

male sexual promiscuity (Smith 1984). Anatomical, physiological, psychological, and behavioral data suggest that sperm competition was an important selection pressure throughout human evolution (Baker & Bellis 1993; Gallup et al. 2003; Goetz et al. 2005; Shackelford et al. 2002; Smith 1984).

At first, one might posit that a high sex ratio would generate more sperm competition because there is a surplus of males in the population and therefore, more males' sperm competing for fewer females' eggs. However, sperm competition is independent of the general area of intrasexual competition. Instead, it is a low sex ratio (more women than men) that is likely to generate more intense sperm competition. As predicted by sex ratio theory and documented by Schmitt, a low sex ratio is associated with greater sexual promiscuity because men are the scarce, valued resource and can actualize their preference for promiscuous sex. Sexual promiscuity or unrestricted sociosexuality increases the likelihood that sperm from two different men will occupy simultaneously a woman's reproductive tract and thus generates an increased risk of sperm competition (Smith 1984). Risk of sperm competition therefore is hypothesized to be a consequence of variations in sex ratio and in sociosexuality. That is, variations in sex ratio and sociosexuality are expected to influence the risk of sperm competition, which will consequently produce variations in particular sexual behaviors.

One sexual behavior that may be facultatively contingent on the risk of sperm competition is copulatory frequency. High in-pair copulatory frequency has been proposed as a corrective measure in the context of sperm competition, because the relative abundance of sperm from the primary male would outnumber rival sperm, as a result of differential insemination frequency (Parker 1984). An increase in the frequency of in-pair copulations in response to cues of increased risk of sperm competition has been documented in several species of birds, insects, and mammals (e.g., Dickinson & Leonard 1996; Evans et al. 2003; Møller & Birkhead 1989). We therefore predict that in societies with a low sex ratio (more women than men) and unrestricted sociosexuality, men will initiate more copulations with their in-pair partner. Accordingly, there is substantial variation in the copulatory rates of peoples in different societies. Ford and Beach (1951), for example, reviewed anthropological records and identified tribes in which couples copulated an average of once per week, tribes in which couples copulated an average of three to four times per week, and tribes in which couples copulated more than seven times per week.

Existing data related to the interrelationships among sex ratio, sexual behavior, and the risk of sperm competition are not abundant, but some data can be reexamined to assess informally if copulation frequency (a sperm competition parameter) is related to local sex ratio. Ford and Beach (1951), for example, documented that the Keraki tribe of Papua New Guinea report copulating once per week on average. If sex ratio, sociosexuality, and sperm competition risk are related, as we predict, we expect the Keraki to have had a high sex ratio. A high sex ratio is associated with lower sociosexuality and (theoretically) with lesser risk of sperm competition. We examined data taken from the same time period and, indeed, found some evidence that New Guinea had a correspondingly high sex ratio (Keesing 1952). Data from the Keraki are consistent with the hypothesis that a high sex ratio and restricted sociosexuality are likely to generate lesser sperm competition in a population.

Another society in Papua New Guinea for which there are records of the sex ratio and of sexual behavior is the Chimbu of Mintima (Brown 1978). Although the sex ratio was not formally recorded, Brown (1978) repeatedly mentions the noticeable surplus of women, attributable to the death of men in warfare. The Chimbu, therefore, had a low sex ratio. Although polygyny was practiced among one-third to one-half of the population, female sexual infidelity was frequent. Brown (1978) describes several conflicts arising from adulterous wives and jealous husbands. Brown also writes, "A pregnant bride or unmarried girl is thought

to be promiscuous; it is believed that the baby has been fathered by 'all the men,' and her husband may deny responsibility" (p. 176). Data from the Chimbu are consistent with the prediction interrelationships among a low sex ratio, unrestricted sociosexuality, and greater sperm competition risk.

We cannot rule out the possibility that copulatory frequency is an artifact of sociosexuality, for example, independent of sperm competition risk. Multiple sperm competition parameters (e.g., cuckoldry rates, testis size) are needed to determine if sex ratio, sociosexuality, and sperm competition are interrelated.

Schmitt recognized that future research is needed to discover other factors associated with sex ratio and with sociosexuality. Sperm competition theory, in conjunction with sex ratio theory (Pedersen 1991) and strategic pluralism theory (Gangestad & Simpson 2000), may help to provide a more complete theory of cross-cultural variation in sexual behavior.

Medical advances reduce risk of behaviours related to high sociosexuality

Valerie J. Grant

Health Psychology, University of Auckland, Private Bag 92019, Auckland, 1, New Zealand. vj.grant@auckland.ac.nz

Abstract: Although statistically significant correlations have been found among political, economic, and social indices, on the one hand, and measures of sociosexuality, on the other, it is likely that these correlations are second-order effects. Underpinning the reproductive freedom associated with higher sociosexuality are factors more closely related to biology, namely, easy access to safe, effective contraception and reproductive medical care.

Schmitt summarised his findings by reporting *inter alia* that "sex differences in sociosexuality were significantly larger when reproductive environments were demanding but were reduced to more moderate levels in cultures with more political and economic gender equality" (abstract). This conclusion was based on his investigation of both social structural theory and strategic pluralism.

Schmitt opted for "political and economic gender equality" as his criterion for looking at social structural theory and used as measures "percentage of women in parliament, percentage of women in ministerial positions, percentage of women-headed households, and divorce rates across cultures" (sect. 6.7.1). While investigating strategic pluralism, he looked at the prevalence of low birth weights, women's mean age at marriage, and GDP (gross domestic product per capita). He noted that the "same sex-differentiated pattern of correlations was evident for infant mortality rate, teen pregnancy rate, mean age at marriage, and the Human Development Index" (sect. 6.7.2).

It is perfectly plausible that there would be statistically significant correlations between all these measures and sociosexuality scores. And Schmitt adds to the usefulness of these theories by documenting support for them. However, these are mostly second-order effects, the primary factors being more closely related to biology. For example, if women were not freed from unplanned and often frequent child bearing they would be unlikely to be members of parliament, let alone hold ministerial positions. They would be much less likely to contribute to GDP, nor would they be deferring marriage and pregnancy at least until their early thirties, and sometimes indefinitely.

Thus Schmitt underestimates the arguably overwhelming effect of modern contraception; availability of safe, early abortion; advances in reproductive healthcare; and medical protection against sexually transmitted diseases (STDs). This means he may be underestimating the extent to which high sociosexuality or promiscuity in premodern or third-world cultures was or still is a high-risk, life-threatening strategy, especially, but not solely, for women.

In contemporary settings where antibiotics and contraceptives are not reliably available (and before their introduction in modern cultures), women capable of weighing future consequences are less likely to participate in promiscuous sexual activity, thus avoiding both pregnancy and STDs. Because such forward-looking women are also likely to be the best educated, it would not be surprising if Schmitt et al.'s (2003b) college samples reflected the attitudes of well-informed, forward-looking women in all the cultures they measured rather than those who are less well-informed. In doing so, they may be both underestimating sociosexuality for third-world cultures and overestimating it for developed countries.

Before the advent of modern medicine, most reproductively successful cultures had strong social constraints against promiscuity in women. Such constraints could be viewed as evolutionarily strategic, having as their outcome a protective, even life-saving effect on women of reproductive age.

Campbell (1999) described how, from an evolutionary perspective, women have more (than men) to lose and less to gain from taking risks involving physical harm, because in the environment of evolutionary adaptation "infant survival depended more on maternal than on paternal care and defence." Or, as Browne (1999) expressed it, "Because death has greater negative fitness consequences for females, women are more concerned with staying alive than are men." Infant dependence is a fact of biology. Thus, "if a mother wants her children to survive, then she must be equally concerned with her own survival" (Campbell 1999).

Before the advent of medical science, the death rate for young women was the same as or higher than for young men. Young women who conceived too early during their lifespans could and did die of the complications of pregnancy and spontaneous abortion. Women high in sociosexuality could and did contract untreatable STDs, which resulted in death for both themselves and their babies. Women low in sociosexuality, or those surrounded by tight social and cultural constraints on sexual behaviour at least had the benefit of being slightly older at first pregnancy and better supported when the baby arrived, thus increasing life expectancy for both mother and child.

In a section entitled, "Do we need Darwin?" Campbell (1999, p. 242) wrote that "some commentators seek to replace an evolutionary analysis with a menu of alternative social theories." Campbell was arguing the case for an evolutionary basis for sex differences in aggression, but the same argument applies to being unwilling to take risks that involve bodily harm in other settings, especially those involved in high sociosexuality, because these have clear links with reproductive outcomes.

Schmitt's article illustrates this contention. Although it is not clear whether Schmitt himself prefers an evolutionary interpretation of his data, he goes to some length in his article to substantiate the cultural, political, and social ramifications rather than the underlying biological basis. That is, instead of searching social indices, he could have searched for international data on the availability of effective contraception, safe abortion, good ante- and postnatal care, as well as easy access to STD clinics.

Of course, there is nothing wrong with documenting both. And given the tensions between disciplines, it may pay to minimise so-called reductionist explanations in some settings, in favour of the more expansive ones. But in my opinion there is no need for either to be ignored or de-valued. Each exists, the one underpinning the other. Both levels of explanation enrich our understanding of human behaviour.

The trees are not the forest, and monogamy is certainly not a kind of wood

Shashi Kiran

National Institute of Mental Health and Neurosciences, Bangalore, India
560029. ishashi@yahoo.com skiran@nimhans.kar.nic.in

Abstract: The target article, which is part of a larger study, the International Sexuality Description Project (ISDP), seeks to explore cross-culturally aspects of human mating behavior on a global scale. However the non-representation of large cultures restricts the depth of this study. The inferences drawn from such a sample must therefore remain limited despite the impressive sample sizes. In a larger context it raises thoughts on how partial disclosures may misrepresent the design of the larger study.

The target article is a part of the larger International Sexuality Description Project (ISDP). In the target article the objective the ISDP sets for itself is testing the cross-cultural validation of the Sociosexual Orientation Inventory (SOI; Simpson & Gangestad 1991). It does succeed in certain ways. The span of cultures the SOI is tested on, the translations of the SOI, and the sample size are impressive. It is by these same standards that the methodology appears to have limitations. A definition of *culture* speaks of its coming into being wherever people engage in joint activity over a period of time (Cole 1996). Such a definition goes beyond geopolitical boundaries and is a pragmatic definition of culture. This essentially means that there are macro and micro issues involved in cultures, and that mating as a cultural phenomenon has both macro and micro perspectives. In addition, phenomena are believed to be universal and possibly modulated by biological processes. The sequel of these phenomena in the form of thoughts, acts, and behaviors is largely influenced by the sociocultural milieu in which these phenomena occur. This is particularly so in sexuality related behaviors. Mating behavior is one aspect of sexuality and by itself is a highly dynamic factor. The inference drawn is that mating as a behavior has both macro dimensions and individualized factors in various degrees at different points of time. Thus there are mating behaviors in different ethnic and national groupings, which at the same time have universally common factors, as well as unique differentiating factors.

Schmitt does not attempt to delineate his definition of culture, and presumably it is national identity that Schmitt has in mind when he speaks of "modern cultures." The concept of a nation is only one construct, and that, too, is a relatively recent attribute of cultures. It is not even equitably distributed given that there are cultural identities that cross political boundaries, and multiple cultures exist within a nation. Thus it sounds unreal when Schmitt concludes with a certainty that the SOI scores in the tested cultures indicate the mating patterns in that culture. He goes on to state that the SOI predicts national levels of sociosexuality, which remains only a presumption because the gauge of culture has only been nationality.

Mating is a sexual activity seen across the biosphere in a variety of forms, and in human cultures, this takes on a greater variety of forms. In the ISDP, although 48 nations are studied, many cultures do not find representation; 6 of the 10 most populous countries, including the two most populous countries in the world – China and India, with a combined population of more than 2 billion, are not part of the study. The countries not included are multiethnic nations with diverse sexual behaviors, which are unfortunately inadequately documented. Schmitt seems to have lost an opportunity to examine mating strategies and parental investment in these cultures. This is all the more exasperating because corporate entities have conducted preliminary explorations of sexual behaviors in China, India, and Southeast Asian cultures from Malaysia, Thailand, and others (Durex Sexuality Study 2003). However, samples from Arab, African, and South American cultures remain largely underrepresented in the target article. Elsewhere (Schmitt 2002a), Schmitt speaks of recruiting samples in India in the context of infidelity and promiscuity, and this was part