

There is a large body of psychological literature based on the female ovulatory cycle. However, this literature rests on several assumptions. Distinguish between those assumptions that are at the theoretical level versus those that are auxiliary assumptions. Using this analysis, produce a paper to undermine the whole field of ovulatory cycle research as it relates to mating.

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Evolutionary psychology (EP) began as a way to explain the manner in which Darwinist ideas of natural selection could apply to the way humans think and behave today. The guiding principle is that, throughout history, humans have developed adaptive systems with which to best navigate the environment around them in order to best survive and mate (Symons, 1995). As such, the field has taken to task attempting to explain the *evolved mechanism* that has shaped humans' every psychological process. The field has met with a back lash of criticism, however. Many psychologists are skeptical that EP is largely post hoc storytelling, and that in the event one particular story is ruled implausible, another one is placed nicely in its place.

For this paper, evolutionary psychology will be evaluated for its ability to accurately explain and support theories of the psychological mechanisms surrounding female ovulation. First, the EP perspective on the evolved psychological mechanism surrounding sexual strategies as a function of ovulation will be discussed. Then, the roles of an EP metatheory and the auxiliary assumptions necessary to conduct tests which support these theories will be discussed.

### *Sexual Selection and Ovulation*

Sexual selection refers Darwin's (1871) proposal that evolution has favored traits in species which raise the likelihood of reproductive success. Two paths to reproductive success are possible: through intrasexual competition (eg. fighting off same sex for mates) and intersexual attraction (attracting the best possible mate). For the sake of this paper, intrasexual

competition will not play much of a role as theories regarding ovulation are generally concerned with obtaining the best possible mate at the best possible moment for successful, and beneficial, reproductions.

One major theory that seeks to explain efficient intersexual attraction strategies is parental investment theory (Trivers, 1972). Trivers (1972) proposes that the sex which invests more in the successful survival of offspring is likelier to be the more selective sex when choosing mating partners. In humans, the female absorbs the highest levels of investment from the beginning (Buss & Schmitt, 1993). In deciding to mate, the male's sole responsibility is simply genetic extraction, which can take as few as a matter of seconds. The female, however, faces a potential parental investment of nine months gestating and deliver a child. Considerably more investment is involved in order protect and to raise the child to a state of reproductive fitness of its own.

Additionally, women's reproductive lives are considerably more restricted to that of men over the course of a lifetime. This places more value to each sexual mating encounter in that a female's reproductive potential is limited by both her limited fertile window throughout the menstrual cycle as well as her limited reproductive life spanning from shortly after menarche until menopause (~30 years). On the other hand, men's reproductive potential is limited only by the number of fertile women he can successfully inseminate.

The differential cost-benefit structure between sexes has largely dictated the strategies through which each seeks to obtain a mating opportunity. As males are generally less constrained to their reproductive potential, they are more likely to approach short-term mating goals (Buss & Schmitt, 1993). This goal of this strategy is immediate reproductive benefits by maximizing the potential number of offspring. This strategy is more costly for women however,

and, while not exempt from engaging in it, is far less likely due to the long-term costs. Women typically implore a more long-term mating strategy which allows for the parents to invest more heavily in offspring to increase its likelihood of survival (Buss & Schmitt, 1993). Long-term mating strategies typically shift the balance of investment from entirely on the female's side closer to equilibrium.

These sexual strategies are not gender specific, however. For instance, a woman may engage a long-term mate to secure resources and share the overall investment of raising one or more offspring. However, men in long-term committed relationships have been shown to have lower testosterone levels than single men (Gray, Kahlenberg, Barrett, Lipson, & Ellison, 2002). According to Folstad and Karter's (1992) immunocompetence signaling hypothesis, the physical characteristics of a male carrying higher levels of testosterone would be attractive to a woman seeking the best possible genetics to pass down to her offspring. With the shared investment of the long-term mate secured, the best option for the woman would then be to seek out the better genes through a short-term mate at times of peak fertility. This is what is referred to as the dual-mating strategy (Pillsworth & Hasleton, 2006). The benefits of this reproductive strategy are the basis of the *evolved mechanism* which explains women's increase in sexual desire in, and approaching, their ovulatory, or most fertile, phase.

The ovulatory shift hypothesis (Gangenstad, Thornhill, & Garver-Apgar, 2005) states that natural and sexual selection will have likely structured a woman's psychology to shift from long-term mating strategies toward short-term mating strategies as they approach the late-follicular phase of their ovulatory cycle (when they are most fertile). This shift would maximize the benefits of short-term mating for just a short time without minimizing the costs of imploring a long-term mating strategy for the rest of the cycle. In other words, this allows for a woman to

extract the best available genetic quality for their offspring by mating with high-testosterone males while securing the shared investment of raising that offspring of a long-term mate.

In an effort to support this theory, quite a number of studies have been conducted over the course of the past ten years involving measuring various aspects of women's psychologies at differing stages of their ovulatory cycle. These studies range from subconscious testosterone perception, to shopping for clothes, to dressing up to find a mate. The following will outline some of the findings evolutionary psychologists have found with their army of non-contraceptive taking undergraduate females.

The female body undergoes a number of hormonal changes as it prepares to begin ovulation. According to evolutionary psychologists, these changes in a woman's body chemistry should be detectable by one or more biological cues. Miller & Maner (2010) found that men rated t-shirts worn by women as more preferable than women. This, they concluded, was evidence that men have retained an olfactory capacity for identifying females that it would be most beneficial to mate with. To supplement this finding, Miller and Maner (2010) found larger influxes of testosterone in men that had smelled an ovulating woman's t-shirt than men that had smelled an anovulatory woman's t-shirt. This boost in testosterone was said to be a response to a female's cues of fertility in order to prepare for either mating or compete with other men in order to mate.

In addition to sub-conscious biological cues women use to advertise their fertility, there are a number of more overt behaviors women have been shown to exhibit when approaching ovulation. In a number of studies, women at peak fertility have been rated as dressing sexier, ornamenting more (Hasleton, Mortezaie, Pillsworth, Bleske-Rechek, & Fredrick (2007), and choosing more revealing clothes to wear (Durante, Li, & Hasleton, 2008) than women who were

not at peak fertility. Also, one study (Miller, Tybur, & Jordan, 2007) found that lap dancers made more in tip earnings in nights on and surrounding their fertility peaks than other times. As this was a field study, however, it is difficult to tease out the directional causality. The increase in earnings could either have been from men detecting fertility and tipping more to signal available resources, or it might have been the ovulatory shift causing the women to act sexier around their fertile peaks.

### *Evolutionary Psychology's Necessary Assumptions*

Evolutionary psychology has shown that it is capable of generating some very provocative and convincing findings over the last 20 years. Their explanations seem sound in that they explain in one way or another the evolved mechanism and the function behind each of their hypotheses. However, in considering whether evolutionary psychology stands as a valid, hypothesis generating branch of science, there must be a clear and testable theory from which hypotheses are to be generated. The scientific merit of evolutionary psychology will be explored.

In David Buss' (1995) introduction of evolutionary psychology to the world, he begins by attempting to silence those critics that seemingly badger him with the question "Well how can you prove it". His answer only begins to beg more questions of what is true and what is testable in EP. He states his reaction to these questions by suggesting:

"When an evolutionary psychologist tests an evolutionary proposition, she or he is not testing 'general evolutionary theory' just as, when an astronomer tests a hypothesis, she or he is not testing 'general relativity theory' with each experiment. That theory is assumed to be true, just as evolution by natural selection is assumed to be true... because

no compelling alternatives have been proposed over the past 130 years, and because there is overwhelming evidence supporting general evolutionary theory.”

Buss’ decision to use the word assumption in this case may have been somewhat misguided, for, according to Karl Popper (1970/2002), it is precisely BECAUSE general evolutionary theory is such a commonly held assumption that it should be held to more rigorous tests more often. For Popper, a theory was only genuinely scientific if were comprised of statements which, when subjected to intense testing under conditions that would otherwise subject the theory to removal, stands firm and continues as the prominent theory for the time being. Popper would take even more issue with Buss’ assertion that general evolutionary theory has received overwhelming support for the last 130 years. By suggesting that there has been support shown for a theory that has already been established, Buss is effectively subjecting all of evolutionary theory to the logical fallacy of affirming the consequent.

Buss does not appear to be willing allow evolutionary psychology available for that sort of scrutiny. Instead, he produces a chart of the “hierarchy of levels of social psychology” (p 3) whereby all local and testable hypotheses can be traced directly back to General Evolutionary Theory. The trouble many scientists have with EP, however, is that despite evidence contradicting many of the theories allegedly tracing back to general evolutionary theory, there appears no interest on the part of EPs to reconsider the entire foundation.

Regardless of what Popper might have thought, here Buss has established what in Lakatosian terms would be the “hard core” of a research programme (Lakatos, 1970, 1978). At the very core of the theories that evolutionary psychology proposes is Darwin’s initial law on natural selection (1859). This core is largely untestable and held to be true. Perhaps Lakatos’ major contribution to science, and subsequently evolutionary psychology, is the concept of

auxiliary hypotheses, or the “protective belt” which surrounds and protects the integrity of the established theory in the middle. The initial purpose of this protective layer was to protect theories from Karl Popper. What Lakatos understood, that Popper did not, is that it is simply not practical, nor is it beneficial to science, to submit theories to Popper’s “severe tests” and throw them out if it failed once. Lakatos understood that that science does not occur in a vacuum. He cites a story in which a scientist refutes Niels Bohr on a matter of a hydrogen count. Bohr wrote back without picking up his head that the young scientist should have taken into account the hydrogen escaping out of the tube (Lakatos, 1999 p. 104)

A demonstration may assist in explaining what is meant by “auxiliary hypotheses” (adapted from Trafimow, 2012):

- Premise 1 } If theory  $T$  is true and auxiliary hypotheses  $A_1, A_2, \dots, A_n$  are true, then observation  $O$  should occur ( $T \& (A_1 \& A_2 \& \dots \& A_n)$ )
- Premise 2 } Observation  $O$  does not occur ( $\neg O$ ).
- Conclusion } Therefore, theory  $T$  is not true ( $\neg T$ ) OR one or more of the auxiliary hypotheses is  $\neg A_1, \neg A_2, \dots, \neg A_n$  are false.

Now, theory testing necessarily involves variables at the observable and the unobservable level. In order to provide support for a theory, there must be a set of auxiliary assumptions which connect the two. For instance, the method in which social psychologists generally take attitude measures is by having undergraduate students mark representations of their attitude on a continuous scale from 1-7. There has already been at least one auxiliary assumption made here: the assumption that observable marks from the undergraduate are an accurate and valid representation of the unobservable concept that is the researcher is interesting in testing.

Therefore, if, when this theory is tested, the predicted outcome does not occur, there are at least two possibilities with which to consider. The first is that the theory is wrong. This is simple enough conclusion. The theory can be considered falsified and never addressed again. The second is that the method of measurement, the 7-point Likert scale, does not do an adequate job of measuring the unobservable variable that the researcher had based his predictions on. *This* can be a perfectly justifiable reason to retain the theory, throw out the measurement, and begin all over again.

To demonstrate the importance of auxiliary validity espoused by Trafimow (2012), let us look at a considerably more absurd example of how the “protective belt” of auxiliary assumptions can be misused. Using the same undergraduate, the scientist looks to test his theory about attitudes again. This time, since he had ruled that it was the Likert scale, and not the theory, that that influenced the results, he has decided to measure the student’s attitude with a Geiger counter. The researcher then asks the student to stand still while his attitude is read, and, as the scientist predicted, the Geiger counter tops the charts. He takes this as confirmation that his theory is supported.

There is more here to be concerned with than an unhealthy dose of radiation. What has been demonstrated in this example is the importance of the “goodness” of the auxiliary validity linking the observed variable (results from the scale or from the Geiger counter) with the unobserved variable of interest (attitude). Without specifying the precise logic behind his choice of the Geiger counter, this scientist has been able to get away with abusing the initial purpose of the protective belt.

As vulnerable as the protective belt is to misuse by allowing researcher to cast out auxiliary assumptions when their theory is not supported, it so too can be misused to show support for a theory that likely might not have any. Consider this logic:

Premise 1} If theory  $T$  is true and auxiliary hypotheses  $A_1, A_2, \dots, A_n$  are true, then observation  $O$  should occur ( $T \& (A_1 \& A_2 \& \dots \& A_n)$ )

Premise 2} Observation  $O$  does occur ( $O$ ).

Conclusion} Therefore, theory  $T$  is probably true because that is what I predicted

This confirmatory logic uses the observation to validate the theory while ignoring the potential role any auxiliary assumptions, known or unknown, had in impacting the observation.

This example demonstrates that when a scientist ignores auxiliary assumptions (either willfully or unwillfully), any evidence that appears to support his prediction looks like he is responsible for the outcome. Previously, it was demonstrated how an auxiliary assumption could be “blamed” for disrupting the finding that a scientist was hoping to observe and thrown out. In this case, an auxiliary assumption can cleverly be left unacknowledged if the observation turns out favorably for the scientists’ theory.

It would bode well for ovulation researchers to carefully consider the auxiliary validity of their measurements in the future. Many of the studies listed above have used very indirect measurements to assess behavioral changes relating to ovulation. For instance, Durante, Li, and Hasleton (2008) had women come in to the lab at peak or off-peak times and asked participants to draw an ideal outfit that they would consider wearing out. This study fails to account for a number of procedural complications, however. The first issue stems from the assumption that a drawing is a reflection of how sexy a woman feels at a given time. Variation in participants’ drawing ability is capable of impacting the drawings; as is perhaps the last time they went

shopping or were exposed to new clothes. Additionally, Hasleton et al. (2007) found that women were rated by judges to dress sexier in peak fertility than off-peak. This study, however, fails to link the assumption that the manner in which an undergraduate women chooses to dress herself to attend an experiment is a reflection of how sexy she feels.

Miller, Tybur, and Jordon (2007) even remarked on the validity of much of this research. Their paper sought to fix issues with laboratory research citing Hasleton and Gangstad (2006), Hasleton et al. (2007), and Gangstead, Thornhill, and Garver (2002) as having weak and indirect measures. For instance, Hasleton and Gangstad (2006) used pair-bonded women's subjective ratings of their partner's mate-guarding behaviors at peak and off-peak times without observing the couple themselves. Miller et al. (2007) sought to take a direct, objective measure of behavioral shift when approaching ovulation by counting tip money from earned by lap dancers through their cycle. This, however, is making a rather large auxiliary assumption by suggesting that money is indeed an accurate measurement of sexiness. Additionally, this study fails to establish the causal chain between the lap dancer and the patron by which the dancer receives more money when ovulating. It is difficult to determine whether the dancers made more money because they were acting sexier or that the patrons were more attracted to the ovulating dancers.

Ultimately, from a practical standpoint, there is ever decreasing value to this research. The restrictions woman must be under in order to participate give rise to issues of ecological validity. While women's contraceptives have become cheaper and easier to access, women using these are barred from ovulation research because of the disruptive effect of the natural fluctuation of hormones. Durante et al. (2008) additionally barred women that had an irregular cycle length, recently had a child, was currently breastfeeding, had experienced dramatic changes in weight, used antidepressants, or regularly smoked cigarettes. If the crux of ovulation

research is limited to only a small subsection of women, then it does not necessarily have anything to offer in terms of what it can tell about how the majority of women around us actually behave. The reality is that mating choices vary around many more aspects of the 21<sup>st</sup> century than ovulation. Attraction and sexual selection also depend on sex-based disease and mortality, population density, and available mate quality (Kokko & Monaghan, 2001; Kokko & Johnstone, 2002), for example.

In sum, while evolutionary psychology is certainly an interesting method to speculate about how human history has shaped many of our psychological processes today, there is very little evidence to actually support it. Not only is it not empirically testable, as we cannot observe humans' behavior 50,000 years ago, but many of the studies that are conducted to support adaptive function hypotheses are often poorly designed and require loosely associated measurements to these processes. Also, the auxiliary hypotheses necessary for conducting this research are too easily abused in order to claim support for a particular theory by being blamed for bad results and ignored for good ones. Lastly, while understanding the past is undoubtedly useful, it would benefit humans today more to focus on how to best move forward.

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