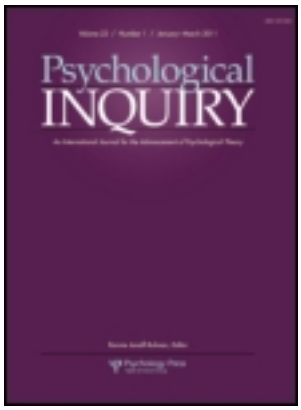

Psychological Inquiry: An International Journal for the Advancement of Psychological Theory

Publication details, including instructions for authors and subscription information:
http://www.tandfonline.com/loi/hpli20

Attachment Fertility Theory: Complex Systems of Mechanisms Simplify Sex, Mating, and Sexual Risks

Lynn Carol Miller [a] , John L. Christensen [b] , William C. Pedersen [c] , Anila Putcha-Bhagavatula [c] & Paul Robert Appleby [d]

[a] Annenberg School for Communication and Journalism & Department of Psychology , University of Southern California , Los Angeles , California

[b] Department of Communication and Center for Health, Intervention, & Prevention , University of Connecticut , Storrs , Connecticut

[c] Department of Psychology , California State University, Long Beach , Long Beach , California

[d] Annenberg School for Communication and Journalism & Keck School of Medicine , University of Southern California , Los Angeles , California

Published online: 02 Sep 2013.

To cite this article: Lynn Carol Miller , John L. Christensen , William C. Pedersen , Anila Putcha-Bhagavatula & Paul Robert Appleby (2013) Attachment Fertility Theory: Complex Systems of Mechanisms Simplify Sex, Mating, and Sexual Risks, Psychological Inquiry: An International Journal for the Advancement of Psychological Theory, 24:3, 211-220

To link to this article: http://dx.doi.org/10.1080/1047840X.2013.817322

Psychological Inquiry, 24: 211–220, 2013

ISSN: 1047-840X print / 1532-7965 online
DOI: 10.1080/1047840X.2013.817322

Routledge
Taylor & Francis Group

Attachment Fertility Theory: Complex Systems of Mechanisms Simplify Sex, Mating, and Sexual Risks

Lynn Carol Miller
Annenberg School for Communication and Journalism & Department of Psychology, University of Southern California, Los Angeles, California

John L. Christensen
Department of Communication and Center for Health, Intervention, & Prevention, University of Connecticut, Storrs, Connecticut

William C. Pedersen and Anila Putcha-Bhagavatula
Department of Psychology, California State University, Long Beach, Long Beach, California

Paul Robert Appleby
Annenberg School for Communication and Journalism & Keck School of Medicine, University of Southern California, Los Angeles, California

Sex and mating are central to evolutionary processes. Understanding the factors, including the evolved mechanisms, affecting men's and women's sexual decision making, is of interest to scientists, and the public at large. But "getting it right" is critical to researchers trying to develop more effective interventions to address today's important health issues (e.g., preventing HIV, the sexually transmitted virus that causes AIDS, in high-risk populations).

In the current work, we briefly describe attachment fertility theory (AFT; Miller & Fishkin, 1997; Miller, Pedersen, & Putcha-Bhagavatula, 2005; Miller, Putcha-Bhagavatua, & Pedersen, 2002; Pedersen, Miller, Putcha-Bhagavatula, & Yang, 2002; Pedersen, Putcha-Bhagavatula, & Miller, 2011), and Stewart-Williams and Thomas's (this issue) approach, then we discuss the communalities and differences between these approaches. AFT's ability to provide a unified, universal (sex-similar) framework for understanding *intraindividual* and *interindividual sexual diversity* (e.g., from short-term relationships to pair-bonds) has guided unique research questions, including in HIV prevention research. It has done so with high-risk populations (e.g., men who have sex with men) who engage in high levels of sex (and unprotected anal intercourse [UAI]) with numerous sexual partners. One might think that high-risk men who have sex with men (MSM) might be an unlikely population for testing AFT's predictions. Nevertheless, we briefly present a new set of findings that demonstrates how generalizable and useful AFT can be in developing testable hypotheses regarding sexual behaviors and sexual risk taking. Finally, along with our conclusions, we discuss what tools are needed to better understand systems of evolved mechanisms and advance future work in this field.

Attachment Fertility Theory

The opening paragraph of Miller and Fishkin's (1997) argument reads as follows:

> Are close, relatively enduring relationships, fundamental to human beings? In this work, biological and psychological evidence is presented that suggests the intriguing possibility that our current biological design—rooted in our Pleistocene gatherer-hunter roots—strongly favors relatively enduring relationships and few sex differences in mating strategies . . . . Because human infants were exceptionally dependent primates (Fisher, 1987, 1989), the involvement of paternal as well as maternal caregivers was critical for offspring survival. As they are today, high levels of paternal involvement would be expected to be associated with close, relatively enduring pair-bonds (Draper & Harpending, 1988, p. 197)

Our initial findings (Miller & Fishkin, 1997), and subsequent studies (Miller & Fishkin, 1997; Miller et al., 2002; Miller et al., 2005; Pedersen et al., 2002), challenged the claim of large sex differences in long-term or even in short-term human mating and yielded findings much more in line with AFT's claims. Pedersen et al. (2002), for example, found that men's and women's median number of desired partners in 30 years was one, a finding that is consistent with Schmitt's (2003) cross-cultural findings, as is apparent, not in the text but in one of his figures.[1] We also

[1]What is needed in this area is a systematic, deep, critical review. Often what is claimed is not what is found. For example, Buss and Schmitt (1993) claimed that their findings supported sex-distinct mating mechanisms for short-term and long-term mating, but they did not consistently examine sex differences on the same variables for men versus women, or tested the sex by mating strategy implicit

found that the vast majority of the men (98.9%) and women (99.2%) said they wanted to eventually settle down with one mutually exclusive sexual partner at some point in their life, ideally—on average—in the next 5 years. Before settling down, neither the median number of partners desired nor median number of short-term partners desired (0) differed by gender.

In more recent empirical work, Pedersen et al. (2011) also directly tested and challenged the assumptions of sexual strategies theory (Buss & Schmitt, 1993). We found, for example, that men more so than women *did not* spend proportionately more of their total mating effort on short-term relationships, lower their standards in short-term compared to long-term mating when men and women were compared on the same variables, or feel reproductively constrained by women. Our work typically suggested that there was often large overlap between men's and women's distributions (see, e.g., Miller & Fishkin, 1997; Pedersen et al., 2002) and little in the way of gender difference in central tendency when appropriate tests are used. More recently, Conley, Moors, Matsick, Ziegler, and Valentine (2011) reviewed a series of findings that showed that many gender differences (e.g., in desire for causal sex) purported to support evolutionary accounts were completely eliminated or not what they seemed, providing a very different interpretation that did not support a genetic, biological, or evolutionary explanation.

Stewart-Williams and Thomas's Argument

Stewart-Williams and Thomas (this issue) argue for an alternative evolutionary position that, in a nutshell, makes these arguments: (a) "as brain size increased in the hominin lineage, our young became progressively more dependent and the childhood period became progressively longer" (p. 138); (b) "As a result, pair bonding and male parental care became central elements in our reproductive repertoire" (p. 138); (c) "Consequently, we exhibit reduced psychological dimorphism. Moreover, we are not the kind of species in which females alone exert mate choice or males alone compete for mates; we are a species with mutual courtship" (p. 138). In addition, Stewart-Williams and Thomas argue that claims regarding sex differences in mating strategies are exaggerated.

We find ourselves in general agreement with these basic arguments. But, then again, as just suggested, many of these and/or related arguments were made earlier in AFT (Miller & Fishkin, 1997) and subsequent work.

Next we start with an elaboration of the communalities between AFT and Stewart-Williams and Thomas's position just mentioned. Then we discuss how the approaches differ.

Communalities

There are numerous communalities between these approaches. For example, let's consider Stewart-Williams and Thomas's argument regarding the "exceptional dependency of human offspring" in human evolutionary history. Many of Stewart-Williams and Thomas's arguments, perhaps not surprisingly, cover familiar ground. For example, Miller and Fishkin (1997) and subsequent work (e.g., Miller et al., 2005) similarly point to the role of bipedalism (with an enlarging female pelvis) and a subsequently expanding human brain, in producing what Fisher called an "obstetrical crisis," which is likely to have resulted in more immature and less well-developed human offspring. AFT also pointed to the extended dependency in childhood for humans compared to other primates, the increased number of human concurrent dependent offspring, and high rates of infant mortality. In short, "because human infants were exceptionally dependent primates (Fisher, 1987, 1989), the involvement of paternal as well as maternal caregivers was critical for offspring survival" (Miller & Fishkin, 1997, p. 197).

As AFT does, Stewart-Williams and Thomas also argue for pair-bonding and biparental care as solutions to grapple with dependent offspring. As Stewart-Williams and Thomas note, "the idea that pair bonding and biparental care are a central part of our evolutionary endowment appears to be viable (Geary, 2000; Geary & Flinn, 2001; Gray & Anderson, 2010; Kaplan, Hill, Lancaster, & Hurtado, 2000; Lancaster & Lancaster, 1983; Miller & Fishkin, 1997)" (p. 145) and, we would add, certainly—at this point—not a new idea. Regarding pair-bonds, Stewart-Williams and Thomas argue that these are held together by a variety of factors, including "sexual desire, romantic love, and long-term attachment (Fisher, 1992)" (p. 145). Of course, AFT also reviewed that literature and argues for the importance of the hormonal, neural, and neuromodulator mechanisms underpinning these phases of attachment leading up to and supporting pair-bonding outcomes (Miller & Fishkin, 1997; Miller et al., 2005),

in their theoretical reasoning (Miller et al., 2002). When we tested this (see Pedersen et al., 2011), we did not find support for this or other critical assumptions of Buss and Schmitt's theory. Schmitt (2003) claimed that "sex differences in the desire for sexual variety were evident regardless of whether mean, median, distributional, or categorical indexes of sexual differentiation were evaluated" (p. 85), however, one needs only to look at Figure 2 on page 94 and use the knowledge that if less than 50% of the sample desires more than one partner over 30 years, then the median of the samples from each of the 10 world regions (except Oceania) must have been one partner desired for men and one partner desired for women. This would not seem to reflect a lot of variety desired by either women or men. Schmitt, however, did not appropriately test for median differences, and did not mention that the medians for men and women were one.

even though Stewart-Williams and Thomas provide a somewhat updated account.

Stewart-Williams and Thomas argue that (a) pair-bonds do not "necessarily last for life" and (b) pair-bonds need not be sexually exclusive, and that (c) pair-bonds are not the only mating outcome that humans exhibit. We certainly agree and do not claim otherwise, although they suggest that we do. In fact, we pointed this out, in our very definition of pair-bond (see Miller & Fishkin, 1997). We said that pair-bonds need not last for life, they need not be sexually exclusive, and humans can exhibit a wide diversity of mating outcomes.

> "The reader should note that we do not mean to imply that pair-bond is synonymous with monogamy" (p. 198), a term often "used to refer to whether an individual is having sex with only one other partner (behavioral monogamy)" (p. 198). Furthermore, "sexual relationships, whether short- or long-term can either be sequential (behaviorally monogamous) or involve simultaneous multiple partners (behaviorally non-monogamous). In using the term *pair-bond* we are referring then to an emotionally close, relatively enduring sexual relationship." (p. 198)

In fact, especially during the first few years of pair-bond formation, pair-bonds can be fragile, and they can break down after that (Hazan & Zeifman, 1999). Humans also have the mechanisms to "get out of" pair-bonds, even after a full-fledged pair-bond has formed (see Miller & Fishkin, 1997; Miller et al., 2005), and often humans can be in (or moving from) a pair-bond while pursuing a new relationship, a topic to which we return later.

AFT noted that father presence versus absence can have a profound effect on a child's survivability across cultures. Furthermore, a variety of studies are increasingly providing evidence of the biological footprint of evolved paternal (as well as maternal) caregiving in humans. As Stewart-Williams and Thomas's review in this area indicates, this literature has increasingly provided evidence for many of AFT's (Miller & Fishkin, 1997) arguments.

Miller and Fishkin (1997) also suggested that secure individuals and warm responsive caregiving might especially provide "windows" on our evolutionary past. It is interesting that as Draper and Harpending (1988) noted, that unlike in father absent societies,

> in father present societies, both male and female offspring as adolescents, are more careful and reticent in choosing partners and entering into sexual relationships, have good skills for forming and maintaining close relationships, and tend to form a pair-bond with a single mate. (Miller & Fishkin, 1997, pp. 217–218)

That is, father present societies might provide an especially clear "window" for understanding evolved mechanisms pertaining to mutual partner choice.

There is other common ground as well, in the area of reduction of sexual dimorphism, although perhaps some misunderstandings of our position as well. We agree that there was reduction in sexual dimorphism in our human evolutionary history (e.g., canine dimorphism). Some of this reduction in sexual dimorphism may well have been due to sexual selection, as well as natural selection, as Miller and Fishkin (1997) mention, for example, in discussing Tanner's fascinating argument (Tanner, 1981; Tanner & Zihlman, 1976) regarding the potential role of women's selection of more sociable and friendly males, and the role it may have played in reducing male canine size. In short, Miller and Fishkin (1997) did not rule out sexual selection as Stewart-Williams and Thomas seem to imply. In fact, in a number of areas (e.g., canine dimorphism reduction, size and shape of human penis, larger female breasts, shape and tilt of the vagina, etc.) we think sexual selection, beyond natural selection alone, is quite likely.

Relatively Few and Small Sex Differences

We concur with Stewart-Williams and Thomas that the current evidence suggests relatively few or small sex differences in short-term mating in humans. We find, however, their argument that "AFT has trouble explaining the sex difference in short-term mating predilections" curious (p. 151). Miller and Fiskin's (1997) extensive interdisciplinary review, theoretical approach, and their own preliminary empirical tests of that theory, argued for *relatively few sex differences* in underlying mating mechanisms, and correspondingly relatively few (and small) emergent sex differences in line with other pair-bonding species. AFT is not simply reflecting the state of the field: Rather, those early predictions are now very much in line with subsequent and emerging findings from our team (Miller et al., 2002; Pedersen et al., 2002; Pedersen et al., 2011) and others (see Conley et al., 2011). Conley et al.'s review suggests there may be even less to explain.

We Lack Evidence That Humans Are Specifically Designed to be Short-Term Maters

We noted that on the basis of evolved physical as well as underlying biological and chemical features (e.g., sexual skins, testicle size, immune system functioning, etc.), humans—among primates—are classified as long-term and not short-term maters (Dixson, 1998; Nunn, Gittleman, & Antonovics, 2000; Pedersen et al., 2002). Stewart-Williams and Thomas's position and review covers very similar ground; in fact, they use

the calculations for relative testicle size (we computed) that were part of our earlier review (the reader will note the citation for that—but not the argument—in the footnotes).

Where the Approaches Differ

Although there are numerous communalities between AFT and Stewart-Williams and Thomas's approach, there are notable differences. Before discussing them, we first start with the many misleading claims by Stewart-Williams and Thomas regarding AFT.

Misleading and Inaccurate Claims

AFT does not claim that "long-term pair-bonding is [human's] solitary evolved mating pattern" (Stewart-Williams & Thomas, this issue, p. 151). First, AFT *does* argue that humans evolved a system of mechanisms leading up to, enabling, and supporting pair-bonding.

> In summary, a variety of design elements and historical adaptations may have come together to increase the adaptive advantage of pair-bonding. First, a variety of chemical transmitters may have increased the likelihood of humans forming and maintaining pair-bonds (at least long enough to ensure the survival of young infants). Second, additional chemical agents may have increased the probability of humans being fertile and producing offspring with mates with whom they were regularly sexually active. Third, an obstetric crisis for extended periods may have enhanced the likelihood that females may have selected men who were more committed to relationships and therefore more likely to take care of their offspring. (Miller & Fishkin, 1997, p. 228)

Second, this *does not mean* that an evolved pair-bonding system of mechanisms would *only produce* long-term relationships. The pair-bonding system of mechanisms naturally produces a variety of different types of sexual relationships as outputs (Miller et al., 2005):

> Universal (sex-similar) systems of mechanisms afford enduring pair-bonding . . .while producing dating outcomes (from short-term to nonenduring pair-bonds) as by-products. . .The number of these depends, in part, on time until an emotionally close pair-bond and whether that bond is maintained. Other mechanisms afford relationship repair (e.g., protest, despair) and even permanent detachment when there is sufficient sustained negative or insufficient positive affect. Then the process can begin anew. Variability in parameter settings (e.g., relative levels of neuromodulators) as a result of experiential, maturational, and biological factors produce emergent within and between-subject diversity in mating outcomes over time. (p. 290)

Third, this *does not mean* that humans do not experience other mating behaviors, such as short-term mating or that acts of short-term mating do not naturally fall out as outcomes of this evolved system. We would indeed argue that such relationships naturally "fall out" of the "promiscuous seeking" or "pre-attachment" (Hazan & Zeifman, 1999) testosterone-mediated phase of the overall pair-bonding system (see Miller et al., 2005). When humans are motivated (perhaps by testosterone level) to seek out a partner (e.g., they have not had sex in a while; they are lonely, etc.), if one does not have an existing partner one desires, one is apt to go in search of a new one. Humans do not typically simply select the first available new partner of the appropriate sex with whom to form a relationship. All this promiscuous seeking reflects *choosiness*—and may increase the odds that one will find a promising relationship, but it also increases the odds that one will have more relationships, including more short-term ones. Short-term relationships then naturally "fall out" as outcomes of a system of mechanisms leading up to, supporting, and enabling pair-bonding.

Fourth, AFT's position *does not mean* that other types of relationships (in addition to short-term and enduring pair-bonds) *do not naturally fall out* of such a system of mechanisms. Through the three phases needed to establish a full-fledged pair-bond (Hazan & Zeifman, 1999), things often do not work out in a given relationship. It is argued that the evolved pair-bonding system is designed to try to repair the relationship with specific mechanisms, similar to those used by young children (e.g., protest, despair within the pair-bond phase) but if that does not work, mechanisms can enable emotional detachment (as also happens in attached children).

In this way, human men and women can end up having quite a few relationships as they try again and again, albeit not always consciously, to form an emotionally close relationship that will last. Why would the system be adapted in this way? We have argued that emotionally close relationships signaled to the man and the woman that this relationship could last long enough to support offspring and enhance their chance of survival.

Fifth, AFT argues that there is not credible evidence that humans evolved sex-distinct short-term mating mechanisms (beyond those found in the system of pair-bonding mechanisms previously described). And, using the typical criteria used in making such claims, we find no evidence for evolved sex-distinct mechanisms (Miller et al., 2002; Pedersen et al., 2002).

> Most primatologists do not classify humans as having a short-term mating system, but instead classify

> humans as having a predominately long-term mating system, either monogamous ["two animals that breed together to rear offspring" (Hrdy, 1981/1999, pp. 34–35)] or polygynous ["enduring relationship between a single male and a number of offspring for the purposes of mating and production of offspring" (Dixson, 1998, p. 29)] (Dixson, 1998; Hrdy, 1981/1999). Humans fit with monongamous and polygynous primates, and not with short-term maters, on a variety of parameters, including small testicle size and low sperm counts (Dixson, 1998) and low white cell counts associated with low rates of sexually transmitted diseases. (Nunn, Gittleman, & Antonovics, 2000). (Pedersen et al., 2002, p. 160)

Sixth, we *do argue* that short-term mating, is a natural outcome of the system of mechanisms leading up to pair-bonding. On the other hand, we find no evidence for it emerging from a sex-distinct adaptation (product of selection processes). Still, short-term mating could have been a secondary alternative adaptive strategy (i.e., beneficial to this individual in the current time) for individual men and women.

> When, for whatever reasons, long-term relationships were not possible or difficult to forge and maintain, humans, both men and women, **may have developed a secondary alternative strategy**: short-term relationships. Many humans may seek both types of relationships over time, in part, because at some point or chronically they are unable to achieve (or because of their caregiving histories, less motivated to seek) enduring, emotionally close, long-term relationships. (p. 228, emphasis added)

But, again, we did/do not claim that humans *evolved* sex-distinct short-term mating mechanisms beyond those that are part of the pair-bonding system of mechanisms leading up to, supporting, enabling (and affording the dissolution of) pair-bonds.

We do not argue, as Stewart-Williams and Thomas claim, that "short-term mating is merely a non-adaptive or maladaptive by-product of these mechanisms operating in evolutionarily-novel conditions" (p. 151). This is a misrepresentation. Let us unpack this claim about what AFT claims. To begin, to our knowledge, we do not even use the term "maladaptive" or even "nonadaptive" throughout any of our work. AFT actually argued that chronic patterns of short-term mating may actually be adaptive for some individuals.

> It is important to emphasize that patterns of emergent behavior for nonsecurely attached persons, as well as for those with more distant caregivers, may well be adaptive, given their difficulties in maintaining relationships. Their behavioral strategies may be their most viable alternatives, given the constraints under which they operate. (Miller & Fishkin, 1997, p. 226)

Next, we need to separate out two things here: (a) acts of short-term mating (e.g., having a fling following the breakup of a marriage), which AFT argues naturally emerges (or "falls out") as an outcome in a system of pair-bonding mechanisms from (b) chronic patterns of short-term mating (e.g., having only short-term sexual partners over 10 years). Chronic patterns also naturally fall out of the system, but they are more likely to be tied to additional, more chronic factors (e.g., genetics, early experience differences, early caregiving differences, attachment styles) rather than just state factors (e.g., time since last sex; feelings of closeness toward one's partner) affecting the system's parameters. We suspect that it is this latter pattern to which Stewart-Williams and Thomas refer.

Miller and Fishkin (1997) argued that during the Pleistocene, given greater human infant vulnerability, father presence would have dramatically impacted offspring survivability. If we take father presence as a critical part of our evolved-for social environment, which AFT does, we could view father presence (or more positive engagement with offspring) as a "window" on this heritage. We could contrast that with what happens when fathers are not present or are more psychologically distant. We argued that more distant fathers resulted in

> naturally occurring emergent outcomes: greater difficulties in trusting and forming positive views of others, greater insecurity (and concerns with control), and greater difficulties in forming and maintaining emotionally close relationships. Because of such outcomes, nonsecure individuals may have tended to develop less positive views of others, especially outgroup others (e.g., of the opposite sex), and because they were more insecure, they may have been more likely to compete with and dominate others (e.g., to gain some measure of perceived control). They would have had fewer social skills that enhanced cooperation and would have formed less stable pair-bonds. Because of this, they might have spent a greater proportion of their time seeking less enduring relationships that met at least some of their needs (e.g., short-term relationships). (Miller & Fishkin, 1997, p. 228)

Although we found no overall median sex differences in terms of desired number of partners over the next 30 years, we wondered where we might find sex differences in these distributions. To examine this with our "windows" for paternal caregiving, we measured men's and women's paternal caregiving and broke this down into quadrants (from perceptions that fathers were distant to fathers were warm and responsive). We examined for each of these quadrants the extent to which men and women reported the number of part-

ners they ideally desired in 30 years. We found that both men and women reported a median number of one partner desired for all quadrants except one (the quadrant for most distant fathers and only for men). The men in this quadrant were many of the men in the tails of our distribution (see Miller & Fishkin, 1997).

Were pair-bonding systems of mechanisms evolved systems? How about short-term mating apart from those? AFT (Miller & Fishkin, 1997) argued,

> In short, it seems that a propensity [life-long pattern] to spend more of one's time seeking short-term relationships rather than long-term ones simply may have been "fallout" of a failure to interface with humans' adapted for social environment (e.g., responsive paternal and maternal caregivers). (Miller & Fishkin, 1997, p. 228)
>
> What was the strategy for which we were adapted? We would argue that although short-term mating strategies [e.g., as a chronic predominate pattern] may be fall out from a failure of humans to interface with their adapted for environments, seeking a long-term mate for a close and enduring relationship is based on universal design features (i.e., part of our evolutionary design." (p. 228; bracketed material added for clarity)

If No Evolved Sex-Distinct Mechanisms: How Do We Get Sex Differences in Behavior?

Stewart-Williams and Thomas ask, What if there are sex differences in mating behaviors? "If short-term mating were simply a by-product of sex-similar attachment mechanisms, why would the difference exist at all? How could sex-differentiated short-term inclinations emerge as a side effect of mechanisms that are not themselves sex-differentiated?" (p. 151).

1. *The evidence to date pertaining to sex differences in causal sex typically involves huge overlap between men and women, with typically no differences in medians for men and women, when appropriate statistical analyses are performed*. And, as Stewart-Williams and Thomas point out, claims regarding sex differences are exaggerated. Our discussion of this point earlier, and the recent review by Conley, Moors, Matrick, Ziegler, and Valentine (2011) adds even more credence to this claim. It is not clear to us, at this point, that there is "something to be explained."
2. *The variability that needs to be explained is within-gender variability—which is very large compared to variability between gender, which at this point, is not established*. Another large source of variability that needs to be explained is within-individual variability (e.g., changes over time in individuals' sexual behaviors). Those sources of variability—given their relative size—is where we believe we should focus.
3. AFT argues that *pair-bonding systems of mechanisms can produce a diversity of intraindividual mating behaviors over time* from short-term to enduring long-term relationships. For example, as state-dependent parameter settings change (e.g., sufficient change in hormonal levels; sufficient days without sex) and one's perceived emotional closeness with a long-term partner reaches a key threshold, seeking new sexual partners may be triggered. At the same time, with the *same universal (sex-similar) system of mechanisms, AFT, but not Stewart-Williams and Thomas, parsimoniously could explain large individual differences in diverse (e.g., chronic) patterns of mating preferences and outcomes over time* (e.g., attachment styles and parental caregiving styles predict men's desired number of sexual partners over decades). Individuals' chronic factors (e.g., genetics, early experience, caregiving relationships, hormonal differences, etc.) could "tune" or "set" critical system parameters (e.g., sensitivity to threat or pain; ability to down-regulate emotions, trust of others, relative size or strength, etc.) differently. An additional source of gender differences, as we note next, can and does result among primates not allowed to use their mothers as a secure base (e.g., in lab settings). Combined intra-individual and across-individual differences in parameter settings could act together to affect men's and women's desired numbers of sexual partners, sexual experiences, and abilities to develop and maintain pair-bond over time.
4. *Thus, in AFT's framework, it is not necessary (as it is for Stewart-Williams and Thomas) to posit additional evolved short-term mating mechanisms—distinct from those in the system of mechanisms leading up to, supporting, and enabling pair-bonding—to produce naturally emergent diversity in mating outcomes (including having short-term partners)*. For Stewart-Williams and Thomas it is a challenge to figure out where those sex-distinct mechanisms fit in our underlying biological system—given they concur that there is an absence of evolved sex-distinct design features in humans, normally found in primates with short-term mating adaptations that enhanced reproductive success.

Interwoven Caregiving, Attachment, and Pair-Bonding Systems

AFT views the attachment, pair-bonding, and caregiving systems, as Bowlby (1969/1982) did as interwoven systems (i.e., overlapping, interfacing, and influencing one another) with one system (e.g., caregiving) affecting another (e.g., attachment) affecting

another (e.g., pair-bonding). Although the specific patterns of links among caregiving, pair-bonding, and mate selection mechanisms may be unique to a given species (Insel, 1997, 1999), among similar species (e.g., voles) there are differing patterns of mating preferences, sexual circuitry, parental behavior, and infant attachment depending upon whether these species are promiscuous versus monogamous (also see Carter, 1992; Carter et al., 2005; Carter & Getz, 1993; Getz & Carter, 1996; Young, Nilsen, Waymire, MacGregor, & Insel, 1999, for additional work consistent with this work). Even among primate species that are not pair-bonders (e.g., rhesus monkeys), but where caregiving (typically by the mother) and attachment processes are species typical, when primate mothers do not, or cannot, provide a secure base for their offspring (e.g., Harlow & Zimmerman, 1958), subsequent peer interactions along with the ability to subsequently mate can be profoundly adversely affected. This can also produce sex differences in primate behavior in the lab that are not found in more typical or natural settings (for a review, see Wallen, Zehr, Herman, & Graves, 2003).

Among long-term maters, there are greater *interwoven* and/or supportive neurological links *among attachment systems*—caregiving, pair-bonding, and mate selection systems (Insel, 1997, 1999). Furthermore, Mason and Mendoza (1998) examined and noted the striking similarities among various attachment relationships (e.g., between infant and parent; between mating partners) in a monogamous primate species. And a review of emerging evidence for the neurobiological regulation of parental responses among primates suggests an even greater role of interwoven neuroendocrine mechanisms than had previously been suspected (Maestripieri, 1999).

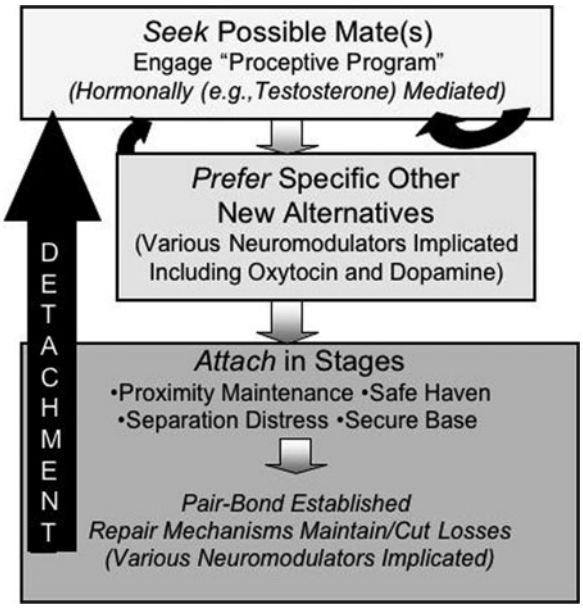

Figure 1. Universal (sex-similar) systems of mechanisms afford enduring pair-bonding (shaded boxes and arrows) while producing dating outcomes (from short-term to nonenduring pair-bonds) as by-products (solid black arrow). *Note*. The number of these depends, in part, on time until an emotionally close pairbond and whether that bond is maintained. Other mechanisms afford relationship repair (e.g., protest, despair) and even permanent detachment when there is sufficient sustained negative or insufficient positive affect. Then, the process can begin anew. Variability in mechanism parameter settings (e.g., relative levels of neuromodulators) as a result of experiential, maturational, and biological factors produce emergent within and between-subject diversity in mating outcomes over time. Source: Miller, Pedersen, and Putcha-Bhagavatula (2005).

Evolved Systems, such as the Pair-Bonding System, Can Produce Various Behavioral Outcomes (From Promiscuity to Pair-Bonds as Outcomes)

However, AFT—unlike Stewart-Williams and Thomas—uses these three sets of biologically based mechanisms, and their neural, hormonal, and neuromodulator concomitants, to argue that the evolved pair-bonding system of mechanisms enables not only pair-bonding as a mating outcome but every other type of mating outcome from more short-term mating outcomes to more long-term pair-bonds (Miller et al., 2005). As we said earlier (see Figure 1),

> AFT argues for universal, sex-similar, evolve mechanisms leading up to and affording pair-bonding. These could also quite naturally (see Figure 1) produce short-term and other types of dating as by-products. That is, humans and other primate species, from those more promiscuous to pair-bonders, engage in the seeking of sexual relationships with possible mates, that is influenced by hormones (Dixson, 1998; Fisher, 2004). This "preattachment phase" (Hazan & Zeifman, 1999) is associated with flirtatious or 'proceptive behavior' (Eibl-Eibesfeldt, 1989). For species that are not exclusively promiscuous, this leads to a specific partner preference phase that is heavily mediated by oxytocin release in humans (see Hazan & Zeifman, 1999; Miller et al., in preparation) and prairie voles (Insel, 1997). A third phase follows with a series of attachment stages that Hazan and Zeifman have identified in humans. From preattachment to established bond, there are parallels in child-parent attachment (Hazan & Zeifman, 1999), and in monogamous voles (Carter, 1998, 2003; Insel, 1997). The underlying evolved mechanisms, can, at least plausibly, be tied to species-wide neuromodulator mechanisms that afford individual variability in parameter settings (Miller et al., in preparation; Insel, 1997). (p. 290)

Not only does this system of mechanisms operate at the within-individual level, over time, as we have mentioned, when we look at individuals patterns of mating behavior over long periods we see patterns in their outcomes that differ across individuals. That is some people, even those who desire more long-term

relationships, may spend decades having numerous short-term relationships. At the other extreme, some individuals may have relatively few partners before they find someone with whom they establish a pair-bond that lasts for decades. Probably most will have a pattern of sexual outcomes over time that falls in between.

One of Miller and Fishkin's (1997) predictions was that as the emotional bond in a pair-bond diminishes, humans universally should seek more sexual partners.

> Today, emotional closeness is still apt to be highly adaptive. In contrast, for women [or men] who are not emotionally close or sexually satisfied (e.g., in terms of frequency, quality) in their primary relationships, the probabilities of being with more than one partner may increase (Laumann, Gagnon, Michael, & Michaels, 1994), along with the adaptive advantages of engaging in sex with another man [or woman]. (p. 210; brackets added)

Because that prediction gets at the dynamic change from one type of relationship to another, it provides a unique test of the predictive power of AFT.

The Predictive Ability of AFT: Predicting Sexual Risk-Taking Over Time

AFT argues that the mechanisms underlying the system of pair-bonding mechanisms should be universal (sex-similar). We wished to set up a very difficult test for AFT. We did so by focusing on an unusual sample: MSM who are highly sexually risky. There are two reasons why this sample is particularly unlikely to produce AFT's predicted effects: (a) MSM are not constrained in sexual relationships as we might expect heterosexual men to be (e.g., by women) according to, for example, Buss and Schmitt (1993). (b) The men in these two particular samples were chosen because they reported one or more sexual partners with whom they had unprotected sex. There was considerable variability in numbers of sexual partners reported.

We had two hypotheses. First, emotional closeness with one's primary partner would be negatively related to one's total number of concurrent nonprimary partners. We also reasoned that individuals who are having an affair outside of their primary partnership, when their primary relationship was no longer providing emotional closeness, might be seeking not only sex but more intimacy (at least physically). One way to do that would be for MSM to have UAI. Thus, our second prediction was that emotional closeness with one's primary partner would be negatively related to the number of times one had unprotected intercourse with nonprimary partners. A primary partner was defined as a man with whom the subject was currently in a long-term relationship (for at least 3 months) and shared a special emotional bond.

To test these hypotheses, we conducted secondary analyses on two separate data sets comprising young MSM who were currently in a relationship with a primary partner. The first data set included 498 MSM. All were 18 to 30 years old; were HIV negative; lived in the Los Angeles metropolitan area; and identified as White, Black, or Latino. The second dataset included a nationwide sample of 299 MSM. These subjects ranged in age from 18 to 24 years; were HIV negative; and identified as White, Black, or Latino.

In both studies, MSM first rated the emotional closeness of their primary relationship and then reported the number of nonprimary partners and number of times they had UAI with these nonprimary partners during the prior 3-month period. In the first data set, we used a modified version of the Relationship Interdependency Scale (Appleby, Miller, & Rothspan, 1999) to assess emotional closeness with one's primary partner. Subjects responded to four of the measure's five items using a scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). Sample items include, "You would be very upset if your relationship ended" and "Your partner provides you with a great deal of emotional support" (Cronbach's $\alpha = .82$). In the second data set, emotional closeness was assessed using a single item measured on a 1 (*not close at all*) to 5 (*extremely close*) scale.

As expected, Spearman correlations revealed that men in a primary partnership who were lower on emotional dependency were especially likely have more sexual partners outside of that relationship. This was observed in the first data set ($\rho = -.327$, $p < .001$) and replicated in the second data set ($\rho = -.428$, $p < .001$). Our second prediction, that emotional closeness would negatively predict the frequency of unsafe sex acts outside of the relationship, was also supported in both the first data set ($\rho = -.244$, $p < .001$) and the second data set ($\rho = -.466$, $p < .001$).

These findings from two studies supported two hypotheses. We found that when MSM's emotional closeness in a relationship is low, there is a concomitant probability that men will have sex with more partners outside of their relationship and that the sex is more likely to be unprotected and risky (in terms of the transmission of HIV). These findings nicely fit with AFT's argument that we can understand short-term mating within the context of a system of mechanisms leading up to, supporting, and leading out of pair-bonds. That is, what is happening in a pair-bond (e.g., closeness level) can act as a trigger for sexual behavior (i.e., promiscuous seeking; sex with multiple partners, intimate—but risky—sex) outside of that relationship.

This provides additional support to the AFT's generalizability and to the predictive power of AFT. We are planning to examine these findings over time to

better understand these relationships, and the direction of effects (or whether a third variable may be responsible, such as individual differences in attachment styles). We expect that men's testosterone levels may also increase as the pair-bond diminishes and unfaithful partners engage in more sex outside of the primary relationship. This work further makes it clear that as an evolutionary approach, AFT can make unique predictions that can have important implications for research in HIV prevention. From an HIV prevention perspective, these findings point to a potential high-risk group among high-risk MSM: those currently in a primary partnership whose emotional closeness is waning.

Conclusions and Future Directions

Stewart-Williams and Thomas (this issue) make arguments very much like those made previously by AFT (Miller & Fishkin, 1997; Miller et al., 2005; Miller et al., 2002; Pedersen et al., 2002; Pedersen et al., 2011). Where the approaches differ is that AFT, but not Stewart-Williams and Thomas, argues that (a) attachment, pair-bonding, and caregiving systems are interwoven and (b) these same universal (sex-similar) systems of mechanisms can explain a diversity of sexual outcomes. These outcomes may be from short-term mating to full-fledged pair-bond, to the breakup of relationships, and the promiscuous seeking of new sexual partners. The system may, but need not, result in one of these emergent sexual relationships becoming a future pair-bond in the making. (c) AFT explains intraindividual mating changes not only over time but also across individual differences in patterns of mating behavior over time (e.g., total numbers of sexual partners, types of partnerships, etc.) over a period.

Stewart-Williams and Thomas acknowledge, as we have (Miller et al., 2002; Pedersen et al., 2002), that humans lack any of the typical indicators primatologists use to assess whether a primate exhibits short-term mating mechanism/design features. Regardless, Stewart-Williams and Thomas still maintain that humans have evolved sex-distinct short-term mating mechanisms. As previously mentioned, AFT argues that additional evolved short-term mating mechanisms beyond those provided by the system of mechanisms leading up to (and out of) and supporting the formation and maintenance of pair-bonds are *sufficient* to explain short-term mating. Unfortunately, we find little here in Stewart-Williams and Thomas's approach—other than perhaps suggesting where the literature might focus more (e.g., on mutual mate choice)—that adds to the literature or would drive new hypothesis testing. From a theoretical position it is less clear to us how Stewart-Williams and Thomas's work adds to the literature.

AFT's theoretical position *drove* new research questions, and questioning about claims, warrants, and evidence regarding whether there are large sex differences in mating strategies after accounting for alternative explanations. We would argue there is ample reason to question whether "when the dust settles" there will be good evidence for any sizeable sex differences in causal dating—and credible evidence of biologically based sex-distinct mating mechanisms—to convincingly argue for sex-distinct short-term mechanisms. Furthermore, AFT suggested how promiscuous seeking fits in the overall human mating system and how different parameter settings on the same sex-similar universal system could result over time in within and between individual variability in lifelong sexual behavior outcomes**.** It also suggests why individuals sought different types of sexual relationships; why infidelity occurs (e.g., reduction in emotional closeness); and how and why the system features guide us toward seeking, establishing, and retaining relationships that will enhance the survivability of our offspring. The system does this, we argue, across all humans living today, including for men, unconstrained by women in their relationships—that is for MSM. These recent findings further support this theoretical position.

System Science and Computational Modeling

AFT argues for the importance of understanding systems of mechanisms and how they are interwoven to impact emerging sexual behavior. Understanding within and between individual differences in these patterns over time is challenging. Part of our difficulty as a field is that our typical tools are really not well adapted to help us understand systems and how parameter settings within these systems influence emerging patterns of outcomes within and across individuals. Many of these dynamics are increasingly being understood in terms of brain patterns. But understanding the system dynamics of brain systems has been a challenge. Clearly computational models are needed as tools to help understand this complexity. But those tools will need to operate at a variety of levels of scale to understand neural circuitry as well as individual, dyadic, and group-level behavior. Read and Miller, along with a variety of colleagues, are currently working on developing the tools that might do just that. With such tools, understanding the dynamics that have eluded us to make better predictions within individuals as well as across them could change from being a dream to becoming a reality.

Acknowledgments

The research described was supported by Grant Number R01 MH082671 from the National Institute of Mental Health (NIMH) and Grant Number R01 AI052756 from the National Institute of Allergy and Infectious Diseases (NIAID) awarded to Dr. Lynn

Carol Miller. The content is solely the responsibility of the authors and does not necessarily represent the official views of the NIMH, NIAID or the National Institutes of Health (NIH).

Note

Address correspondence to Lynn Carol Miller, Annenberg School for Communication and Journalism, University of Southern California, Los Angeles, CA 90089. E-mail: lmiller@usc.edu

References

Appleby, P. R., Miller, L. C., & Rothspan, S. (1999). The paradox of trust for male couples: When risking is a part of loving. *Personal Relationships*, *6*, 81–93.

Bowlby, J. (1982). *Attachment and loss: Vol. 1. Attachment*. New York, NY: Basic Books. (Original work published 1969)

Buss, D. M., & Schmitt, D. P. (1993). Sexual strategies theory: An evolutionary perspective on human mating. *Psychological Review*, *100*, 204–204.

Carter, C. S. (1992). Oxytocin and sexual behavior. *Neuroscience and Biobehavioral Reviews*, *16*, 131–144.

Carter, C. S. (1998). Neuroendocrine perspectives on social attachment and love. *Psychoneuroendocrinology*, *23*, 779–818.

Carter, C. S. (2003). Developmental consequences of oxytocin. *Physiology and Behavior*, *79*, 383–397.

Carter, C. S., Ahnert, L., Grossmann, K., Hrdy, S. B., Lamb, M. E., Porges, S.W., & Sachser, N. (Eds.). (2005). *Attachment and bonding: A new synthesis*. Cambridge, MA: MIT Press.

Carter, C. S., & Getz, L. L. (1993). Monogamy and the prairie vole. *Scientific American*, *268*, 100–106.

Conley, T. D., Moors, A. C., Matsick, J. L., Ziegler, A., & Valentine, B. A. (2011). Women, men, and the bedroom methodological and conceptual insights that narrow, reframe, and eliminate gender differences in sexuality. *Current Directions in Psychological Science*, *20*, 296–300.

Dixson, A. F. (1998). *Primate sexuality: Comparative studies of the prosimians, monkeys, apes and human beings*. New York, NY: Oxford University Press.

Draper, P., & Harpending, H. (1988). A sociobiological perspective on the development of human reproductive strategies. In *Sociobiological perspectives on human development* (pp. 340–372). New York, NY: Springer.

Eibl-Eibesfeldt, I. (1989). *Human ethology*. New York, NY: Aldine de Gruyter.

Fisher, H. E. (1987). The four-year itch. *Natural history*, *96*(10), 22–28.

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

Fisher, H. E. (1992). *The anatomy of love: The natural history of monogamy, adultery, and divorce*. New York, NY: Norton.

Fisher, H. (2004). *Why we love—The nature and chemistry of romantic love*. New York, NY: Holt.

Geary, D. C. (2000). Evolution and proximate expression of human paternal investment. *Psychological Bulletin*, *126*, 55.

Geary, D. C., & Flinn, M. V. (2001). Evolution of human parental behavior and the human family. *Parenting: Science and Practice*, *1*, 5–61.

Getz, L. L., & Carter, C. S. (1996). Prairie-vole partnerships. *American Science*, *84*, 56–62.

Gray, P. B., & Anderson, K. G. (2010). *Fatherhood: Evolution and human paternal behavior*. Cambridge, MA: Harvard University Press.

Harlow, H. F., & Zimmermann, R. R. (1958). The development of affective responsiveness in infant monkeys. *Proceedings of the American Philosophical Society*, *102*, 501–509.

Hazan, C., & Zeifman, D. (1999). Pair-bonds as attachments: Evaluating the evidence. In J. Cassidy & P. R. Shaver (Eds.), *Handbook of attachment theory and research* (pp. 336–354). New York, NY: Guilford.

Hrdy, S. B. (1999). *The woman that never evolved: With a new preface and bibliographical updates*. Cambridge, MA: Harvard University Press. (Original work published 1981)

Insel, T. R. (1997). A neurobiological basis of social attachment. *American Journal of Psychiatry*, *154*, 726–735.

Insel, T. R. (1999). Animal research in psychiatry and neurology. *CNS Spectrums*, *49*(10), 18.

Kaplan, H., Hill, K., Lancaster, J., & Hurtado, A. M. (2000). A theory of human life history evolution: Diet, intelligence, and longevity. *Evolutionary Anthropology*, *9*, 156–185.

Lancaster, J. B., & Lancaster, C. S. (1983). Parental investment: The hominid adaptation. In D. Ortner (Ed.), *How humans adapt: A biocultural odyssey* (pp. 33–66). Washington, DC: Smithsonian Institution Press.

Laumann, E. O., Gagnon, J. H., Michael, R. T., & Michaels, S. (1994). *The social organization of sexuality: Sexual practices in the United States*. Chicago, IL: University of Chicago Press.

Maestripieri, D. (1999). The biology of human parenting: Insights from nonhuman primates. *Neuroscience & Biobehavioral Reviews*, *23*, 411–422.

Mason, W. A., & Mendoza, S. P. (1998). Generic aspects of primate attachments: Parents, offspring and mates. *Psychoneuroendocrinology*, *24*, 765–778.

Miller, L. C., & Fishkin, S. A. (1997). On the dynamics of human bonding and reproductive success: Seeking windows on the adapted-for human–environmental interface. In J. A. Simpson & D. T. Kenrick (Eds.), *Evolutionary social psychology* (pp. 197–235). Mahwah, NJ: Erlbaum.

Miller, L. C., Pedersen, W. C., & Putcha-Bhagavatula, A. (2005). Promiscuity in an evolved pair-bonding system: Mating within and outside the Pleistocene box. *Behavioral and Brain Sciences*, *28*, 290.

Miller, L. C., Putcha-Bhagavatula, A., & Pedersen, W. C. (2002). Men's and women's mating preferences: Distinct evolutionary mechanisms? *Current Directions in Psychological Science*, *11*, 88–93.

Nunn, C. L., Gittleman, J. L., & Antonovics, J. (2000). Promiscuity and the primate immune system. *Science*, *290*, 1168–1170.

Pedersen, W. C., Miller, L. C., Putcha-Bhagavatula, A. D., & Yang, Y. (2002). Evolved sex differences in the number of partners desired? The long and the short of it. *Psychological Science*, *13*, 157–161.

Pedersen, W. C., Putcha-Bhagavatula, A., & Miller, L. C. (2011). Are men and women really that different? Examining some of Sexual Strategies Theory (SST)'s key assumptions about sex-distinct mating mechanisms. *Sex Roles*, *64*, 629–643.

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

Tanner, N. (1981). *On becoming human*. New York, NY: Cambridge University Press.

Tanner, N., & Zihlman, A. (1976). Women in evolution. Part I. Innovation and selection in human origins. *Signs: Journal of Women in Culture and Society*, *1*, 585–608.

Wallen, K., Zehr, J. L., Herman, R. A., & Graves, F. C. (2003). Sexuality. In D. Maestripieri (Ed.), *Primate psychology* (pp. 69–107). Cambridge, MA: Harvard University Press.

Young, L. J., Nilsen, R., Waymire, K. G., MacGregor, G. R., & Insel, T. R. (1999). Increased affiliative response to vasopressin in mice expressing the vasopressin receptor from a monogamous vole. *Nature*, *400*, 766–768.