversy as to whether these menstrual cycle shifts definitively exist (Wood, Kressel, Joshi, & Louie, 2014).

However, to my knowledge, no study has yet examined whether women's overall choosiness or competitiveness is affected by fertility across the menstrual cycle. The present study will be critically important to understanding the adaptive function of fertility-moderated preferences and behaviors, and the role that life history strategy may play in the variation of these behaviors. This study explores the predictions that both intrasexual competitiveness and intersexual choosiness will be stronger for women in the

fertile phase of their menstrual cycle.

Summary of Hypotheses

In sum, the present study investigates two primary hypotheses: that life history strategy influences intrasexual competitiveness, where individuals with faster life history strategies are more intrasexually competitive than those with slower strategies; and that life history strategy also influences intersexual choosiness, where individuals with faster life history strategies are less intersexually choosy than those with slower strategies.

Additionally, the present study explores two secondary hypotheses: that sex will moderate these relationships, as men are predicted to be more competitive and less choosy than women; and that fertility status across the menstrual cycle is predicted to moderate these relationships for women, as women in the fertile window are predicted to be more choosy and more competitive than women not in the fertile window.

Chapter II

Methods

The methodologies of the present study were all derived from established theories, protocols, and instruments used in previous research; no new instruments were developed for the study. Efforts were made to utilize only the most validated and widely-accepted methods for testing the study hypotheses, as well as to gather the most data as possible while keeping the study manageable and efficient.

Participants

A target sample of 300 U.S. participants was gathered from the Amazon Mechanical Turk (MTurk) Internet platform. Ideally, equal numbers of men and women were preferred, with a relatively even distribution of other demographic characteristics. To ensure honesty and keep the hypotheses of the study concealed, the only eligibility criteria were that subjects be above 18 years of age and fluent in English. However, the inclusion criteria for the final sample also required that all participants identify as either biologically male or female, not intersex or transgender.

A total of 305 MTurk workers submitted the survey. Only five participants were excluded: three because they did not complete the survey, one because they identified as transgender, and one because they indicated they were under 18 years of age, resulting in a final sample size of 300. The section on data cleaning below further discusses these exclusions.

Instruments

The demographic questionnaire is presented in full in Appendix A. All other instruments are presented in full in Appendices B through E, and the two tables that were used to measure female fertility status across the menstrual cycle are presented in Appendices F and G.

Mini-K

The primary psychometric measure of life history strategy was the Mini-K (see Appendix B): a 20-item, 7-point likert scale measure that results in a mean score of life history strategy as a continuous variable from fast to slow, developed by Figueredo, et al. (2006). This measure is the short form of the 199-item Arizona Life History Battery (ALHB) (Figueredo, Vásquez, Brumbach, & Schneider, 2007). Both the ALHB and the short form Mini-K are widely used, standardized psychometric measures of human life history strategy. In previous studies, the Mini-K has shown a fairly high average internal reliability (Cronbach's Alpha = .73).

Scores on the Mini-K were averaged, resulting in a single mean score of life history strategy ranging from -3 to +3 for each participant, with higher numbers indicating slower life history strategies.

There is only one other scale measure, to my knowledge, that attempts to capture the entire domain of human life history strategy, the High-K Strategy Scale (HKSS) (Giosan, 2006). While the HKSS does show high internal reliability (Cronbach's Alpha = .92), its external validity has never been comprehensively evaluated. In contrast, the Mini-K has been extensively validated by numerous measures of both convergent and

nomological validity (including 346 different bivariate correlations) that have been reviewed in a meta-analysis (Figueredo, et al., 2014). The meta-analytic results suggest that the Mini-K is a psychometrically valid measure of life history strategy as predicted by numerous evolutionary and psychological theories.

Perceived Socioeconomic Status

A secondary measure of life history strategy was a biodemographic measure of perceived socioeconomic status (SES) (see Appendix C). This 6-item, 7-point likert scale survey is used to measure both current SES and childhood SES (Griskevicius, Tybur, Delton, & Robertson, 2011; Griskevicius, Delton, Robertson, & Tybur, 2011). The mean scores for both current and childhood SES are typically combined into two composite factors: perceived childhood SES (Cronbach's Alpha = .87) and perceived current SES (Cronbach's Alpha = .70).

Scores on the perceived SES measure were averaged for perceived current SES and perceived childhood SES, resulting in two mean scores ranging from -3 to +3 for each participant, with higher numbers indicating higher perceived SES.

Many life history studies find that childhood SES is correlated with adult life history strategy (Amir, Jordan, & Bribiescas, 2016; Figueredo, Vásquez, Brumbach, & Schneider, 2004; Ellis, 1987; Brumbach, Figueredo, & Ellis, 2009), however most of these studies come from large, longitudinal, national health survey datasets that have the benefit of knowing exact figures like parental income, average income in each participants zip code, crime and safety data from the years and locations of each participant, etc.

When testing adults in a non-longitudinal study, one must ask them to remember back to their childhoods to estimate their family incomes or neighborhood crime rates. This method is taxing for participants and has the potential to be wildly inaccurate. However, the measure developed by Griskevicius et al. only measures *perceived* SES. Examples of items include “I felt relatively wealthy compared to the other kids in my school” or “I grew up in a relatively wealthy neighborhood”. While it may be difficult for adults to recall exact childhood SES variables, it is theoretically much easier to recall one’s *relative* wealth and status as a child. Additionally, this perceived SES, however inaccurate to one’s true SES, is theoretically more important to one’s internal psychology and subsequent development of a life history strategy.

Biodemographic Measures of Life History Strategy

While the Mini-K functioned as the primary measure of life history strategy, several demographic questions were asked that relate to markers of life history strategy as predicted by life history theory (see Appendix A). Questions included factors related to reproductive strategy, such as number of biological children, age at birth of first child, age at first sexual intercourse, total number of sexual partners, and for women, age at menarche. Life history theory predicts that those pursuing a faster life history strategy will be more likely to mature faster, reproduce earlier in life, and reproduce more prolifically (Figueredo, et al., 2006).

Questions regarding one’s early childhood environment were also asked, including perceived safety of one’s home and neighborhood, presence of biological parents, and presence of step-parents or other non-related adults during ones childhood.

Life history theory predicts that individuals from a more dangerous environment, with less parental involvement, and increased exposure to step-parents, are more likely to pursue a faster life history strategy (Figueredo, et al., 2006; Amir, Jordan, & Bribiescas, 2016).

Intrasexual Competitiveness Scale (ICS)

The primary measure of intrasexual competitiveness was the Intrasexual Competitiveness Scale (ICS) (see Appendix D) developed by Buunk and Fisher (2009). This is a 12-item, 7-point likert scale measure for both men and women. Scores on the ICS were averaged, resulting in a single mean score of intrasexual competitiveness ranging from -3 to +3 for each participant, with higher numbers indicating more competitiveness.

While other measures of general competitiveness and aggressiveness exist in the psychological literature, this is the only validated scale, to my knowledge, that measures competitiveness specifically as it relates to mating. The scale has shown high internal reliability in previous studies (Chronbach's Alpha between .80 and .88), has shown strong external validity with a variety of psychometric traits that are predicted by evolutionary theory to correlate with intrasexual competitiveness (e.g., the Big Five personality traits, sociosexual orientation, and social comparison orientation), and has shown strong cross-cultural equivalence (Buunk & Fisher, 2009).

Measure of Intersexual Choosiness (MICH)

The primary measure of intersexual choosiness was a measure of minimum standards for characteristics in both long-term and short-term mates (Kenrick, Sadalla, Groth, & Trost, 1990; Kenrick, Groth, Trost, & Sadalla, 1993). The Measure of Intersexual Choosiness, or MICH (see Appendix E), contains 24 characteristics, 13 of which are taken from a classic mate preferences study (Buss & Barnes, 1986) and found to elicit significant universal sex differences across 36 cultures (Buss, 1989); the other 11 characteristics were added by Kenrick and colleagues for several studies on differences in mate choosiness between males and females (Kenrick et al., 1990, 1993).

Participants were instructed to rate from 0 to 10 how *essential* they consider each characteristic in a potential romantic partner at two levels of involvement: a short-term and long-term partner. For example, rating a trait as 0 indicates that the trait is not at all essential in a partner, while a rating a trait as 10 indicates that it is highly essential in a partner. A short-term partner was described as a one-night-stand or single sexual encounter, while a long-term partner was described as a long-term relationship or marriage.

Scores on the MICH were averaged for each level of involvement, resulting in two mean scores of intersexual choosiness ranging from 0 to 10 for each participant, one for a short-term partner, and one for a long-term partner. However, for several analyses these two scores were averaged together for one mean score of overall choosiness. Higher scores indicate more choosiness.

In previous studies, Chronbach's Alpha aggregated across all levels of involvement = .94. While many measures of preferences for traits in a potential mate

exist in the psychological literature, this is the only one, to my knowledge, that attempts to capture *selectivity* for those preferences.

Conception Risk and Fertile Window Probability

It can be difficult to accurately measure whether or not a woman is currently in her fertile window. One of the most precise measures that is commonly used by researchers is to test women's luteinizing hormone (LH) levels with a urine test, as a sharp increase in LH is a very reliable sign of ovulation (Gangestad, et al., 2016). This is how a standard, drug store ovulation test works. In a research setting, women must be given the test for several days prior to the estimated day of ovulation, until the spike in LH is witnessed, then they can be given any testing materials and can be assumed to be in the fertile window. However, gathering a large sample of women using this method is time-consuming, expensive, and requires a lab space to host the equipment and participants.

Due to the lack of these resources, as well as the need to gather a large sample of both men and women in a short period of time, I utilized another common method of fertility assessment: estimation based on previous menstruation dates. This method has the benefit of not requiring any special resources, as it simply relies on participants to recall the last few dates of their menstrual cycles. However, this method has the potential to be fairly inaccurate (Gangestad, et al., 2016).

To mitigate concerns about accuracy, two measures were used that are recognized by researchers who study ovulatory shifts to be the most accurate fertility estimation

measures when estimating based on previous menstrual cycle dates (Gangestad, et al., 2016).

The first is a continuous measure of conception risk based on a woman's current position in her menstrual cycle (Stirnemann, Samson, Bernard, & Thalabard, 2013) (see Appendix F for the full chart). The probability of conception for each day of the cycle was calculated based on observing nearly 6000 women who were confirmed as at least 11 weeks pregnant. The day of conception was estimated based on several fetal measurements and these data were analyzed with the dates of the last menstrual period for each woman to create a probability of conception risk on each day of the menstrual cycle.

The second measure was created by Gangestad, et al. (2016) from these conception risk data. They were re-analyzed to produce probabilities of being in the fertile window (defined as 5 days prior to conception) for any given cycle day (see Appendix G).

In the present study, both measures were used, with each participant's start day of their last indicated menstrual period used to calculate their current menstrual cycle day. Both measures were analyzed separately as potential moderators to the relationship between life history strategy and both intrasexual competitiveness and intersexual selectivity.

Procedures

All of the study protocols were vetted and approved by the Harvard Committee on the Use of Human Subjects, which serves as Harvard University's Internal Review Board.

Data Collection

All participants were recruited from the MTurk Internet platform. MTurk is an online labor crowdsourcing tool that has become popular with social scientists in recent years. Research has shown that people who complete surveys through MTurk tend to be fairly representative of the U.S. population with regard to gender, race, education, and age, especially more so than college undergraduate samples (Paolacci, Chandler, & Ipeirotis, 2010). Additionally, there is no evidence that MTurk data is of poorer quality than data collected in a lab setting, undergraduate course, or other online platform (Gosling, Vazire, Srivastava, & John, 2004). Moreover, as a crowdsourcing site, MTurk has the advantage of being able to collect vast amounts of data in a very short time frame. The current study took approximately 8 hours to gather the total sample of 300 participants.

The study took place online using the Qualtrics software program. MTurk workers were shown a short description of the study and the eligibility criteria. Interested participants were then provided with an online link to the Qualtrics survey through MTurk. They were first shown a consent page describing the structure of the study, its general purpose, approximate time needed for completion, detailed confidentiality measures, and any foreseeable risks, without disclosing specific hypotheses. They were

instructed to answer the questions as honestly as possible and informed that they were allowed to quit the study at any time or skip any questions that they were uncomfortable answering.

After indicating their consent, participants were first asked to complete a demographics questionnaire that also included several questions related to life history (see Appendix A). They were then presented with the survey measures (see Appendices B – E) in a random order. All of the questions that participants received were tailored to their indicated gender and sexual orientation. For example, only those who identified as female were given questions about menstrual cycles.

At the end of the survey, participants were shown a debriefing form explaining the hypotheses and full purpose of the study. After completion of the study, participant data was deidentified, MTurk IDs were deleted, and all data was stored on a secure, password-protected computer.

The survey took about 15 minutes for each participant to complete ($M = 15.16$, $SD = 11.67$). Each received \$2.00 USD in compensation for completing the survey. Most participants answered every question in the survey and there were no major issues with data collection. Participants were given the option to provide written feedback at several points during the study. Feedback was generally very positive, with many stating that they found the study and hypotheses interesting, that the questions were easy to understand, that the layout was well-designed, and that there were no technical issues with the Qualtrics program.

Data Cleaning

A total of 5 out of the 305 participants were excluded from the final sample. Three were excluded for not completing the survey: two appeared to close the survey after answering only a few demographic questions, and one appeared to have clicked through the entire survey without answering any questions. One indicated their age as under 18, which caused the survey to end automatically after the third question. One identified themselves as transgender, so according to the predetermined inclusion criteria, their data were not analyzed with the rest of the sample.

Participants were given free-response prompts at the end of several sections of the survey that allowed them to add any feedback or additional information related to the questions in the preceding section (e.g., “If you would like, please tell us any other relevant information about your environment, parents, or guardians during your childhood”). Several participants indicated errors or typos they had made on previous questions, so these responses were changed to reflect the free-response comments. For example, one participant wrote that they had accidentally entered 100 for their number of sexual partners, when the correct answer was 10, so the response in the data was changed to 10.

Fertility Data. Several exclusion criteria were used to create the final sample of women for testing the fertility hypotheses. Women were only included if they indicated that they currently had a menstrual period, were not pregnant or breastfeeding, indicated that they did not use any form of hormonal contraceptives, had no history of hormonal or other disorders that affect their menstrual cycles, and indicated that their cycles occur regularly (last the same length ± 2 days each cycle).

Additionally, women were asked to report the start dates of their last three menstrual periods, and any participants who reported dates that were inconsistent with having a relatively regular menstrual cycle, or a date of their most recent menstrual period that seemed inaccurate, were also excluded. For example, one participant reported her most recent cycle as starting on a day in the future from the day the study was conducted, and one reported a day that was two days before the start of the previous menstrual cycle she reported. These exclusions led to a final sample size of 55 participants.

Chapter III

Results

All statistical analysis procedures were conducted in SPSS v. 24, with all primary analyses and reliability analyses being completed first, followed by the secondary analyses and any exploratory analyses.

Total Sample Features

The sample showed several notable overall features, see Table 1 for demographic characteristics of the sample, Table 2 for the full list of mean scores on the primary measures, and Table 3 for mean scores on the secondary measures.

The final sample consisted of 137 (45.67%) females, 266 (88.67%) heterosexuals, and the mean age was 34.47, with a range from 19 to 73. The majority of participants identified as white (76.62%), had at least some college education (84.33%), identified as at least slightly liberal (55.33%), and rarely attended religious services (69.33%).

Table 1

Demographic Characteristics of the Sample (Percentage of the Total Sample in Parentheses)

Characteristic	Male	Female	Total
Mean Age (SD)	34.21 (10.84)	34.77 (11.15)	34.47 (10.98)
Sex	163 (54.33%)	137 (45.67%)	300 (100%)
Sexual Orientation			
Heterosexual	152 (50.67%)	114 (38.00%)	266 (88.67%)

Homosexual	8 (2.67%)	12 (4.00%)	20 (6.67%)
Bisexual	3 (1.00%)	9 (3.00%)	12 (4.00%)
Other	0 (0.00%)	2 (0.67%)	2 (0.67%)
Education Level			
High School Graduate or Some College	29 (9.67%)	18 (6.00%)	47 (15.67%)
Two-Year Degree	42 (14.00%)	42 (14.00%)	84 (28.00%)
Four-Year Degree	17 (5.67%)	23 (7.67%)	40 (13.33%)
Above a 4-Year Degree	60 (20.00%)	47 (15.67%)	107 (35.67%)
	15 (5.00%)	7 (2.33%)	18 (7.33%)
Race (able to select multiple)			
White	134 (41.23%)	115 (35.38%)	249 (76.62%)
Black or African American	12 (3.69%)	15 (4.62%)	27 (8.31%)
Native American	2 (0.62%)	4 (1.23%)	6 (1.85%)
Asian	11 (3.38%)	9 (2.77%)	20 (6.15%)
Hispanic or Latino	11 (3.38%)	10 (3.25%)	21 (6.46%)
Other	2 (0.62%)	0 (0.00%)	2 (0.62%)
Religious Affiliation			
Christianity	45 (15.00%)	48 (16.00%)	93 (31.00%)
Catholicism	18 (6.00%)	11 (3.67%)	29 (9.67%)
Judaism	2 (0.67%)	1 (0.33%)	3 (1.00%)
Islam	0 (0.00%)	1 (0.33%)	1 (0.33%)
Buddhism	1 (0.33%)	4 (1.33%)	5 (1.67%)
Atheism	74 (24.67%)	44 (14.67%)	118 (39.33%)
Agnosticism	10 (3.33%)	9 (3.00%)	19 (6.33%)
Spiritual but not religious	3 (1.00%)	8 (2.67%)	11 (3.67%)
None	6 (2.00%)	8 (2.67%)	14 (4.67%)
Other	4 (1.33%)	3 (1.00%)	7 (2.33%)
Religious Service Attendance			
Two or more times per week	7 (2.33%)	4 (1.33%)	11 (3.67%)
Once per week	9 (3.00%)	20 (6.67%)	29 (9.67%)
Once per month	7 (2.33%)	8 (2.67%)	15 (5.00%)
Several times per year	14 (4.67%)	11 (3.67%)	25 (8.33%)
Once per year	13 (4.33%)	7 (2.33%)	20 (6.67%)
Rarely or never	113 (37.67%)	87 (29.00%)	200 (66.67%)
Political Party Affiliation			
Democratic	60 (20.00%)	60 (20.00%)	120 (40.00%)
Republican	28 (9.33%)	25 (8.33%)	53 (17.67%)
Independent	59 (19.67%)	38 (12.67%)	97 (32.33%)
Other	4 (1.33%)	5 (1.67%)	9 (3.00%)
None	12 (4.00%)	9 (3.00%)	21 (7.00%)
Political Orientation			
Very Liberal	30 (10.00%)	29 (9.67%)	59 (19.67%)
Somewhat Liberal	40 (13.33%)	31 (10.33%)	71 (23.67%)
Slightly Liberal	19 (6.33%)	17 (5.67%)	36 (12.00%)
Neutral	33 (11.00%)	27 (9.00%)	60 (20.00%)

Slightly Conservative	12 (4.00%)	14 (4.67%)	26 (8.67%)
Somewhat Conservative	17 (5.67%)	14 (4.67%)	31 (10.33%)
Very Conservative	12 (4.00%)	5 (1.67%)	17 (5.67%)

The sample had a slightly slower than average life history strategy as measured by the Mini-K ($M = .91$), with men having a slightly faster strategy ($M = .84$) than women ($M = .99$). The sample was slightly less intrasexually competitive than average as measured by the ICS ($M = -1.06$), with men slightly more competitive ($M = -.83$) than women ($M = -1.32$). The sample had a mean overall choosiness score of 4.88 out of 10, with men slightly less choosy ($M = 4.65$) than women ($M = 5.15$).

Table 2

Mean Scores on Primary Measures (Standard Deviations in Parentheses)

Measure	Scale	Male	Female	Total
Mini-K	-3 - +3	.84 (.81)	.99 (.81)	.91 (.81)
ICS	-3 - +3	-.83 (1.06)	-1.32 (1.20)	-1.06 (1.15)
MICH Combined	0 - 10	4.65 (1.32)	5.15 (1.58)	4.88 (1.47)
MICH Long-Term Partner	0 - 10	5.36 (1.37)	5.56 (1.53)	5.45 (1.45)
MICH Short-Term Partner	0 - 10	3.94 (1.58)	4.73 (1.79)	4.30 (1.73)

The sample also showed slightly lower than average perceived childhood SES ($M = -.24$) and perceived current SES ($M = -.11$). Both men and women rated their strength and attractiveness as slightly higher than 50% of others of their same sex ($M_{\text{strength}} = 56.62$, $M_{\text{attractiveness}} = 57.70$). However, men rated themselves as stronger and more attractive than nearly 60% of other men ($M_{\text{strength}} = 59.72$, $M_{\text{attractiveness}} = 60.58$), while women rated themselves closer to 50% of other women ($M_{\text{strength}} = 52.94$, $M_{\text{attractiveness}} =$

54.47). Participants reported high levels of perceived safety in their childhood homes ($M = 2.05$) and neighborhoods ($M = 2.10$). Participants reported a strong presence of their biological mother ($M = 6.47$) in their childhood homes, and slightly less for their biological father ($M = 5.45$). Men reported having their first child slightly later in life than women ($M_{\text{men}} = 27.52$, $M_{\text{women}} = 24.23$). Men reported having more sexual partners in their lifetimes than women ($M_{\text{men}} = 14.55$, $M_{\text{women}} = 7.97$). However, there were 3 outliers in this variable for men: 150, 150, and 300 reported sexual partners. The mean number for men with these outliers removed is 11.08. All further analyses regarding number of sexual partners will be using this adjusted variable with the outliers removed, though including them did not significantly change the result of any analysis.

Table 3

Mean Scores on Secondary Measures (Standard Deviations in Parentheses)

Measure	Scale	Male	Female	Total
Perceived Childhood SES	-3 - +3	-.31 (1.50)	-.15 (1.52)	-.24 (1.51)
Perceived Current SES	-3 - +3	-.05 (1.57)	-.18 (1.75)	-.11 (1.66)
Relative Formidability	0 - 100	59.72 (19.69)	52.94 (20.98)	56.62 (20.57)
Relative Attractiveness	0 - 100	60.58 (20.21)	54.27 (23.49)	57.70 (21.99)
Safe Childhood Home	-3 - +3	2.23 (1.42)	1.84 (1.75)	2.05 (1.59)
Safe Child Neighborhood	-3 - +3	2.09 (1.27)	2.12 (1.26)	2.10 (1.27)
Age First Sexual Intercourse	Age	17.56 (2.78)	17.83 (3.89)	17.69 (3.34)
Number of Sexual Partners	Num.	14.55 (30.21)	7.97 (10.01)	11.55 (23.50)
Num. of Sexual Partners Adj.	Num.	11.08 (13.42)	7.97 (10.01)	9.64 (12.06)
Age at Birth of First Child	Age	27.52 (6.04)	24.23 (4.87)	25.76 (5.69)
Number of Children	Num.	.57 (.99)	1.04 (1.40)	.78 (1.22)
Time Mother in Child Home	1 - 7	6.55 (1.24)	6.38 (1.56)	6.47 (1.40)
Time Father in Child Home	1 - 7	5.68 (2.16)	5.17 (2.45)	5.45 (2.31)
Unrelated Female Child	1 - 7	1.33 (1.09)	1.72 (1.71)	1.51 (1.42)
Unrelated Male Child Home	1 - 7	1.53 (1.44)	1.80 (1.78)	1.65 (1.61)

Reliability Analyses

The three primary scale measures were first tested for their internal reliability, as measured by Chronbach's Alpha. See Table 4 for the full results of these analyses, as well as reported Chronbach's Alpha scores from previous studies for each scale. In general, all three measures showed very high internal reliability – between .843 and .921 – and all were consistent with or better than reliability scores from previous studies. Therefore, there was no cause for concern about the internal reliability of these primary scale measurements.

Table 4

Results of Internal Reliability Analyses

Measure	Items	Scale	Current Alpha	Previous Alpha
Mini-K	20	-3 - +3	.843	.73
ICS	12	-3 - +3	.916	.88
MICH Total	24	0 - 10	.917	.94
MICH Long-Term	24	0 - 10	.901	n/a
MICH Short-Term	24	0 - 10	.921	n/a

Primary Analyses

The primary analyses consisted of the Pearson correlations between the Mini-K and ICS, as well as the Mini-K and the MICH for a short-term partner, a long-term partner, and aggregated across both of these levels of involvement. See Table 5 for the results of the primary analyses. Primary analyses included these results separated by sex as well as aggregated across both males and females. However, the test for whether or not

the interaction of sex with the Mini-K was significant for either the ICS or MICH is reported in the section on demographic moderators below.

Table 5

Results of Primary Analyses

Relationship	Variable 1	Variable 2	<i>n</i>	<i>r</i>	<i>p</i>
Life History Strategy and Intrasexual Competitiveness					
Total	Mini-K	ICS	300	-.177**	.002
Male	Mini-K	ICS	163	-.196*	.012
Female	Mini-K	ICS	137	-.127	.138
Life History Strategy and Intersexual Choosiness					
Total	Mini-K	MICH Total	300	.328***	<.001
Male	Mini-K	MICH Total	163	.275***	<.001
Female	Mini-K	MICH Total	137	.364***	<.001
Life History Strategy and Short-Term Intersexual Choosiness					
Total	Mini-K	MICH ST	300	.237***	<.001
Male	Mini-K	MICH ST	163	.147	.062
Female	Mini-K	MICH ST	137	.307***	<.001
Life History Strategy and Long-Term Intersexual Choosiness					
Total	Mini-K	MICH LT	300	.380***	<.001
Male	Mini-K	MICH LT	163	.363***	<.001
Female	Mini-K	MICH LT	137	.392***	<.001

Note. * $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$

Life History Strategy and Intrasexual Competitiveness

As predicted, there was a significant negative correlation between life history strategy and intrasexual competitiveness ($r = -.177, p = .002$), indicating that those with faster strategies had higher levels of competitiveness (see Figure 1). However, when analyzed separately, the correlation was only significant for men ($r = -.196, p = .012$), and not for women ($r = -.127, p = .138$).

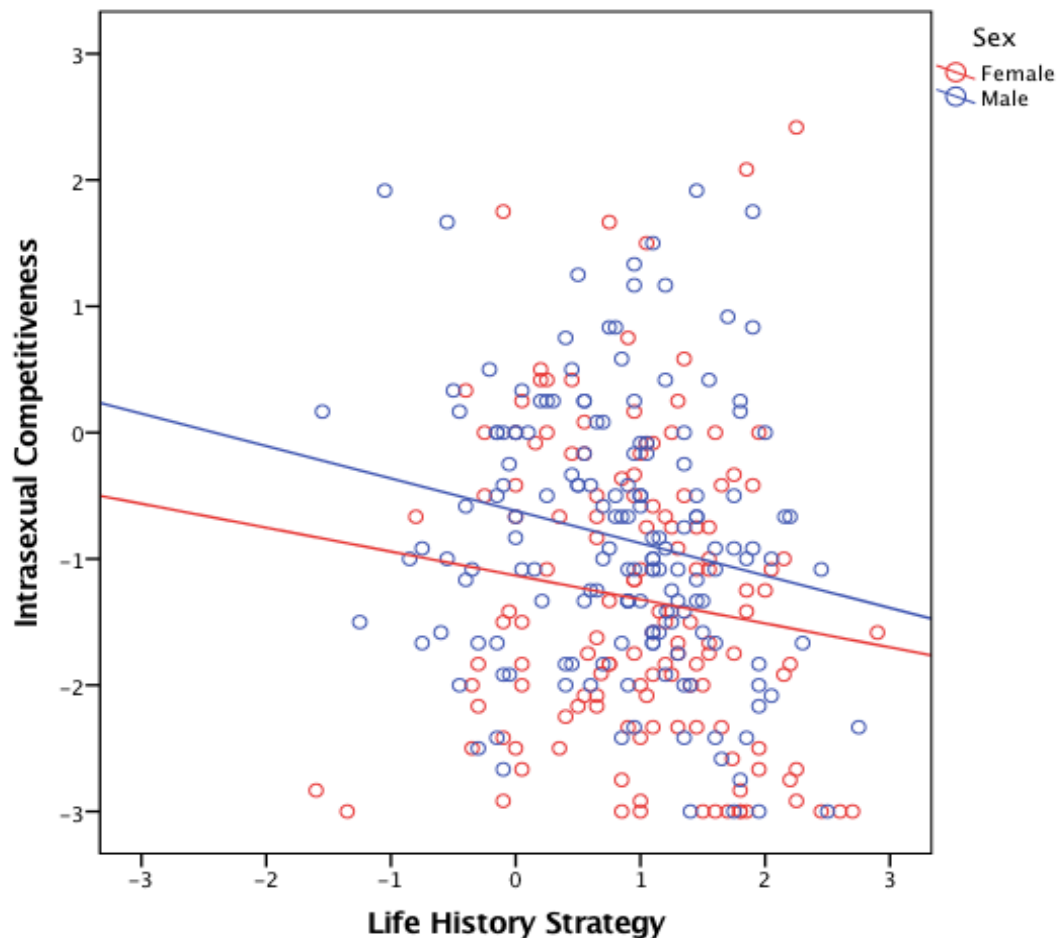


Figure 1. Scatterplot of the relationship between life history strategy and intrasexual competitiveness. Mini-K mean scores appear on the X-axis and ICS mean scores on the Y-axis. Lines of best fit appear for both male and female scores.

Life History Strategy and Overall Intersexual Choosiness

As predicted, there was a significant positive correlation between life history strategy and overall intersexual choosiness aggregated across both long-term and short-term relationships ($r = .328, p < .001$), indicating that individuals with faster life history strategies were less choosy overall (see Figure 2). This relationship was significant for both men ($r = .275, p < .001$) and women ($r = .364, p < .001$) when analyzed separately.

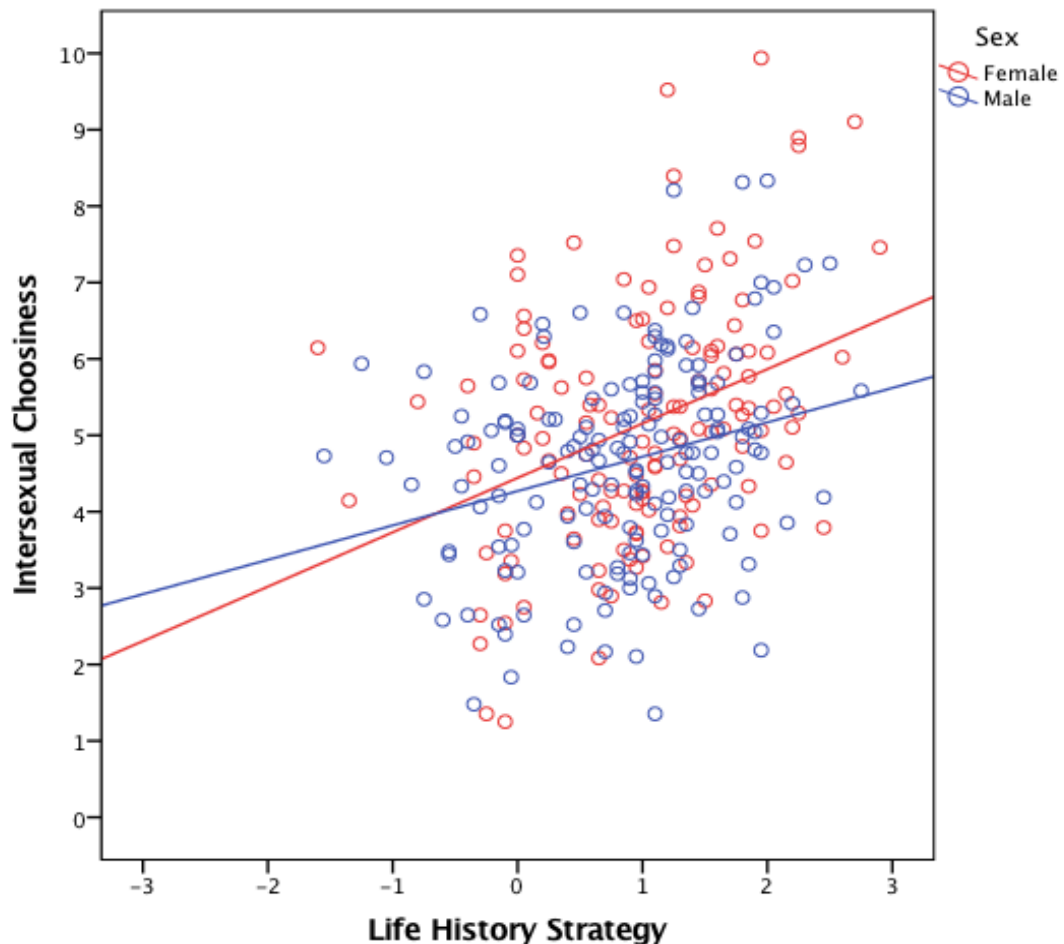


Figure 2. Scatterplot of the relationship between life history strategy and overall intersexual choosiness. Mini-K mean scores appear on the X-axis, and MICH mean scores aggregated across both levels of involvement appear on the Y-axis. Lines of best fit appear for both male and female scores.

Life History Strategy and Choosiness for a Long-Term Partner

As predicted, there was a significant positive relationship between life history strategy and choosiness for a long-term partner ($r = .380, p < .001$), indicating that individuals with a slower life history strategy were more selective than individuals with faster strategies. The results were significant for both men ($r = .363, p < .001$) and women ($r = .392, p < .001$) when analyzed separately.

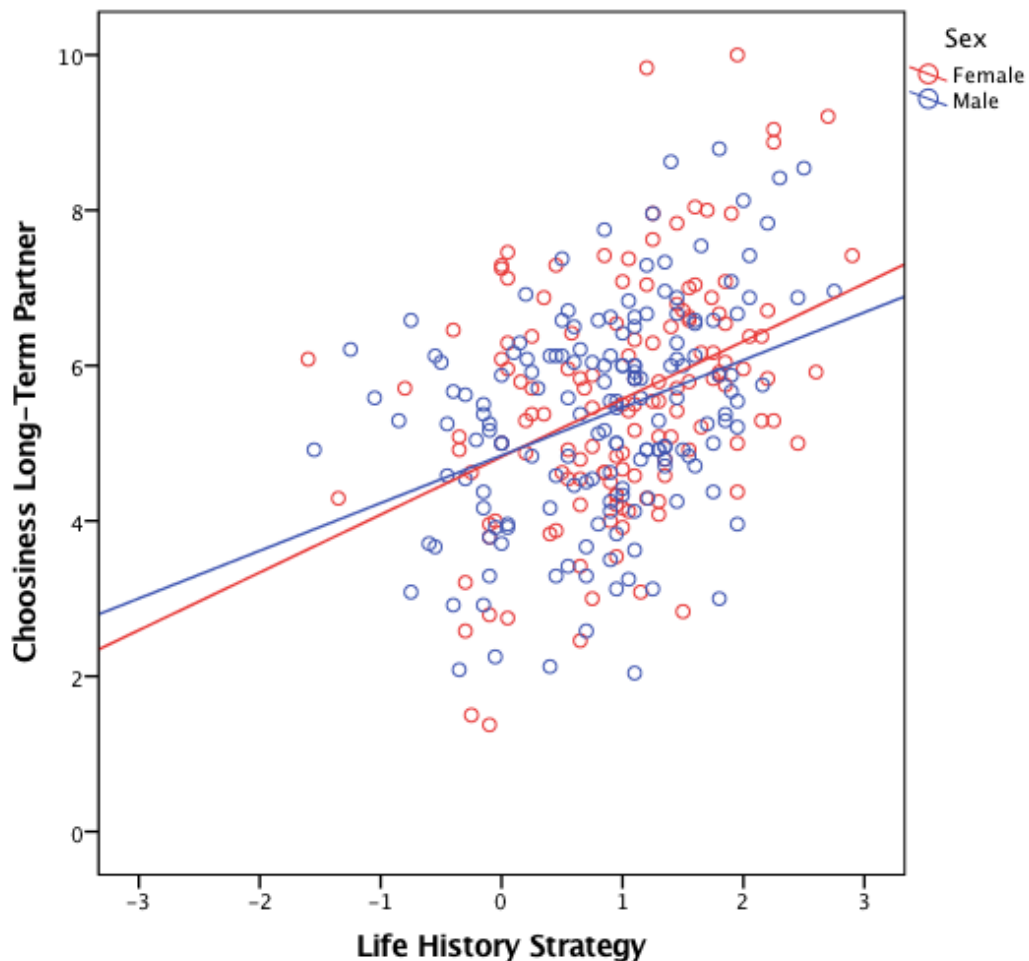


Figure 3. Scatterplot of the relationship between life history strategy and intersexual choosiness for a long-term partner. Mini-K mean scores appear on the X-axis and MICH mean scores for a long-term partner appear on the Y-axis. Lines of best fit appear for both male and female scores.

Life History Strategy and Choosiness for a Short-Term Partner

As predicted, there was a significant positive relationship between life history strategy and intersexual choosiness for a short-term partner ($r = .237, p < .001$), indicating that individuals with slower strategies were more selective than those with faster strategies. However, although this relationship was highly significant for women ($r = .307, p < .001$), it failed to reach statistical significance when analyzed for men separately ($r = .147, p = .062$).

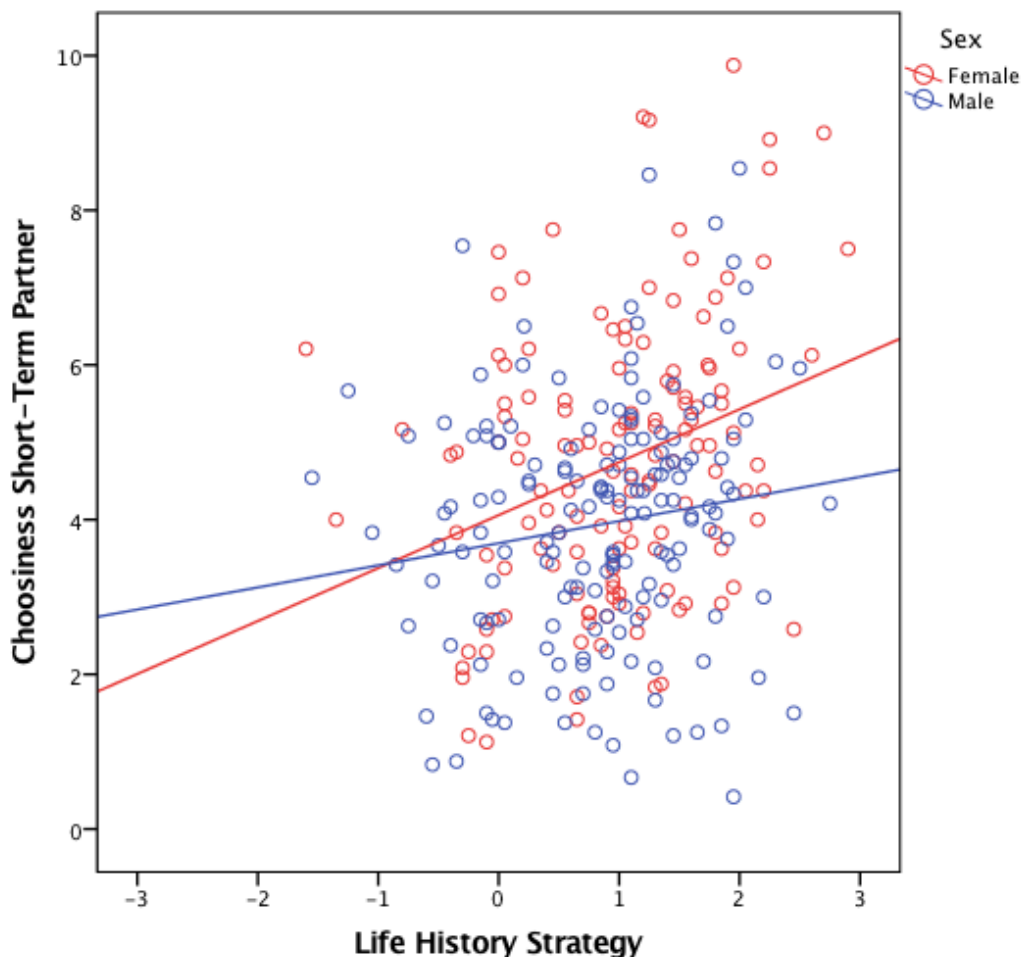


Figure 4. Scatterplot of the relationship between life history strategy and intersexual choosiness for a short-term partner. Mini-K mean scores appear on the X-axis and MICH mean scores for a short-term partner appear on the Y-axis. Lines of best fit appear for both male and female scores.

Fertility

Continuous conception risk based on current cycle day (see Appendix F), and the probability of being in the fertile window (5 days prior to ovulation) based on current cycle day (see Appendix G), were used as measures of current fertility. Neither of the two measures of fertility showed any significant moderation effect on the relationship between life history strategy and either intrasexual competitiveness or intersexual choosiness (see Table 6). All simple correlations between conception risk and both intrasexual competitiveness and intersexual choosiness failed to gain statistical significance, suggesting no linear relationship between the variables. The interaction of the fertility measures with the Mini-K on both the ICS and MICH was also tested in a multiple regression analysis and was not found to be statistically significant.

Table 6

Results of Fertility Analyses

Variable 1	Variable 2	<i>n</i>	Correlation		Interaction	
			<i>r</i>	<i>p</i>	<i>t</i>	<i>p</i>
Fertile Window Probability	ICS	55	.004	.489	.728	.470
Conception Risk	ICS	55	-.060	.331	.325	.746
Fertile Window Probability	MICH Total	55	-.056	.344	-.946	.349
Conception Risk	MICH Total	55	-.146	.144	-.636	.527

Secondary Analyses

Pearson correlation analyses were conducted to assess the effects of the biodemographic measures of life history strategy on intrasexual competitiveness and intersexual selectivity, which were predicted to show similar patterns of results as the

Mini-K measure of psychometric life history strategy. Multiple regression models were run to test for potential moderation effects of several demographic variables. The only significant demographic moderator was predicted to be sex.

Life History Measures

Although the Mini-K served as the primary psychometric measure of life history strategy, several biodemographic variables are often associated with life history strategy as well. These variables were correlated with both the ICS and combined MICH, to assess the effects of each variable independently on intrasexual competitiveness and intersexual choosiness (see Table 7).

Only one variable was significantly positively correlated with the ICS for all participants: perceived childhood SES ($r = .140, p = .015$), suggesting that, contrary to predictions, those from wealthier childhood homes tend to be more intrasexually competitive. However, it failed to reach statistical significance when analyzed for males and females separately.

Safety in one's childhood neighborhood ($r = -.158, p = .044$), as well as the presence of one's biological father in one's childhood home ($r = .154, p = .050$) were also significantly correlated with the ICS for men only, suggesting that, as predicted, men from more dangerous childhood neighborhoods, and, contrary to predictions, those with their fathers present more often during childhood, tend to be more intrasexually competitive.

The presence of one's father was also significantly correlated with the ICS for women only, but in the opposite direction ($r = -.220, p = .010$), suggesting that, as

predicted, women who come from homes with a more absent father tend to be more intrasexually competitive.

Perceived current SES ($r = .196, p = .001$) and number of biological children ($r = .259, p < .001$) were significantly positively correlated with the combined MICH, suggesting that, as predicted, those who are currently more financially stable tend to be more selective; but contrary to predictions, those with more children are also more selective.

Several variables were also significantly correlated with MICH for women only: number of sexual partners ($r = -.188, p = .028$), safety in one's childhood home ($r = .194, p = .023$), and number of pregnancies ($r = .242, p = .004$). As predicted, those with fewer sexual partners and safer childhood homes tend to be more selective; but contrary to predictions, those with more pregnancies are also more selective.

Table 7

Results of Biodemographic Life History Measures Analyses

Variable	<i>n</i>	ICS		MICH	
		<i>r</i>	<i>p</i>	<i>r</i>	<i>p</i>
Perceived Child SES					
Total	300	.140*	.015 ^a	.046	.428
Male	163	.146	.063	.022	.781
Female	137	.164	.055	.053	.537
Perceived Current SES					
Total	300	.005	.932	.196***	<.001 ^b
Male	163	-.077	.329	.156*	.047 ^b
Female	137	.067	.438	.250**	.003 ^b
Number of Sexual Partners					
Total	297	.050	.392	-.103	.075
Male	160	-.024	.765	-.006	.935
Female	137	.091	.289	-.188*	.028 ^b
Number of Children					

Total	300	-.013	.822	.259***	<.001 ^a
Male	163	.010	.898	.177*	.024 ^a
Female	137	.042	.629	.275***	<.001 ^a
Age at First Sexual Intercourse					
Total	286	-.055	.356	.040	.500
Male	156	.093	.249	-.033	.685
Female	130	-.149	.091	.082	.356
Age at Birth of First Child					
Total	112	.023	.812	-.055	.563
Male	52	-.181	.200	.003	.985
Female	60	.084	.521	.047	.721
Safety Childhood Home					
Total	300	-.068	.243	.063	.278
Male	163	-.124	.115	-.050	.526
Female	137	-.072	.403	.194*	.023 ^b
Safety Childhood					
Total	300	-.113	.051	-.003	.965
Male	163	-.158*	.044 ^b	-.096	.224
Female	137	-.065	.452	.087	.314
Time Mother in Child Home					
Total	300	-.106	.068	.035	.550
Male	163	-.081	.302	-.002	.978
Female	137	-.155	.070	.084	.331
Time Father in Child Home					
Total	300	-.016	.780	-.096	.097
Male	163	.154*	.050 ^a	-.087	.270
Female	137	-.220**	.010 ^b	-.072	.406
Unrelated Female Child Home					
Total	300	.068	.244	-.036	.536
Male	163	.034	.664	-.014	.859
Female	137	.144	.093	-.090	.294
Unrelated Male Child Home					
Total	300	-.023	.694	-.031	.598
Male	163	-.045	.572	-.053	.503
Female	137	.028	.742	-.040	.640
Number of Pregnancies					
Female	137	.093	.281	.242**	.004 ^a
Age at Menarche					
Female	132	.112	.201	.157	.072

Note. * $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$

^a Significant result contrary to the predicted direction. ^b Significant result in the predicted direction

Clearly, these results are far from clear or conclusive, raising more questions than they provide answers. The discussion section (see Chapter IV) attempts to make some sense of these very mixed data, with an examination of the data that support the opposite conclusions of the tested predictions, as well as the implications of having such uncertain results.

Demographic Moderators

Several variables were tested in multiple regression models as potential moderators to the effect of life history strategy, as measured by the Mini-K, on both intrasexual competitiveness, as measured by the ICS, and intersexual choosiness, as measured by the MICH (see Table 8). The demographic variables and the Mini-K values were not centered when evaluating the interactions, because the Mini-K values are on a 7-point scale from -3 to +3, so zero is already a meaningful term.

The demographic variables were defined in the following ways for all analyses: sex was defined as a binary category of male vs. female; age was defined as a scale of age in years; sexual orientation was defined as a binary category of primarily straight or primarily bisexual vs. primarily homosexual or other; race was defined as a binary category of white or Caucasian only vs. any other racial identity, religiosity was defined as a 6-point scale from rarely or never attending religious services to attending religious services two or more times per week; political orientation was defined as a 7-point scale from very liberal to very conservative; education level was defined as a 7-point scale from high school diploma or GED to a doctoral degree; relationship status was defined as a binary category of in a relationship vs. not in a relationship; among those in a

relationship, relationship satisfaction was defined on a 7-point scale from very unsatisfied to very satisfied; birth order was defined as a scale of birth order among full and half biological siblings; relative formidability was defined as a scale of self-rated formidability from 0 – 100 compared to one’s peers (e.g., “I am stronger than ___% of others of my sex); relative attractiveness was defined as a scale of self-rated attractiveness from 0 – 100 compared to one’s peers (e.g., “I am more attractive than ___% of others of my sex).

The only demographic trait that was predicted to have a significant moderating effect on the relationship between life history strategy and both intrasexual competitiveness and intersexual choosiness was sex, as men were predicted to be significantly more competitive and women more choosy. However, none of the demographic variables, including sex, produced any significant moderation effects to either intersexual or intrasexual selection.

Although not presented with the results in Table 8 below, sex was analyzed with the non-aggregated versions of the MICH, to analyze it separately in regards to choosiness for a short-term partner and long-term partner. While the results for the effect of life history strategy on choosiness did not vary considerably between men and women for a long-term partner (see Figure 3), they did vary for a short-term partner (see Figure 4 and see Table 5 for full statistical results). However, in this moderation analysis, sex did not moderate the effect of life history strategy on choosiness for a long-term partner ($t = .673, p = .502$) nor choosiness for a short-term partner ($t = 1.689, p = .092$).

Table 8 presents the t-value and associated p-value for the interaction term of the demographic variable and the Mini-K on both the ICS and MICH.

Table 8

Results of Demographic Moderators Analyses

Variable	<i>n</i>	ICS		MICH	
		<i>t</i>	<i>p</i>	<i>t</i>	<i>p</i>
Sex	300	.417	.667	1.329	.185
Age	300	1.204	.229	.856	.393
Sexual Orientation	300	.149	.882	.274	.784
Race	300	.460	.646	-.134	.181
Religiosity	300	.457	.648	.468	.640
Political Orientation	300	.592	.554	-.875	.382
Education Level	300	1.812	.071	-.871	.385
Relationship Status	300	.066	.947	-.303	.762
Relationship Satisfaction	204	-.543	.587	.699	.485
Birth Order	300	-1.52	.130	-.194	.846
Relative Formidability	300	.278	.781	-.322	.748
Relative Attractiveness	300	.964	.336	.970	.333

Chapter IV

Discussion

This study provides support for the novel evolutionary hypothesis that life history strategy influences sexually selected traits and behaviors. The primary hypotheses of the study, that individuals with slower life history strategies would exhibit lower levels of intrasexual competitiveness and higher levels of intersexual choosiness, and that individuals with faster life history strategies would show the opposite pattern, were supported by the data.

Intrasexual Competitiveness

As predicted, individuals with faster life history strategies were shown to be more competitive with members of their same sex in contexts relevant to mating. Throughout human evolution, it likely would have been advantageous for humans developing in less stable and more dangerous environments to be more intrasexually competitive, potentially giving them access to the most possible mating opportunities. On the other hand, for people developing in more stable and plentiful environments, it would have likely been advantageous to be less competitive, preserving the essential cooperative partnerships required to develop successful long-term relationships and a functional society.

However, while this relationship was highly significant for men, it failed to reach statistical significance in women. While it has been demonstrated that men are typically

more intrasexually competitive than women, due to differing parental investment demands (Geary, 2002), women also benefit from being intrasexually competitive (Buss, 1988; Buss, 2006; Rosvall, 2011). Why, then, would intrasexual competitiveness not vary according to life history strategy for women?

There could be several relevant explanations. Because the correlation was nearly significant at the .10 level, this trend may merely indicate an underpowered sample of women in the study. This is supported by the fact that the interaction of sex and life history strategy was not statistically significant. However, this non-significance may have a more practical explanation.

The Intrasexual Competitiveness Scale (ICS), which was used in this study, is designed to test intrasexual competitiveness equally in men and women (Buunk & Fisher, 2009). However, there is evidence that men and women have very different motivations and strategies when engaging in competition for mates (Buss, 1988).

Intrasexual competitiveness can theoretically lead to more mating opportunities, which is adaptive for men as they can potentially pass on more genes to future offspring. However, women do not necessarily benefit from *more* mating opportunities, as they can only produce limited offspring and must invest heavily in them. Women benefit, rather, from access to *better* mates – either of higher genetic quality, or with more resources to invest in offspring. Men can also benefit from competitions that lead to higher-quality mates, but the intricacies of these different competitive motivations are not captured by the ICS. Thus, the relationship between life history strategy and intrasexual competitiveness may not be accurately measured by this single competitiveness scale.

Intersexual Choosiness

As predicted, individuals with faster life history strategies were shown to be less selective in their preferences for a romantic partner. Evolutionarily, it would have likely been adaptive for people who developed in less stable environments to be less selective about mates, leading to more mating opportunities; while those who developed in more stable environments should have been highly selective, to provide the best genetic and parenting quality to future offspring. This correlation was highly significant for both long-term and short-term mates, as well as for both men and women, with the sole exception of short-term mating preferences in men, which was nearly significant at the .05 level.

Again, this trend may simply indicate an underpowered sample, especially because it was significant at the .10 level, but because the correlation coefficient was quite dramatically different from all of the other values – for both men and women at all levels of involvement – this statistic does warrant some further consideration.

Men selecting a short-term partner produced the lowest mean scores of choosiness than any other choosiness category, indicating that men with both slow and fast life history strategies tend to be relatively unselective when choosing a short-term sexual partner.

Having a short-term sexual partner is very low-risk for men, and offers the potential for high-reward: passing on one's genes with no necessary parental investment. Thus, it is possible that the advantages of having a short-term sexual partner may outweigh any effects of life history strategy: it may simply be adaptive for all men, with

fast or slow strategies, to be less selective about short-term partners, giving them access to the most short-term mating opportunities possible.

Life History Variables

Although the Mini-K was used as the primary psychometric measure of life history strategy (results of which are discussed above), data on several other biodemographic life history variables were gathered as secondary measures. The correlation of these variables to the measures for competitiveness and choosiness were not nearly as clear as the results using the Mini-K however. Out of 12 variables for all participants, only 3 showed a significant correlation with either the MICH or the ICS, 4 showed a significant correlation for men separately, and 6 showed a significant correlation for women separately. However, several of these significant correlations were not even in the predicted direction – these will be further examined below.

First, I will present some thoughts on the lack of significant correlations between many of the life history variables and the competitiveness and choosiness measures. It is possible that because these biodemographic variables mostly failed to support the predictions of the study, that this may indicate the lack of a true relationship between life history strategy and either intrasexual competitiveness or choosiness.

Life history strategy is notoriously difficult to measure, as it is extremely variable from person to person and does not manifest as a distinct point on the fast-slow continuum for each individual, as it can change across time and circumstances (Del Giudice, 2014). Thus, these data may simply indicate that biodemographic measures, especially these particular ones, may not be as relevant to sexually selected traits and

behaviors as the psychometric measures are. However, more research is warranted to tease apart these differences.

On the several biodemographic life history variables that showed correlations to either the ICS or MICH that were opposite the predicted direction, some of these may have more functional explanations that should be considered.

For competitiveness, two variables were significantly correlated with the ICS in the opposite of the predicted direction. Childhood SES was positively correlated, indicating those with higher perceived childhood SES were likely to be more competitive, however this correlation was relatively small ($r = .140, p = .015$) and failed to reach significance when analyzed for men and women separately, so it would take more replications to say anything conclusive about this point.

The amount of time one's biological father was present in one's childhood home was significantly positively correlated with the ICS for men only ($r = .154, p = .050$), indicating that men from households where their fathers were more present are likely to be more competitive. There is evidence that women from father-absent households tend to have faster life history strategies (Amir, Jordan & Bribiescas, 2016) – a point supported by the significant negative correlation between father presence and the ICS ($r = -.220, p = .010$) for women in this study – however, not as much is known about the effects of father presence on male life history strategies. It is possible that father presence may have the opposite effect on male life history strategy, or at least on male competitiveness.

For choosiness, two related variables showed the opposite correlation with the MICH than predicted: number of children for both men and women and number of

pregnancies for women. Higher numbers of pregnancies and subsequent offspring are associated with faster life history strategies for most species. However, this particular correlation may be measuring something different than the true correlation between life history strategy and choosiness. Although it may be adaptive for men and women with slower life history strategies to be more choosy about a mate to produce children with, it is likely even more adaptive for those who *already* have children to be highly selective about new potential mates. It is important for all parents to protect their offspring and be very choosy about the other individuals they allow to come into contact with them, to ensure that their offspring will have the greatest chance for survival and reproductive success.

Fertility

Contrary to the predictions, conception risk across the menstrual cycle was not shown to have any relationship to either intrasexual competitiveness or intersexual choosiness.

This null result could simply be due to the highly underpowered sample ($n = 55$). While some previous studies have used smaller samples to study menstrual cycle shifts in behavior (e.g., Wallen & Rupp, 2010, a sample of 15 normally-cycling women, and 15 hormonal contraceptive users as a control group) it is generally accepted that a sample of at least 500-1200 participants is needed to generate 70-80% power when using a between-subjects design that only uses previous menstrual cycle dates to estimate conception risk (Gangestad, et al., 2016). This is over 10-20 times the size of the current sample. Thus, this null result may not necessarily indicate that conception risk has no

effect on intrasexual competitiveness or intersexual choosiness. It may simply mean that more subjects, or a more powerful study design, are needed to capture the effect.

Demographic Moderators

A total of 12 variables were analyzed as potential moderators to the relationship between life history strategy and both intersexual choosiness and intrasexual competitiveness. The only variable that was predicted to moderate the strength of these relationships was sex, as men were predicted to have higher levels of competitiveness and lower levels of choosiness, compared to women.

Consistent with predictions, the other 11 variables did not show any significant interaction effects, indicating that no other demographic variables affect the relationship between life history strategy and either measure of sexual selection.

However, contrary to predictions, sex also showed no significant interaction effects. Although the means of men's and women's scores on the MICH and ICS were slightly different in the predicted direction, this indicates that the difference was not statistically significant, so both men and women with faster life history strategies are more intrasexually competitive and less intersexually choosy, compared to those with slower strategies.

Although sex differences are important for understanding variations in the evolution of sexually selected traits, this shows that one's developmental environment and subsequent life history strategy are perhaps of even greater importance in understanding individual differences.

Limitations

Perhaps the greatest limitations of the study were that it was non-experimental and relied on only self-reports. However, because this is a largely unexplored area of research, the correlational data is still highly informative to understanding preliminary relationships between life history strategy and sexual selection. Still, future experimental measures would add a considerable degree of validity to these results. Additionally, no causal relationships can be identified by these data.

The accuracy of self-report data is often questioned, especially with regard to the social desirability effect: that people prefer to answer questions in a way that will paint them in a favorable light (Fisher R. J., 1993). The methodology of this study took several steps to prevent this bias. First, participants participated on their own computer, in the privacy of their own home, unlike many traditional psychology studies that take place in a classroom or lab setting surrounded by other participants. Second, participants were ensured that their information would be kept completely confidential. And third, all hypotheses were kept concealed until the end of the study.

Another limitation was in the accuracy of the fertility data. Gathering between-subjects menstrual cycle date information is a simple, non-invasive, and efficient way to measure fertility. However, it has been demonstrated that within-subjects hormonal validation of fertility (e.g. measurement of LH to confirm ovulation) is a far more accurate predictor of conception risk (Gangestad, et al., 2016). Unfortunately, the time and budget constraints of this project did not allow for this measurement of fertility. By keeping the hypotheses of the study concealed, no recruitment was done to explicitly target women who do not use hormonal contraceptives. This, and budget limitations that

restricted the overall sample size, led to an underpowered sample of naturally-cycling women to test the fertility hypotheses.

Future Directions

As with all studies, replication is necessarily called for. As this was one of the first studies to test these hypotheses, more data from either direct or theoretical replications will be very important for understanding the true relationships between life history strategy and sexually selected traits and behaviors.

It could be particularly interesting to replicate the effects while adding a measure to test for overall competitiveness. It is plausible that individuals with faster life history strategies are simply more competitive in all scenarios, not just in competition for mates. Likewise, as mentioned previously, there is evidence that competitiveness for mates occurs differently for men and women, so it would be interesting to add survey questions or other measures that could tease apart these differences in competitive strategies and motivations.

Similarly, individuals with slower life history strategies may be more selective in other scenarios as well, so adding measures to test for differences in mating selectivity compared to selectivity in other contexts could be informative as well.

Additional measures of life history strategy may be useful for understanding the non-significant and opposite patterns of results found in several of the biodemographic measures of life history strategy. Further research could tease apart which measures are most important for understanding differences in competitiveness and choosiness, or whether the results actually indicate that the relationships do not exist. Additionally,

future research could potentially utilize longitudinal methods, or existing longitudinal datasets, to get a more accurate and complete picture of individuals' developmental environments and subsequent life history strategies.

As mentioned in the limitations, any experimental measures that could be utilized to test these relationships will be highly important in future research. It would likely be difficult or impossible to develop experimental measures of life history strategy, as it depends largely on inherent genetic traits that were adjusted over time in each individual's unique developmental environment. However, one could possibly create experimental measures of intrasexual competitiveness or intersexual choosiness, or at least more implicit measures, instead of only self-report questions, that could help add validity to future results.

To further test whether or not fertility has any moderating effect on the relationship between life history strategy and either intrasexual or intersexual selection, more subjects or more accurate methods of fertility estimation must be used in future studies. It would be ideal to use LH tests to know with far more certainty when subjects are in the fertile window.

Many studies that use LH testing to research menstrual cycle shifts use within-subjects designs, with subjects completing the same tests once when in the fertile window, and once when not in the fertile window. However, with the current measures, even when utilizing counterbalancing, there may be concerns of sequence effects, where subjects will be aware of the measures during their second testing and may be biased. This may necessitate more implicit or experimental measures. However, the between-subjects design could still be utilized, and if LH testing was not practical, a larger online

sample, one that specifically targets eligible women, could be sufficient to gain enough power to draw more valid conclusions.

On a larger scale, this study is the first, to my knowledge, that attempts to explore any sources of individual differences in sexually selected behaviors and traits. There could be numerous sources of variation in these characteristics, so this could be the starting point for testing the relationship of many other variables to both intrasexual and intersexual selection. Some possible promising factors could be sociosexual orientation or personality trait differences.

References

- Abed, R., Mehta, S., Figueredo, A. J., Aldridge, S., Balson, H., Meyer, C., et al. (2012). Eating disorders and intrasexual competition: Testing an evolutionary hypothesis among young women. *The Scientific World Journal*.
- Amir, D., Jordan, M. R. & Bribiescas, R. B. (2016). A longitudinal assessment of associations between adolescent environment, adversity perception, and economic status on fertility and age of menarche. *PLOS One*, *11* (6), e0155883.
- Bateman, A. J. (1948). Intra-sexual selection in *Drosophila*. *Heredity*, *2* (3), 349-368.
- Brumbach, B. H., Figueredo, A. J. & Ellis, B. J. (2009). Effects of harsh and unpredictable environments in adolescence on development of life history strategies. *Human Nature*, *20* (1), 25-51.
- Buss, D. M. (1989). Sex differences in human mate preferences: Evolutionary hypotheses tested in 37 cultures. *Behavioral and Brain Sciences*, *12* (1), 1-14.
- Buss, D. M. (2006). Strategies of human mating. *Psychological Topics*, *15* (2), 239-260.
- Buss, D. M. (1994). *The evolution of desire: Strategies of human mating*. New York: Basic Books.
- Buss, D. M. (1988). The evolution of human intrasexual competition: Tactics of mate attraction. *Journal of Personality and Social Psychology*, *54* (4), 616.
- Buss, D. M. & Barnes, M. L. (1986). Preferences in human mate selection. *Journal of Personality and Social Psychology*, *50*, 559-570.
- Buss, D. M. & Dedden, L. A. (1990). Derogation of competitors. *Journal of Social and Personal Relationships*, *7* (3), 395-422.
- Buunk, A. & Fisher, M. (2009). Individual Differences in Intrasexual Competition. *Journal of Evolutionary Psychology*, *7*, 37-48.
- Chisholm, J. S. (1993). Death, hope, and sex: Life-history theory and the development of reproductive strategies. *Current Anthropology*, *34* (1), 1-24.
- Cobey, K. D., Klipping, C. & Buunk, A. P. (2013). Hormonal contraceptive use lowers female intrasexual competition in pair-bonded women. *Evolution and Human Behavior*, *34* (4), 294-298.
- Darwin, C. R. (1859). *On the origin of species*. London: John Murray.
- Darwin, C. R. (1871). *The descent of man and selection in relation to sex*. London: John Murray.

- Del Giudice, M. (2014). Life history plasticity in humans: the predictive value of early cues depends on the temporal structure of the environment. *Proceedings of the Royal Society of London B: Biological Sciences*, 281 (1780), 20132222.
- Del Giudice, M., Gangestad, S. W. & Kaplan, H. S. (2016). Life history theory and evolutionary psychology. In D. M. Buss (Ed.), *The Handbook of Evolutionary Psychology* (Vol. 1). Hoboken, NJ: John Wiley & Sons Inc.
- Durante, K. M., Griskevicius, V., Hill, S. E., Perilloux, C. & Li, N. P. (2011). Ovulation, female competition, and product choice: Hormonal influences on consumer behavior. *Journal of Consumer Research*, 37 (6), 921-934.
- Durante, K. M., Li, N. P. & Haselton, M. G. (2008). Changes in women's choice of dress across the ovulatory cycle: Naturalistic and laboratory task-based evidence. *Personality and Social Psychology Bulletin*, 34 (11), 1451-1460.
- Eisenbruch, A. B. & Roney, J. R. (2016). Conception risk and the ultimatum game: When fertility is high, women demand more. *Personality and Individual Differences*, 98, 272-274.
- Ellis, L. (1987). Criminal behavior and r/K selection: An extension of gene-based evolutionary theory. *Deviant Behavior*, 8 (2), 149-176.
- Ellison, P. T. (2003). *On fertile ground: A natural history of human reproduction*. Cambridge, MA: Harvard University Press.
- Figueredo, A. J., Vásquez, G., Brumbach, B. H. & Schneider, S. M. (2004). The heritability of life history strategy: The k-factor, covitality, and personality. *Social Biology*, 51 (3-4), 121-143.
- Figueredo, A. J., Vásquez, G., Brumbach, B. H. & Schneider, S. M. (2007). The K-factor, covitality, and personality: A psychometric test of life history theory. *Human Nature*, 18 (1), 47-73.
- Figueredo, A. J., Vásquez, G., Brumbach, B. H., Schneider, S. M., Sefcek, J. A., Tal, I. R., et al. (2006). Consilience and life history theory: From genes to brain to reproductive strategy. *Developmental Review*, 26, 243-275.
- Figueredo, A. J., Vásquez, G., Brumbach, B. H., Sefcek, J. A., Kirsner, B. R. & Jacobs, W. J. (2005). The K-factor: Individual differences in life history strategy. *Personality and Individual Differences*, 39 (8), 1349-1360.
- Figueredo, A. J., Wolf, P. S., Olderbak, S. G., Gladden, P. R., Fernandes, H. B., Wenner, C., et al. (2014). The psychometric assessment of human life history strategy: A meta-analytic construct validation. *Evolutionary Behavioral Sciences*, 8 (3), 148-185.
- Fisher, M. L. (2004). Female intrasexual competition decreases female facial attractiveness. *Proceedings of the Royal Society of London B: Biological Sciences*, 271 (Supplement 5), S283-S285.
- Fisher, R. J. (1993). Social desirability bias and the validity of indirect questioning. *Journal of Consumer Research*, 20 (2), 303-315.

- Gadgil, M. & Bossert, W. H. (1970). Life historical consequences of natural selection. *American Naturalist*, *104*, 1-24.
- Gangestad, S. W. & Thornhill, R. (2008). Human oestrus. *Proceedings of the Royal Society of London B: Biological Sciences*, *275* (1638), 927-933.
- Gangestad, S. W. & Thornhill, R. (1998). Menstrual cycle variation in women's preferences for the scent of symmetrical men. *Proceedings of the Royal Society of London B: Biological Sciences*, *265* (1399), 991-1000.
- 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*, 151-163.
- Gangestad, S. W., Haselton, M. G., Welling, L. L., Gildersleeve, K., Pillsworth, E. G., Burriss, R. P., et al. (2016). How valid are assessments of conception probability in ovulatory cycle research? Evaluations, recommendations, and theoretical implications. *Evolution and Human Behavior*, *37* (2), 85-96.
- Geary, D. C. (2002). Sexual selection and human life history. *Advances in Child Development and Behavior*, *30*, 41-104.
- Gildersleeve, K., Haselton, M. G. & Fales, M. R. (2014). Do women's mate preferences change across the ovulatory cycle? A meta-analytic review. *Psychological Bulletin*, *140* (5), 1205.
- Giosan, C. (2006). High-K strategy scale: A measure of the high-K independent criterion of fitness. *Evolutionary Psychology*, *4* (1), 394-405.
- Gosling, S., Vazire, S., Srivastava, S. & John, O. (2004). Should we trust web-based studies? A comparative analysis of six preconceptions about internet questionnaires. *American Psychologist*, *59*, 93-104.
- Griskevicius, V., Delton, A. W., Robertson, T. E. & Tybur, J. M. (2011). Environmental contingency in life history strategies: The influence of mortality and socioeconomic status on reproductive timing. *Journal of Personality and Social Psychology*, *100* (2), 241.
- Griskevicius, V., Tybur, J. M., Delton, A. W. & Robertson, T. E. (2011). The influence of mortality and socioeconomic status on risk and delayed rewards: A life history theory approach. *Journal of Personality and Social Psychology*, *100* (6), 1015.
- Hoier, S. (2003). Father absence and age at menarche. *Human Nature*, *14* (3), 209-233.
- Jones, R. & Lopez, K. H. (2013). *Human Reproductive Biology* (4th ed.). Cambridge, MA: Academic Press.
- Kaplan, H. S. & Gangestad, S. W. (2005). Life history theory and evolutionary psychology. In D. M. Buss (Ed.), *The Handbook of Evolutionary Psychology* (pp. 68-95). John Wiley & Sons, Inc.
- Kenrick, D. T., Groth, G. E., Trost, M. R. & Sadalla, E. K. (1993). Integrating evolutionary and social exchange perspectives on relationships: Effects of gender,

- self-appraisal, and involvement level on mate selection criteria. *Journal of Personality and Social Psychology*, 64 (6), 951.
- Kenrick, D. T., Sadalla, E. K., Groth, G. & Trost, M. R. (1990). Evolution, traits, and the stages of human courtship: Qualifying the parental investment model. *Journal of Personality*, 58 (1), 97-116.
- Kim, K. & Smith, P. K. (1999). Family relations in early childhood and reproductive development. *Journal of Reproductive and Infant Psychology*, 17 (2), 133-148.
- Kokko, H. & Jennions, M. D. (2008). Parental investment, sexual selection and sex ratios. *Journal of Evolutionary Biology*, 2 (14), 919-948.
- Little, A. C., Jones, B. C. & Burriss, R. P. (2007). Preferences for masculinity in male bodies change across the menstrual cycle. *Hormones and Behavior*, 51 (5), 633-639.
- Lucas, M. & Koff, E. (2013). How conception risk affects competition and cooperation with attractive women and men. *Evolution and Human Behavior*, 34 (1), 16-22.
- Maynard-Smith, J. (1978). *The evolution of sex*. Cambridge: Cambridge University Press.
- McDonald, M. M., Donnellan, M. B. & Navarrete, C. D. (2012). A life history approach to understanding the Dark Triad. *Personality and Individual Differences*, 52 (5), 601-605.
- Paolacci, G., Chandler, J. & Ipeirotis, P. G. (2010). Running experiments on amazon mechanical turk. *Judgement and Decision Making*, 5 (5), 411-419.
- Penton-Voak, I. S., Perrett, D. I., Castles, D. L., Kobayashi, T., Burt, D. M., Murray, L. K., et al. (1999). Menstrual cycle alters face preference. *Nature*, 399 (6738), 741-742.
- Pianka, E. R. (1970). On r- or K-selection. *American Naturalist*, 104, 592-596.
- Piccoli, V., Foroni, F. & Carnaghi, A. (2013). Comparing group dehumanization and intra-sexual competition among normally ovulating women and hormonal contraceptive users. *Personality and Social Psychology Bulletin*, 39 (12), 1600-1609.
- Presser, H. B. (1978). Age at menarche, socio-sexual behavior, and fertility. *Social Biology*, 25 (2), 94-101.
- Promislow, D. E. & Harvey, P. H. (1990). Living fast and dying young: A comparative analysis of life-history variation among mammals. *Journal of Zoology: Proceedings of the Zoological Society of London*, 220, 417-437.
- Puts, D. A. (2010). Beauty and the beast: Mechanisms of sexual selection in humans. *Evolution and Human Behavior*, 31 (3), 157-175.
- Puts, D. A. (2006). Cyclic variation in women's preferences for masculine traits: Potential hormonal causes. *Human Nature: An Interdisciplinary Biosocial Perspective*, 17 (1), 114-127.

- Rosvall, K. A. (2011). Intrasexual competition in females: Evidence for sexual selection? *Behavioral Ecology*, 22 (6), 1131-1140.
- Salmon, C., Figueredo, A. J., & Woodburn, L. (2009). Life history strategy and disordered eating behavior. *Evolutionary Psychology*, 7 (4), 585-600.
- Stearns, S. C. (1977). The evolution of life history traits: a critique of the theory and a review of the data. *Annual Review of Ecological Systems*, 8 (1), 145-171.
- Stearns, S. C. (1983). The influence of size and phylogeny on patterns of covariation among life-history traits in the mammals. *Oikos*, 173-187.
- Stirnemann, J. J., Samson, A., Bernard, J. P. & Thalabard, J. C. (2013). Day-specific probabilities of conception in fertile cycles resulting in spontaneous pregnancies. *Human Reproduction*, 28 (4), 1110-1116.
- Trivers, R. (1972). Parental investment and sexual selection. In B. Campbell (Ed.), *Sexual Selection and the Descent of Man* (pp. 136-179). Chicago, IL: Aldine Publishing Company.
- Wallen, K. & Rupp, H. A. (2010). Women's interest in visual sexual stimuli varies with menstrual cycle phase at first exposure and predicts later interest. *Hormones and Behavior*, 57 (2), 263-268.
- West-Eberhard, M. J. (2003). *Developmental plasticity and evolution*. New York: Oxford University Press.
- Wood, W., Kressel, L., Joshi, P. D. & Louie, B. (2014). Meta-analysis of menstrual cycle effects on women's mate preferences. *Emotion Review*, 6 (3), 229-249.

Appendix A

Demographic Questionnaire

1. Sex – Male; Female; Other (please describe)
2. Sexual Orientation – Predominately heterosexual; Predominately homosexual; Bisexual; Other (please describe)
3. Age in years
4. Race – White; Black or African American; Asian or Pacific Islander; Native American; Hispanic or Latino; Other (please describe)
5. Religious Affiliation – Christianity; Catholicism; Islam; Buddhism; Judaism; Hinduism; Agnostic; Atheist; Spiritual but not religious; No religious affiliation; Other (please describe)
6. How often religious services are attended – Two or more times per week; Once per week; Once per month; Several times per year; Once per year; Rarely or never
7. Political Affiliation – Democrat; Republican; Independent; Libertarian; Other (please describe)
8. Political Orientation – Very liberal; Somewhat liberal; Slightly liberal; Neither liberal or conservative; Slightly conservative; Somewhat conservative; Highly conservative
9. Highest Level of Education Completed – Some high school; High school graduate or GED; Some college; Associate’s degree; Bachelor’s degree; Master’s degree; Professional degree; Doctoral degree
10. Relationship Status – Single (never married); In a relationship but not married; Married; Separated; Widowed; Divorced
 - a Length of current relationship
 - b Level of satisfaction in current relationship – Very unsatisfied; Unsatisfied; Neutral; Satisfied; Very satisfied
 - c Whether or not hormonal contraceptive was being used at the start of the relationship (by either oneself or the female partner) – Yes; No; Unknown
 - d Whether or not hormonal contraceptive is currently being used in the relationship (by either oneself or the female partner) – Yes; No; Unknown
11. Number of biological children
 - a Age at birth of first child
12. Number of non-biological children
13. Age at first voluntary sexual intercourse
14. Total number of sexual partners
15. Number of biological siblings
16. Number of non-biological siblings
17. Birth order – First; Second; Third; Fourth; Fifth; Sixth; Other (please describe)

18. Percentage of time biological father was present in household during childhood (under 10 years of age) – 0%; 0% – 25%; 25% – 50%; 50%; 50% – 75%; 75% – 100%; 100%
19. Percentage of time biological mother was present in household during childhood (under 10 years of age) – 0%; 0% – 25%; 25% – 50%; 50%; 50% – 75%; 75% – 100%; 100%
20. Percentage of time step-father or other unrelated adult male was present in household during childhood (under 10 years of age) – 0%; 0% – 25%; 25% – 50%; 50%; 50% – 75%; 75% – 100%; 100%
21. Percentage of time step-mother or other unrelated adult female was present in household during childhood (under 10 years of age) – 0%; 0% – 25%; 25% – 50%; 50%; 50% – 75%; 75% – 100%; 100%
22. Perceived level of safety in childhood home – Very safe; Somewhat safe; Neutral; Somewhat unsafe; Very unsafe
23. Perceived level of safety in childhood neighborhood/school – Very safe; Somewhat safe; Neutral; Somewhat unsafe; Very unsafe
24. Relative formidability – I am stronger than <blank>% of others of my sex
25. Relative attractiveness – I am more attractive than <blank>% of others of my sex

For women only:

26. Age at menarche (first period)
27. Currently pregnant or breastfeeding – Yes, currently pregnant; Yes, currently breastfeeding; No
28. Presence of menstrual period – Yes; No, have gone through menopause; No, use hormonal contraceptive that causes amenorrhea; No, have not yet had first period; No for another reason (please describe)
29. Number of pregnancies
30. Average menstrual cycle length in days
31. Regular or irregular menstrual cycle – Regular (the same length ± 2 days each cycle); Irregular (variability in cycle length greater than ± 2 days)
32. Start dates of last three menstrual periods
33. Methods of birth control currently used – Condoms; Oral contraceptives (the pill); IUD (Mirena/Skyla or Paraguard); Contraceptive ring (Nuva ring); Injectable contraceptive; Wearable contraceptive (the patch); Contraceptive implant; Spermicide; No regular contraceptive use; Other (please describe)
34. Total number of pregnancies
35. Any history of hormonal or reproductive disorders – Yes (optional: please describe); No

Appendix B

The Mini-K (Figueredo et al., 2006)

Please indicate how strongly you agree or disagree with the following statements. For any item that does not apply to you, please select “0”.

Disagree Strongly	Disagree Somewhat	Disagree Slightly	Don't know/ Not applicable	Agree Slightly	Agree Somewhat	Agree Strongly
-3	-2	-1	0	+1	+2	+3

	1. I can often tell how things will turn out.
	2. I try to understand how I got into a situation to figure out how to handle it.
	3. I often find the bright side to a bad situation.
	4. I don't give up until I solve my problems.
	5. I often make plans in advance.
	6. I avoid taking risks.
	7. While growing up, I had a close and warm relationship with my biological mother.
	8. While growing up, I had a close and warm relationship with my biological father.
	9. I have a close and warm relationship with my own children.
	10. I have a close and warm romantic relationship with my sexual partner.
	11. I would rather have one than several sexual relationships at a time.
	12. I have to be closely attached to someone before I am comfortable having sex with them.
	13. I am often in social contact with my blood relatives.
	14. I often get emotional support and practical help from my blood relatives.
	15. I often give emotional support and practical help to my blood relatives.
	16. I am often in social contact with my friends.
	17. I often get emotional support and practical help from my friends.
	18. I often give emotional support and practical help to my friends.
	19. I am closely connected to and involved in my community.
	20. I am closely connected to and involved in my religion.

Appendix C

Perceived Socioeconomic Status (Griskeviskius et al., 2011)

Disagree Strongly	Disagree Somewhat	Disagree Slightly	Don't know/ Not applicable	Agree Slightly	Agree Somewhat	Agree Strongly
-3	-2	-1	0	+1	+2	+3

Childhood SES

	1. My family usually had enough money for things when I was growing up
	2. I grew up in a relatively wealthy neighborhood
	3. I felt relatively wealthy compared to the other kids in my school

Current SES

	4. I have enough money to buy the things I want
	5. I don't worry too much about paying my bills
	6. I don't think I'll have to worry about money too much in the future

Appendix D

The Intrasexual Competition Scale (ICS) (Buunk & Fisher, 2009)

Disagree Strongly	Disagree Somewhat	Disagree Slightly	Neutral	Agree Slightly	Agree Somewhat	Agree Strongly
-3	-2	-1	0	+1	+2	+3

	1. I can't stand it when I meet another man/woman who is more attractive than I am.
	2. When I go out, I can't stand it when women/men pay more attention to a same-sex friend of mine than me.
	3. I tend to look for negative characteristics in attractive men/women.
	4. When I am at a party, I enjoy it when women/men pay more attention to me than other men/women.
	5. I wouldn't hire a very attractive man/woman as a colleague.
	6. I don't like very ambitious men/women.
	7. I tend to look for negative characteristics in men/women who are very successful.
	8. I wouldn't hire a very competent man/woman as a colleague.
	9. I like to be funnier and more quick witted than other men/women.
	10. I want to be just a little better than other men/women.
	11. I always want to beat other men/women.
	12. I don't like seeing other men/women with a nicer house or a nicer car than mine.

Appendix E

Measure of Intersexual Choosiness (MICH) (Kenrick et al, 1990)

Imagine you are looking for a potential short-term[long-term] romantic partner (e.g., a single sexual encounter, or one-night-stand)[(e.g., a long-term relationship or marriage)].

Please move the sliders to indicate how *essential* it is that your short-term partner have each of these traits. Please rate each trait from 0-10.

For example:

Selecting 0 would indicate that a trait is not at all essential in a short-term partner, or is something doesn't matter to you.

Selecting 10 would indicate that a trait is extremely essential in a short-term partner, or is something that matters a lot.

1. Kind and understanding
2. Religious
3. Exciting personality
4. Creative and artistic
5. Good housekeeper
6. Intelligent
7. Good earning capacity
8. Wants children
9. Easygoing
10. Good heredity
11. College graduate
12. Physically attractive
13. Healthy
14. Aggressive
15. Emotionally stable
16. Friendly
17. Popular
18. Powerful
19. Sexy
20. Wealthy
21. Ambitious
22. Good sense of humor
23. High social status
24. Dominant

Appendix F

Conception Risk Table (Stirnemann, Samson, Bernard, & Thalabard, 2013)

Conception probabilities in fertile cycles in women with an ongoing pregnancy after 11 weeks, according to age, cycle characteristics, and ethnicity (probability \times 100).

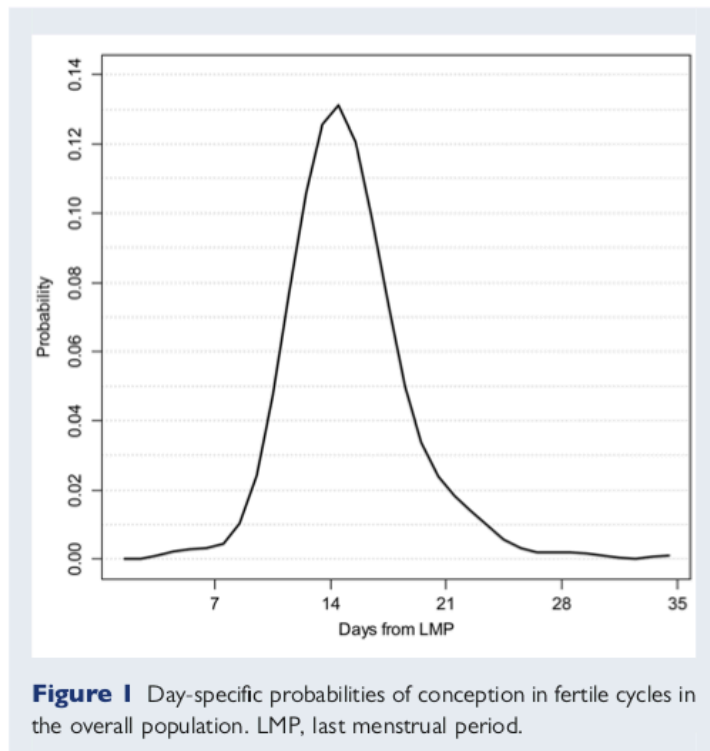
Day	Overall	Age (years)			Cycles		Ethnicity		
		<25	25-35	>35	Regular	Irregular	White	Black	Asian
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.3	0.1
4	0.1	0.2	0.1	0.3	0.1	0.2	0.1	0.6	0.3
5	0.2	0.3	0.2	0.4	0.2	0.3	0.2	0.7	0.5
6	0.3	0.4	0.3	0.4	0.3	0.4	0.3	0.5	0.5
7	0.3	0.4	0.3	0.4	0.3	0.4	0.3	0.3	0.4
8	0.4	0.5	0.3	0.6	0.4	0.5	0.5	0.4	0.5
9	1.0	1.1	0.8	1.6	1.0	1.0	1.0	1.2	1.1
10	2.4	2.3	2.1	3.6	2.5	2.3	2.4	3.0	2.5
11	4.8	4.3	4.3	6.3	4.9	4.2	4.6	5.6	4.7
12	7.7	6.9	7.2	9.3	7.9	6.6	7.6	8.5	7.4
13	10.6	9.3	10.2	11.8	10.9	8.9	10.5	10.7	9.8
14	12.6	11.1	12.5	12.9	12.9	10.5	12.6	11.8	11.2
15	13.1	11.6	13.3	12.4	13.4	11.0	13.2	11.5	11.5
16	12.1	11.0	12.5	10.5	12.2	10.5	12.2	10.2	10.5
17	9.9	9.4	10.4	8.0	9.9	9.1	10.0	8.3	8.8
18	7.3	7.5	7.7	5.6	7.2	7.4	7.4	6.3	6.8
19	5.0	5.7	5.3	3.8	4.8	5.9	5.0	4.7	5.1
20	3.4	4.3	3.5	2.7	3.1	4.7	3.4	3.5	3.9
21	2.4	3.3	2.4	2.2	2.1	3.8	2.4	2.7	3.1
22	1.8	2.5	1.8	1.9	1.6	3.0	1.8	2.1	2.6
23	1.4	1.9	1.4	1.5	1.2	2.3	1.4	1.6	2.1
24	1.0	1.3	1.0	1.1	0.9	1.7	1.0	1.2	1.6
25	0.6	0.9	0.6	0.6	0.5	1.1	0.6	0.9	1.2
26	0.3	0.6	0.3	0.4	0.2	0.8	0.3	0.7	0.8
27	0.2	0.5	0.2	0.3	0.1	0.6	0.2	0.5	0.5
28	0.2	0.4	0.2	0.2	0.1	0.6	0.2	0.4	0.4
29	0.2	0.4	0.2	0.2	0.2	0.5	0.2	0.3	0.4
30	0.2	0.3	0.2	0.2	0.1	0.4	0.2	0.2	0.3
31	0.1	0.2	0.1	0.1	0.1	0.3	0.1	0.2	0.3
32	0.0	0.2	0.1	0.1	0.0	0.2	0.0	0.2	0.3
33	0.0	0.2	0.0	0.1	0.0	0.2	0.0	0.2	0.3
34	0.1	0.2	0.1	0.1	0.1	0.2	0.1	0.2	0.2
35	0.1	0.2	0.1	0.1	0.1	0.2	0.1	0.2	0.2

Appendix G

Fertile Window Probability Table (Stirnemann, et al., 2013)

Day	Probability
1	1%
2	1%
3	2%
4	3%
5	5%
6	9%
7	16%
8	27%
9	38%
10	48%
11	56%
12	58%
13	55%
14	48%
15	38%
16	28%
17	20%
18	14%
19	10%
20	7%
21	6%
22	4%
23	3%
24	2%
25	1%
26	1%
27	1%
28	1%
29	1%

Calculated by Gangestad, et al. (2016) from data reported in the graph displayed in Figure 1 of Stirnemann, et al. (2013). Analysis was done using an online graphical data extractor at <http://arohatgi.info/WebPlotDigitizer/>.



The fertile window is defined as 5 days preceding conception in Stirnemann, et al. (2013). Because conception occurs within 12 hours of ovulation, ovulation is presumed to occur on the same day as conception (Gangestad, et al., 2016).