

THE IMPACT OF AN UNPREDICTABLE
ENVIRONMENT ON MATE SELECTION

by

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ABSTRACT

The current research examines the impact of climate change on women's mating strategies. The specific mating strategy this research observed is known as extra-pair mating and was examined in college women ages 18 to 24. Previous research indicates females might initiate extra pair mating (infidelity in a monogamous relationship) in unpredictable environments. This research uses climate change and potential outcomes for the future as a parallel to environmental uncertainty and assesses female's openness to infidelity. The results demonstrated there was no measurable relationship between exposure to the unpredictable environments associated with climate change and attitudes towards cheating. Further investigating the nature of the study proposes limitations to the timing of the study (the end of a spring academic semester), and questions if participants were more concerned with academic failure (control) than climate change (prime). There is also a possibility that even though the climate change prime was intended to make participants think about its outcomes for the near future, the concept of climate change might still be considered too far off and theoretical to consider it a threat. With these confounds in mind, future research would be needed to determine if there is a true correlation. Overall, this research is important because finding a parallel between extra pair mating and unpredictable environments could have the ability to impact society enough and trigger the realization that climate change affects humans on a very deep level.

Introduction

Mating is universal; it is what drives the continuation of life. More than 99% of multicellular eukaryotes reproduce sexually, and even against impossible odds have evolved elaborate ways to do so (Scudellari, 2014). While many scientists can attest to the notion that mating is necessary for species survival, there are still unanswered questions as to why and how this desire becomes prevalent in populations.

The Red Queen Hypothesis addresses the concept that both prey and predator are constantly evolving in order to survive (Valen, 1973). This form of coevolution is a sort of “evolutionary arms race” where both organisms live in an uneasy imbalance until one overcomes the other, and vice versa. For example, if a plant was being constantly eaten by aphids, selective pressures would act on this plant and some would evolve to produce a toxin that kills these aphids. If the aphids had no immunity, they would die off and the plants would live. But even if there is a small percentage of aphids that are immune to this toxin, they will survive and reproduce, once again being able to eat the plants. The Red Queen Hypothesis acts upon the basis that there needs to be genetic mixing within population pools to ensure each species can evolve to keep up with selection pressures. This is done via sexual reproduction. In large vertebrate species—such as humans—sexual reproduction is most beneficial to combat pathogen prevalence, giving them the largest advantage to survival. It is because of the Red Queen Hypothesis that mating is such an important part of humanity’s survival. However, the timing and strategy of mating for maximum reproductive fitness depends largely on environmental factors.

Life History Theory

One key concept to natural selection is understanding that selection favors organisms who effectively allocate energy and resources into things that will enhance their fitness within their

ecological niche. The combination of resource allocation in different scenarios affects a large dimension of an individuals' life, as well as the outcome for their survival. Life History Theory (LHT) provides a framework that addresses how organisms allocate time and energy into the resources they deem beneficial to maximize their fitness (Del Giudice, Gangstead, & Kaplan, 2016). Throughout their lifespan, organisms can take on fast or slow life history strategies, depending on environmental conditions. In a stable environment, an organism could achieve higher fitness by pursuing a slow life history strategy, allocating more energy to resources that would parallel a longer lifespan. This would manifest in the organism having a larger body size, later maturation and an overall lower fertility (Del Giudice, Gangstead, & Kaplan, 2016). In contrast, organisms living in unstable environments could achieve higher fitness by pursuing a faster life history strategy and allocate more energy into resources that promote increasing fitness in a shorter time frame. Typically, this energy will be demonstrated as mating strategies—such as reaching maturation at an earlier age and having a higher fertility—in order to ensure the organism produces offspring.

Mating Strategies

Many theories surrounding human mating focus primarily on long-term mating. Perhaps because it is the most common—and therefore easiest—strategy to study, or perhaps because societal pressures of serial monogamy force the conversation about short term mating into a temporary and unimportant phenomenon. And yet, lifetime monogamy does not characterize the primary mating patterns in most societies. Even in presumably monogamous cultures like the United States, divorce rates are roughly 40% to 50% (American Psychological Association, 2018). Additionally, within these monogamous relationships it is estimated that 20-30% of men and 13-23% of women have at one point in their life taken part in infidelity (Wang, 2018). While the

concept of infidelity carries negative social connotations, from an evolutionary perspective it is an entirely rational mating strategy.

Many species in the animal kingdom partake in what is known as “extra-pair copulation,” which is defined as when an individual in a monogamous relationship mates outside of their specific pair bond (Arct, 2013). Throughout the 1990s, studies on birds determined that roughly 150 species participated in extra pair copulation (Yezerinak & Weatherhead, 1997). While both females and males were hypothesized to participate in extra pair mating for different benefits, it was affirmed that both sexes participated in extra-pair copulation as an important source of sexual selection. The researchers found that as a result of extra pair fertilizations, variance in male mating success increased between 3-fold and 15-fold over that which would result from within pair reproduction. Studying these animals and their sexual strategies is beneficial for research regarding evolutionary psychology, because it allows us to further understand human mating behaviors and strategies.

From the male perspective, extra-pair copulation as a mating strategy will directly escalate his fitness. As seen in Figure 1, if one male has increased opportunities to mate with multiple females that are not within a monogamous pair bond, he has the potential to sire more offspring, thus increasing his reproductive fitness (Bateman, 1948) (see Figure1).

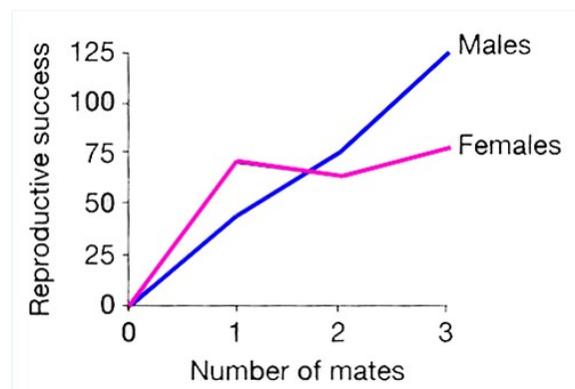


Figure 1. The Bateman Principal

For many years the concept of female extra pair copulation seemed contradictory and unexplained by evolutionary thought. Since the female is generally the one to carry offspring, her obligate parental investment is both greater and longer than the male's (Trivers, 1972). As females carry a higher cost for reproduction, they are more likely to be the choosier sex when looking for a potential mate. Additionally, as a long-term mate could provide a female with resources and protection while she is pregnant and tending to her young, she has much to gain from pursuing a long-term mating strategy. So why would a female risk the potential cost of having offspring with a short-term candidate that will not provide her, nor the offspring, with the correct tools of survival? This thought process suggests that there must be some hidden evolutionary benefit to female extra-pair mating (Buss, 2000).

Hypothesized Explanations for Female Extra-Pair Mating

There are quite a few hypotheses that could explain the potential benefits females might receive from extra pair liaisons. One of the earliest hypotheses surrounding this concept is known as the *Paternity Confusion Hypothesis*, which claims that a female who engages in sexual acts with multiple partners could obscure the actual paternity of her offspring. This could be beneficial because she could theoretically receive support from a variety of males who believe the offspring is theirs, each one providing more resources than any single mate could give (Hrdy, 1981). This hypothesis could be difficult to conceptualize though, due to the low likelihood of a man increasing resource acquisition when there is a decrease in probability of paternity. After this investigation, development of additional hypotheses ensued. Popular theories include the *Mate Switching Hypothesis*, which states females could use short term sex to acquire a potentially better long term mate (Fisher, 1992) and the *Genetic Diversity Hypothesis*, which claims women who mate with

multiple men would benefit from having children that were more genetically diverse to increase their chances of one being successful (Smith, 1984).

To gain further empirical evidence, Buss and Greiling (2000) sought to test several of these hypotheses in order to discover what women found most beneficial in situations where extra-pair liaisons occurred. They concluded that females believed infidelity would be most beneficial in concordance with the Resource Acquisition Hypothesis and the Mate Switching Hypothesis (Buss & Greiling, 2000). Both of these motives may lead to extra pair mating in women; however, it is interesting to note that females can get access to resources by having one singular mate, so there potentially could be no need for extra pair mating to gain resources. While the genetic diversity hypothesis was not highly ranked in this particular study, there may be some scenarios where increasing the genetic diversity of their offspring may motivate women to pursue a short-term mating strategy. If genetic benefits of extra-pair mating are differently expressed across environments, the specific interactions between genes and the environment might make detection of benefits from extra pair mating difficult to see (Schmoll, 2011). When environmental conditions were altered in a socially monogamous bird species, results found extra-pair offspring had a stronger immune system in comparison to within-pair young (Arct, 2013). This indicates that the benefits of an extra pair mating strategy are likely to become visible *only* when environmental conditions are unfavorable and unpredictable.

Climate Change

In October of 2018, the International Panel on Climate Change outlined the consequences the earth is already experiencing from a 1°C global temperature increase. While this temperature change may seem miniscule, the planet is suffering greatly. Increasing ocean temperatures are causing coral reef deaths and inadvertently leading to loss of ocean biodiversity, inhibiting the

fishing industry. Additionally, thermal melting of polar ice is causing sea levels to rise and has the potential to flood island populations and coastal cities. On land, overpopulation, depletion of agricultural resources and water, and exposure to new diseases become increasingly threatening (IPCC, 2018). The report concluded that any increase in temperatures above 1.5° C could lead to irreversible changes in as little as 12 years. It is these unfavorable conditions that create an atmosphere for environmental uncertainty and unpredictability, which could have the potential to impact human behaviors.

Current Study

The current study aims to understand if heightened preference to extra-pair liaisons (infidelity) will be expressed in females who are primed with the concept of climate change. Using multiple outcomes from a global temperature increase greater than 4° C as a proxy for environmental uncertainty, we expect females already in monogamous relationships will perceive infidelity as more acceptable. While we are not directly testing the validity of the genetic diversity hypothesis in this study, previous research underlying the importance of an altering environment on the presence of desiring genetic variability indicates this hypothesis will indirectly be in the study.

Methods

Participants

Participants involved in this study were 84 female students within the psychology department at a private, southern university in the U.S. All subjects were between the ages of 18 and 26 (*M*_{age} 20.02 years, *SD* 1.54; 47 in the climate change condition, 37 in the academic failure condition) and reported being in committed, heterosexual, romantic relationships. Participants were compensated with partial course credit for their participation.

Procedure

Participants completed an online survey under the supervision of a research assistant within the psychology department. Participants read and signed a standard consent form that was approved by the University's Institutional Review Board. After participants completed their consent forms, they viewed a PowerPoint describing either increases in education assessment exams (control) or unpredictable outcomes associated with climate change. After viewing the PowerPoint, participants were then asked to answer a series of questions about their views on romantic preferences and infidelity. At the end of the study they were debriefed and compensated with course credit.

Measures

Relationship Status. Participants were recruited based on a pre-screen identifying their relationship status as in a committed relationship. (partnered: $n = 86$)

Infidelity. Participants were asked how they felt about infidelity by ranking their beliefs on acts of infidelity on a 7-point scale (anchors: "strongly agree," "neither agree nor disagree," "strongly disagree"). Examples of statements from this section included "infidelity is acceptable under certain circumstances" and "I can understand why people in long-term relationships are sometimes tempted to cheat on their partners".

Short Term Mating Motives. Attitudes toward sex and relationships were observed using the sociosexual inventory scale (SOI) and were estimated via participant agreement to various statements (Penke & Asendorpf, 2008). The selection of answers was on a 9-point scale, ranging from: "very strongly disagree" "neither agree or disagree" or "very strongly agree". Participants reported agreement to the following statements: "sex without love is OK", and "I can imagine myself being comfortable and enjoying casual sex with different partners". We then asked

participants to mark the level of frequency they experience sexual fantasies or arousal. Selection options were on 9-point scale ranging from “never” to “at least once a day”.

Beliefs in Climate Change. Both the prime and control group were asked their beliefs in climate change and if they credit it will impact their future. The purpose of this was to gauge how unpredictable participants thought their environment was after reading about climate change and to see if this correlated with higher agreement to infidelity and more casual relationships. Additionally, this measure was used to eliminate individuals in the experimental/prime group but do not believe climate change exists at all, in order to ensure participants were actually primed with realistic unpredictable futures.

Results

Manipulation Check: Does Reading About Threat of Climate Change Impact Beliefs About Climate Change

Prior to conducting analyses, a belief about climate change score was created by taking a mean composite across 6 items ($\alpha = .54$). An independent samples *t*-test examined if being primed with threats of climate change, as opposed to being primed with concerns of academic failure, led to stronger beliefs in the threat of climate change. Results revealed no differences between the two conditions, $t(82) = 0.66, p = .512$. This indicates that the prime used may not have influenced participants' beliefs about the threat of climate change.

Target Analysis: Does Threat of Climate Change Predict Attitudes Towards Cheating

Prior to conducting analyses, an attitude towards cheating score was created by taking a mean composite across 6 items ($\alpha = .70$). An independent samples *t*-test examined if being primed with threats of climate change, as opposed to being primed with concerns of academic failure, led to more positive attitudes towards cheating in women in relationships. Results revealed no differences between the two conditions, $t(82) = 1.05, p = .296$, indicating that thinking about the

environmental unpredictability caused by climate change did not influence participants' attitudes towards cheating.

Follow- up Analysis: Does Threat of Climate Change Interact with Childhood Unpredictability to Predict Attitudes Towards Cheating

Prior to conducting analyses, a childhood unpredictability score was created by taking a mean composite across 3 items ($\alpha = .86$). Next, a moderated regression analysis was used to examine attitudes towards cheating as a function of priming condition (dummy coded; academic failure = 0) and childhood unpredictability (centered). A trending two-way interaction emerged, $b = -0.22$, ($SE = 0.12$), $t = -1.76$, $p = .082$ (see Figure 1). Simple slope tests revealed that while there were no differences in the climate change condition between those who experienced high or low levels of unpredictability in childhood, $b = 0.05$, ($SE = 0.09$), $t = 0.60$, $p = .553$, that within the academic failure condition, those who experienced more unpredictability in childhood had more positive attitudes towards cheating, $b = 0.27$, ($SE = 0.09$), $t = 3.10$, $p = .003$, than those who experienced less unpredictability in childhood. Group differences were then examined at one standard deviation above and below the mean childhood unpredictability. The results showed that there were no differences between groups at low levels of childhood unpredictability, $b = 0.17$, ($SE = 0.29$), $t = 0.60$, $p = .548$, however, at high levels of childhood unpredictability, those in the academic failure condition had marginally more positive attitudes towards cheating than those in the climate change condition $b = 0.54$, ($SE = 0.29$), $t = -1.89$, $p = .061$. These results reveal that for those women who grew up experiencing high levels of childhood unpredictability, thinking about academic failure as opposed to the threat of climate change led to more positive attitudes about cheating.

General Discussion

In terms of short-term mating, men and women receive different benefits and therefore enact different strategies to capitalize on these benefits. In the current research, I examined how unpredictable environments impacted female mating strategies, specifically in terms of extra pair

mating (infidelity). Using both the resource acquisition and genetic variability hypothesis as a guide for my research, I assessed how a woman might react when exposed to unpredictable outcomes related to climate change to see. The goal of this research was to observe if her mating behaviors would indicate a preference to infidelity, favoring a faster life history strategy.

Because climate change has transitioned from being a looming threat to a destructive reality, many researchers are focusing their efforts on assessing the damage already done to the planet. Increasing global temperatures are fostering the rise of sea levels, the infertility of many agricultural soils, and loss of biodiversity (IPCC, 2018). Combined with overpopulation and the continued use of greenhouse gasses which fuel climate change, the earth—and society—could potentially experience irreversible changes in as little as 12 years (IPCC, 2018). Given that women adopt faster life history strategies when exposed to unpredictable environments, I predicted that females would initiate this strategy and report infidelity as more acceptable, in order to maximize their reproductive fitness (Del Giudice, Gangstead, & Kaplan, 2016).

The results of the current research demonstrated there was no measurable relationship between exposure to the unpredictable environments associated with climate change and attitudes towards cheating. Therefore, these results were not consistent with my hypothesis. It is interesting to re-examine the follow up analysis regarding childhood unpredictability, academic failure, and increasing tendency to cheat. While the original hypothesis did not account for a relationship between these items, there could be an explanation for these strong correlations. Perhaps due to the timing of the study (the end of a spring academic semester), participants were more concerned with academic failure than climate change. There is also a possibility that even though the climate change prime was intended to make participants think about its outcomes for the near future, the concept of climate change might still be considered too far off and theoretical to consider it a threat.

Academic failure for a college student, on the other hand, would be a more immediate threat that would have to be addressed. These results reconfirm the hypothesis that an unpredictable environment could have the ability to increase acceptance to infidelity, just not an environment directly related to climate change.

While the current research poses as an important first step in establishing a relationship between climate change and mating strategies, it is not without limitations. An important limitation arises from the small sample size of the study ($n=84$) and the lack of men in the sample. This prevented researchers to see if there were sex differences in preferences towards infidelity when primed with climate change. Another limitation to the study involves not accounting for participant's use of birth control. Because previous studies indicate that birth control prevents natural ovulatory cycling, there is a possibility that many participants who were on birth control were inhibited from thinking about mating strategies altogether (Peterson, 2013). Despite these limitations, the current research is significant because it gives insight into relationship health and the underlying principles behind extra pair mating. Further, it may help illuminate the mechanisms behind perceived vulnerability to climate change and its effect on future mating behaviors.

It is interesting to note that the manipulation check (if reading about threats of climate change impact beliefs about climate change) revealed there was no difference in beliefs about climate change between the groups. This could be attributed to the previous speculation that climate change is still considered too much of a theoretical and distant threat to take it seriously, even on an implicit level. Additionally, these findings could stem from our study taking place in a southern, private and relatively wealthy university in Texas. Many students come from families that are invested in the oil and gas industry, as well as are relatively "right minded" politically. These factors could have influenced participants' beliefs in climate change to an unwavering

degree, even before coming into the study. This would prevent results we were looking for in the prime group from showing up, because participants were not receptive to the prime at all and therefore were not motivated to change their life history strategies.

As previously stated, getting individuals to understand the implications of climate change is a feat in itself and many think these global changes will not affect them directly. If this study were to be replicated or continued, I would want to use a participant pool from a university in a more liberal political setting to see if there are any differences in results. Additionally, I would want to alter the climate change prime into something more interactive. Individuals—myself included—generally respond with more empathy to accredited documentaries than news stores. Perhaps if participants were to watch an environmental documentary outlining the effects of climate change, rather than read about it, the severity of the situation would be brought to the surface and then could have the potential to influence mating behavior. With these future studies in mind, finding a parallel between extra pair mating and unpredictable environments could have the ability to impact society enough and trigger the realization that climate change affects humans on a very deep level. While mating strategies may not be the key to stopping climate change, educating citizens on the concept of behavioral changes and fundamentally, the future relationships they will have with their partners and offspring could be the missing link to initiate global unity in fighting this battle.

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