

ORIGINAL ARTICLE

Evolutional background of dominance/submissivity in sex and bondage: the two strategies?

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Abstract

We theorize that sexual arousal by dominance and submission may be connected to a reproduction strategy respecting a reached social dominance rank (a common reproduction strategy in socially living mammals), while the preference for “bondage” may be derived from an opportunistic strategy when being unable to compete for hierarchic rank (an alternative reproductive strategy that co-occurs frequently with the above-named main strategy). The answers to questions dealing with hierarchy in character should correlate exclusively with sexual arousal connected to any kind of expression of a hierarchy, but not with bondage.

The data were obtained from young adults (157 males and 183 females aged 18–20, with mean 18.4 years) via questionnaires.

Results: Seven out of eight questions dealing with hierarchy correlated with sexual arousal by dominance and submission in men (Spearman's $r=0.169-0.313$; $p<0.05 - p<0.001$), two questions correlated with sexual arousal by dominance and submission in women (Spearman's $r=0.32-0.166$, $p<0.001$, $p<0.05$).

The questions dealing with hierarchy correlated with sexual arousal by dominance and submission while no answers correlated with bondage, neither in men nor in women.

The preference for sexual arousal by dominance and submission may be connected to strategy respecting rank, while the preference for “bondage” may be derived from an opportunistic strategy that may be essential for possible partner problems solution. From the evolutionary biology point of view, these patterns of sadomasochistic sex appear as adaptive rather than as pathology.

INTRODUCTION

The diverse independent behavioral patterns of sadomasochistic sex

According to the Diagnostic and Statistical Manual of Mental Disorders, masochists are aroused by being humiliated, beaten, bound, or otherwise made to suffer

(American Psychiatric Association 2000). The list of the named activities (humiliation, beating, binding) is in good accordance with further analyses of sexual practices (Alison *et al* 2001) disclosing that the phenomenon called “sadomasochistic sex” may include diverse and distinct sexual preferences of practitioners. Interpreting the results obtained by questioning Finn-

ish sadomasochistic sex practitioners, Alison *et al* (2001) distinguished several independent facets, namely administration of pain, (ritualistic) humiliation, bodily restriction and hypermasculinity. These facets are in good accordance with the terms used by active practitioners of sadomasochistic sex themselves. The participants distinguish between S/M (sadism and masochism, involvement of strong physical stimuli); D/s sex (dominance and submissivity in sex – the emphasis is on manifestation of hierarchical disparity between partners, strong physical stimuli are not necessary (Hoff 2006; Kolmes *et al* 2006); bondage (the use of physically-restraining devices or materials that have sexual significance for at least one partner (Ernulf & Innala 1995)); and leathersex (eroticization of the macho, masculine image, symbolized by wearing leather clothing and costumes derived from the cowboy, motorcycle rebel, etc., typical for gay subculture (Weinberg 2006)). The practitioners with preference for a particular subset even gather in diverse groups of interest in both real life and cyberspace.

However, a more accurate analysis of the phenomenon may be blurred by co-occurrence of some preferences. At least a part of sadomasochistic sex practitioners claim to be aroused by hierarchical disparity rather than by strong physical stimuli or pain (Cross & Matheson 2006). When focusing on bondage, 33% of subjects mentioned sadomasochism, which either occurred simultaneously with sexual bondage or was perceived as a part of it in their messages posted to internet discussions (Ernulf & Innala 1995). Another effect may play a role. Sadism and masochism are treated as sociological phenomena, dependent upon meanings which are culturally produced, learned and reinforced by participation in the sadomasochistic subculture (Weinberg 2006). Thus, the subjects may first learn about the practice and then include the practice into their sexual behavior. For example, masochists may practice bondage as a strong stimulus providing sexual pleasure, whereas D/s sex participants may use the practice to overemphasize dominance. In addition, many subjects may practice mild bondage to enrich their sexual repertoire independently of their sexual orientation. It follows that mere co-occurrence of specific sexual behaviors does not imply a common evolutionary background of the behaviors. Indeed, the distinct form of sexual behavior may be derived from distinct individual mating strategies (Hirsch & Paul 1996; Thornhill & Palmer 2000). Thus the analysis of a possible evolutionary background of the phenomenon may help to understand the phenomenon.

Arousal by hierarchy disparity and fitness

Sexual arousal by overemphasized hierarchy (e.g. dominatrix-slave play) may originate in a successful reproductive strategy. This hypothesis was recently supported by Jozifkova and Konvicka (2009), who found, in a modern middle-class population, that markers of reproductive success (the number and gender of rela-

tives and self-reported attractiveness) correlated with sexual arousal by higher- or lower- ranking partner (when compared to respondents' hierarchic rank, measured by questions similar to questions 3 and 4 in Table 1), despite the low average number of offspring in modern humans. Specifically, arousal by lower-ranking partner correlated positively with the proportion of males in relatives and with self-reported attractiveness; arousal by higher-ranking partner correlated positively with self-attractiveness. The proportion of males in relatives is supposed to be connected to increased fitness, because a male in good condition can have more offspring than a female in good condition (extension of the Trivers-Willard hypothesis (Trivers & Willard 1973)). Attractiveness may allow one to reach a high quality partner (Buss & Shackelford 2008; Gangestad & Thornhill 2003). Thus, sexual arousal by lower- and/or higher-ranking partner appeared to be a manifestation of a successful reproductive strategy, and hence natural human behavior.

How exactly can sexual arousal by lower- and/or higher-ranking partner increase reproductive success? Arousal by a higher-ranking male likely facilitates mating with a partner possessing good genes (Gangestad *et al* 2004; Simmons *et al* 2004) or/and access to resources (Llaurens *et al* 2009). There is evidence of advantages of such behavior in humans (Fieder *et al* 2005; Mealey 1985). Attractive males usually guard their female partners less than unattractive ones (Kokko & Morrell 2005). Theoretically, women are expected to lower their infidelity when paired with high quality males (Weatherhead & Boag 1995). This view is supported by the finding that human males tend to prevent infidelity by increased displays of dominance (Goetz & Shackelford 2009).

Importantly, it is advantageous for both lower-ranking females and males to couple with higher-rankers of the opposite sex when considering genes/resources. While analyzing a possible explanation for the preference of higher-ranking females for lower-ranking males (i.e., the arousal of (some) women by male submissiveness), we found that hierarchically disparate pairs had an increased number of offspring independently of the higher-ranking gender in a European urban population (data in preparation). This pattern may be caused by increased within-pair cooperation and cohesion, but regardless of its cause, the connection between courtship and social hierarchy is evident. For example, the markers of dominance in men and markers of submissivity in women (e.g. eye movements, body orientation) are apparent in nonverbal communication during courtship (Burke & Sulikowski 2010; Henley 1995; Moore 2010).

The main and the alternative mating strategy

The possibility that a polygamous mating system (more specifically, polygyny) favoring dominant males had been widespread in prehistoric human populations has received support from various areas (Dupanloup

et al 2003; Potts 1997). Polygyny is still permitted in certain cultures throughout the world, especially in Africa and the Islamic world (Sanderson 2001), Australian Aboriginal communities (Chisholm & Burbank 1991), etc. In virtually all societies, polygynous men are almost invariably men of high social rank (Einon 1998), and the same applies to men practicing serial polygyny (Lockard & Adams 1981). Reproductive success varies more prominently in males under polygamy (Einon 1998) when compared to males under monogamy. The shift from polygyny to monogamy appears to be a relatively recent phenomenon, as indicated by analysis of Y-chromosome diversity, suggesting that for millennia, a small fraction of men may have contributed a large fraction of the Y-chromosome pool at every generation in various parts of the world (Dupanloup *et al* 2003; Kayser *et al* 2003).

In the mating systems in which individuals pair, separate and re-pair repeatedly (i.e. serial monogamy), some males still monopolize more than one female's reproductive life span, thus leaving other males effectively mateless. Males who cannot secure females through standard methods may seek alternatives, such as (but not only) rape, to ensure gene passage into future generations (Starks & Blackie 2000). Such a tactic seems to be opportunistic. Still, predisposition towards alternative male mating strategies may contain a genetic component, or may be influenced by maternal effects (Hews *et al* 1997). It has already been suggested that human males may adopt the "quality strategy", a long-term pair bond with considerable paternal investment, or the "quantity" strategy, short-term bonds with little paternal investment (Hirsch & Paul 1996). Genetic polymorphism for alternative mating behavior has been reported in various taxa (Boul *et al* 2007; Hews *et al* 1997). Also in humans, evolutionary forces have influenced the foundations of interpersonal relationships (Bleske & Buss 2000; Gangestad & Simpson 2000).

In the nonhuman world, alternative male mating strategies appear to be relatively common across taxa (Taborsky 1994; Taborsky 2001). If mates can be monopolized through dominance, males may invest in primary access to fertilization by adopting a "bourgeois" or "courting" strategy (Taborsky 1994). These are also called "primary access males" sensu Reynolds in Taborsky (Taborsky 1994). Those unable to compete for dominance may employ alternative "parasitic" or "sneaking" tactics, evading the reproductive monopoly of other males and forcing or stealing fertilization (e.g. Dominey 1984; Healey & Prince 1998).

Hirsch and Paul's (Hirsch & Paul 1996) "quality" strategy, a long-term pair bond (Gangestad & Simpson 2000), may reflect the ability to monopolize the mate through dominance. Individuals involved in the "dominance principle" should respect principles of social hierarchy, preferring signals of mate quality closely associated with dominance. On the other hand, the alternative mating tactics, "quantity" strategy (Hirsch

& Paul 1996), an "opportunistic principle" in this study, should involve not only disposition to romantic relationships (Furlow *et al* 1998), but, to a much larger extent, opportunistic approaches such as rape (McKibbin *et al* 2008; Starks & Blackie 2000) and other sexual practices including various forms of physical restriction (Alison *et al* 2001).

Tested hypothesis

In this study we propose the existence of at least two possible alternatives in mating strategy in humans.

We investigated the consequences of possible human alternative mating strategies resulting from previous human evolution, applying a division of the human reproductive system into monopolizing partners ("dominance principle") and alternative mating tactics ("opportunistic principle"). If the division of human reproductive strategies into the "dominance" and "opportunistic" principles is valid, then the strategies should be heritable. We may predict then, that the answers to questions dealing with hierarchy in character should correlate exclusively with sexual arousal connected to any kind of expression of a hierarchy but not with bondage. One may expect more pronounced divisions in males than in females.

Aims

Sexual arousal by dominance/submissivity and bondage may be derived from distinct mating strategies – the "dominance" strategy and the "opportunistic" strategy. Based on this assumption, we expect the answers to questions dealing with hierarchy to correlate with reported sexual arousal by dominate/dominated but not with a reported preference of binding/bound.

METHODS

Participants

The studied population consisted of 340 last-year students (157 men and 183 women) from 15 high school classes (in two cases, two classes, and in two cases, three classes, from the same school, one class specializing in arts, one containing the best students, who received more detailed education since the fifth level of their basic school) in Prague, Czech Republic. The age of the students ranged from 18 (222 respondents) to 19 (112 respondents) to 20 (6 respondents). The students were asked to voluntarily participate in human natural behavior research and instructed to feel free to terminate their participation in the study. In case they did not want to answer a particular question, they were instructed to skip it rather than provide false information. The respondents signed an informed consent form. The data were collected anonymously.

The targeted group represents a homogeneous population of European young urban adults, who had already attained their first experiences with sex, but have not met their lifelong partners yet, and whose

partnership preferences were not yet biased by experiences of later adult life.

Questionnaire

This study was a part of a larger project. The respondents completed an original questionnaire containing 95 questions altogether. For this study we selected 12 questions (Table 1). The respondents scored the questions on a scale ranging from 1 to 7.

Main Outcome Measures

A score sum of questions focused on bondage (1 and 2 in Table 1) and a score sum of questions focused on dominance/submissivity (3 and 4 in Table 1) were correlated with eight questions dealing with hierarchy (Table 4).

Tab. 1. Questionnaire used and definition of the scoring the answers.

No	Question
1	During sexual intercourse I would like to bind my partner's hands with a silk scarf absolutely no ► 1 2 3 4 5 6 7 ◀ absolutely yes
2	During sexual intercourse I would like my partner to bind my hands with a silk scarf absolutely no ► 1 2 3 4 5 6 7 ◀ absolutely yes
3	When watching a movie or reading a book I would be aroused with a situation in which a partner would be behaving equally to his partner rather than lower-ranking Equally ► 1 2 3 4 5 6 7 ◀ lower-ranking
4	When watching a movie or reading a book I would be aroused with a situation in which a partner would be behaving equally to his partner rather than higher-ranking Equally ► 1 2 3 4 5 6 7 ◀ higher-ranking
5	In my future relationship, my partner will submit to my demands absolutely yes ► 1 2 3 4 5 6 7 ◀ absolutely no
6	In my future relationship will persist an equality between the partners ► 1 2 3 4 5 6 7 ◀ one of the partners will have to subordinate
7	In my future relationship, my partners and I will have a fixed rank relationship ► 1 2 3 4 5 6 7 ◀ our roles may change in due time
8	I will be pleased being successful to force my partner to do something absolutely yes ► 1 2 3 4 5 6 7 ◀ absolutely no
9	If there is no chance to win the conflict or disputation I do not avoid it ► 1 2 3 4 5 6 7 ◀ I do avoid it
10	I often keep control of the conversation when socializing with others frequently ► 1 2 3 4 5 6 7 ◀ rarely
11	Other people (colleagues or friends) often submit to my demands frequently ► 1 2 3 4 5 6 7 ◀ rarely
12	It would be a pleasure for me to force my friends/colleagues to do something absolutely yes ► 1 2 3 4 5 6 7 ◀ absolutely no

Statistics

All data were analyzed with the aid of SAS version 9.1.3. For clustering we used PROC RANK (SAS software). It partitions the original values into a defined number of groups, with the smallest values receiving a quartile value of 0 and the largest values receiving a quartile value of the number-of-groups minus 1. The Spearman rank correlations were computed in PROC CORR.

RESULTS

The data from 319 respondents (146 men and 173 women) were analyzed. When the questionnaire was not complete in the answers analyzed, answers of that person were omitted from the analysis.

Tab. 2. Spearman correlation matrix among "bonding", "bonded", "dominate", and "dominated" for females (N=173).

	Bound	Dominate	Dominated
Binding	0.678***	0.269***	0.184*
Bound		0.371***	0.210**
Dominate			0.428***

* p<0.05, ** p<0.01, *** p<0.001

Tab. 3. Spearman correlation matrix among "bonding", "bonded", "dominate", and "dominated" for males (N = 146)

	Bound	Dominate	Dominated
Binding	0.747***	0.067	0.093
Bound		0.095	0.003
Dominate			0.508***

*** p<0.001

Tab. 4. Spearman correlation coefficients between Dominance/Bondage and other eight questions according to sex of the respondents.

Question No from Table 1	Correlation Coefficients			
	Female N=174-179		Male N=148-150	
	Dominance	Opportunism	Dominance	Opportunism
5	0.033	0.007	-0.236**	0.118
6	0.32***	0.036	0.313***	0.045
7	0.111	0.128	0.183*	0.012
8	-0.132†	0.047	-0.178*	0.065
9	0.089	0.003	-0.169*	0.118
10	0.005	0.036	-0.196*	0.11
11	-0.036	0.098	-0.146††	0.133
12	-0.166*	0.059	-0.164*	0.127

* p<0.05, ** p<0.01, *** p<0.001, † p=0.08, †† p=0.07

Two questions, 3 and 4 in Table 1, focused on dominance (referred to further as “dominate” and “dominated”), representing the “dominance principle” and two questions, 1 and 2 in Table 1, focused on bondage (referred to further as “binding” and “bound”), representing the predicted “opportunistic principle”.

We calculated a Spearman coefficient matrix for females (Table 2) and males (Table 3). In both sexes there was a high correlation between “binding” and “bound,” and between “dominate” and “dominated” despite their assumed contrasting meaning. When using cluster analysis in both sexes, one cluster was based on questions of “dominate” and “dominated,” while the other one was based on “binding” and “bound” (Figure 1). It led us to discern between two different phenomena via calculating two variables.

We established a variable “Dominance” that was a score sum of “dominate” and “dominated,” and a variable “Opportunism” that was a score sum of “binding” and “bound.”

We used these two new variables for further testing and calculated Spearman correlation coefficients with the scores of the rest of the questions (Table 1, questions 5 to 12).

Spearman’s correlation coefficients between “Dominance” or “Opportunism” and eight questions, split according to the sex of the respondents, are shown in Table 4. There were differences in the relationships between male and female respondents. While there was a significant or nearly significant correlation between “Dominance” and all eight other questions for male respondents, this was the case in only three out of eight questions for female respondents. On the other hand, either for males or females, no significant correlation was found between “Opportunism” and any of the eight questions. “Dominance” and “Opportunism” were correlated in females ($r_s=0.379$, $N=173$, $p<0.0001$), but not males ($r_s=0.107$, $N=146$, $p=0.20$).

DISCUSSION

Although the restriction of locomotion may demonstrate dominance in the cultural context, the present study documents that a tendency to bind or to be bound during sexual activity may represent a different behavioral pattern that was not derived from hierarchy between partners in a substantial part of population. This supports previous findings of Alison *et al* (2001), who reported that bondage was associated with physical restriction, but not with ritualistic humiliation. This is in line with our original expectations, and we suggest the pattern may reflect the existence of distinct reproductive strategies in humans.

As predicted, at least for males, the variable “Dominance” correlated or nearly correlated with all eight questions that focused on hierarchical disparity between partners, while the variable “Opportunism” did not correlate with any of them. The correlation coefficients for “Dominance” were significant though not very high. The strength of the correlations may be masked by various proximate factors (e.g. personal experience, life history, attitude, cultural background) (Furrow *et al* 1998; Hawley 1999; Renaud & Byers 2005), which could interact with the varied individuals’ natural tendency.

In women, the differences were less obvious. Only two hierarchical disparity questions correlated significantly with “Dominance”. Nevertheless, the male and female responses agreed with regard to question 6 (Table 1), asking for the expectation that “one of the partners will have to subordinate”. It must be noted that some of the known female reproductive strategies cannot bring benefit while avoiding cost without being discrete. Cuckoldry as a strategy (Goetz & Shackelford 2009; Kaighobadi & Shackelford 2008) and concealed ovulation (Roberts *et al* 2004) are good examples. “Opportunism” realized as “taking a chance” or more

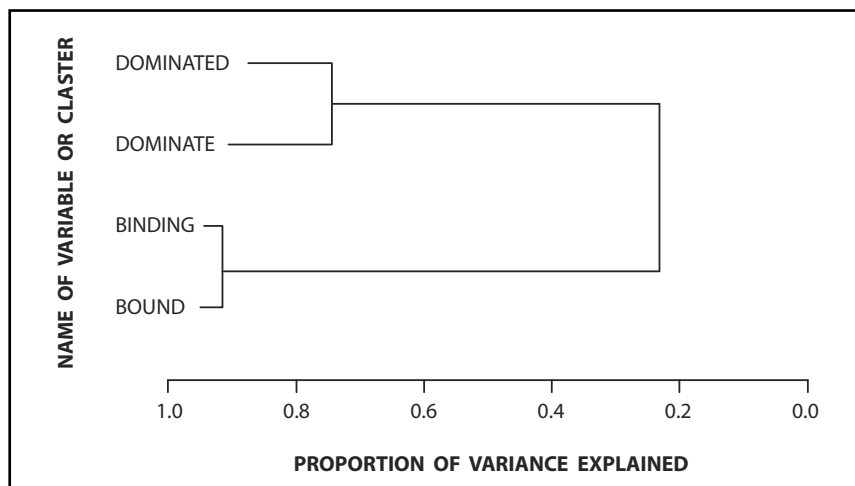


Fig. 1. Cluster analysis applied on questions “binding”, “bound”, “dominate”, and “dominated” for respondents.

specifically “to allow somebody to take the opportunity” must be practiced secretly, too. Thus the strategy may exist independently of the gender of its bearers, but the genders may differ in the ways in how the strategy is manifested and brings expected benefit. Moreover, the male and female preference for “Opportunism” may be connected.

The variation among males in lifetime reproductive success is striking. In still naturally living human populations, such as in New Guinea, an extreme patrilocality and/or biased reproductive success in males has been reported. It has resulted in low levels of Y-chromosome diversity contrasting with high levels of mtDNA diversity reported for the same populations (Kayser *et al* 2003). Thus, male affinity to bondage could represent a male manifestation of opportunistic mating strategy. This strategy, in some aspects related to the strategy of sneakers (Taborsky 1994; 2001) or rapists (e.g. McKibbin *et al* 2008), can be beneficial when rare and disadvantageous when common. Otherwise long-term coexistence of two strategies could not be possible (e.g. Gross 1996). In the same vein, the female affinity to bondage could be an adaptive strategy in situations when opportunistic males are rare and therefore the sons with genes for this strategy are expected to have a high level of fitness (McKibbin *et al* 2008). And/or, it can be speculated that a woman’s affinity to bondage, not affected by the dominance principle, might be associated with an ancient tendency to obtain good genes from outside the local society.

As showed in Table 2, the respondents may prefer both “Opportunism” and “Dominance”. Certainly a portion of respondents may view bondage as a manifestation of hierarchical disparity between partners or they may feel aroused by any “kinky” sexual behavior. Finally, a possibility of co-occurrence of the two tactics (“Opportunism” and “Dominance”) in a single individual that can manifest under different conditions (e.g. conditional strategy (Alcock 2001)) should be considered.

The questions referring to binding and being bound correlated highly and so did questions referring to dominate and being dominated. This could be interpreted in several ways. First, a portion of the respondents may be sexually aroused just by binding or dominating independently of active/passive or dominant/submissive role. Alternatively, the respondents may be unconscious of their concrete specific role due to being young and inexperienced. Or, the substantial portion of respondents may be attracted by both active and passive or dominant and submissive roles. A large portion of sadomasochistic sex practitioners called “switches” are attracted by both sadism and masochism, or both dominance and submissivity (Cross & Matheson 2006; Levitt *et al* 1994; Sandnabba *et al* 1999). Thus the correlation may reflect the reality.

CONCLUSION

Sexual practices such as to bind or to be bound during sexual intercourse are usually interpreted as being linked to dominance. Although it may be used to stress dominance/submissivity, the preference for bondage in a substantial part of the population may represent behaviour originating from different adaptive behavioral patterns than sexual arousal by dominance/submissivity. Arousal by dominance/submission may be connected to dominance strategy respecting hierarchy rank, whereas the preference for “bondage” may be derived from an opportunistic strategy. This finding should be consulted when dealing with problems connected to behavior and partner relations of sexual minorities. Regarding the existence of different reproductive strategies, various sexual practices in humans, including sadomasochistic oriented behavior, appear as adaptive rather than deviant.

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REFERENCES

- 1 Alcock J (2001) *Animal Behavior*. Sunderland: Sinauer Associates, inc.
- 2 Alison L, Santilla P, Sandnabba NK, Nordling N (2001) Sadomasochistically Oriented Behavior: Diversity in Practice and Meaning. *Arch Sex Behav*. **30**: 1–12.
- 3 American Psychiatric Association (2000) *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision*. Washington: American Psychiatric Publishing, Inc.
- 4 Bleske AL, Buss DM (2000) A comprehensive theory of human mating must explain between-sex and within-sex differences in mating strategies. *Behav Brain Sci*. **23**: 593–594.
- 5 Boul KE, Funk WC, Darst CR, Cannatella DC, Ryan MJ (2007) Sexual selection drives speciation in an Amazonian frog. *Proc Roy Soc Lond B*. **274**: 399–406.
- 6 Burke D, Sulikowski D (2010) A New Viewpoint on the Evolution of Sexually Dimorphic Human Faces. *Evol Psychol*. **8**: 573–585.
- 7 Buss DM, Shackelford TK (2008) Attractive Women Want it All: Good Genes, Economic Investment, Parenting Proclivities, and Emotional Commitment. *Evol Psychol*. **6**: 134–146.
- 8 Chisholm JS, Burbank VK (1991) Monogamy and Polygyny in Southeast Arnhem-Land - Male Coercion and Female Choice. *Ethol Sociobiol*. **12**: 291–313.
- 9 Cross PA, Matheson K (2006) Understanding sadomasochism: An empirical examination of four perspectives. *J Homosex*. **50**: 133–166.
- 10 Dominey WJ (1984) Alternative Mating Tactics and Evolutionarily Stable Strategies. *Amer Zool*. **24**: 385–396.

- 11 Dupanloup I, Pereira L, Bertorelle G, Calafell F, Prata MJ, Amorim A, Barbujani G (2003) A recent shift from polygyny to monogamy in humans is suggested by the analysis of worldwide Y-chromosome diversity. *J Mol Evol.* **57**: 85–97.
- 12 Einon D (1998) How many children can one man have? *Evol Hum Behav.* **19**: 413–426.
- 13 Ernulf KE, Innala SM (1995) Sexual Bondage – A Review and Unobtrusive Investigation. *Arch Sex Behav.* **24**: 631–654.
- 14 Fieder M, Huber S, Bookstein FL, Iber K, Schafer K, Winckler G, Wallner B (2005) Status and reproduction in humans: New evidence for the validity of evolutionary explanations on basis of a university sample. *Ethology.* **111**: 940–950.
- 15 Furlow B, Gangestad SW, Armijo-Prewitt T (1998) Developmental stability and human violence. *Proc Roy Soc Lond B.* **265**: 1–6.
- 16 Gangestad SW, Simpson JA (2000) Trade-offs, the allocation of reproductive effort, and the evolutionary psychology of human mating. *Behav Brain Sci.* **23**: 624–644.
- 17 Gangestad SW, Simpson JA, Cousins AJ, Garver-Apgar CE, Christensen PN (2004) Women's preferences for male behavioral displays change across the menstrual cycle. *Psychol Sci.* **15**: 203–207.
- 18 Gangestad SW, Thornhill R (2003) Facial masculinity and fluctuating asymmetry. *Evol Hum Behav.* **24**: 231–241.
- 19 Goetz AT, Shackelford TK (2009) Sexual Coercion in Intimate Relationships: A Comparative Analysis of the Effects of Women's Infidelity and Men's Dominance and Control. *Arch Sex Behav.* **38**: 226–234.
- 20 Gross MR (1996) Alternative reproductive strategies and tactics: Diversity within sexes. *Trends Ecol Evol.* **11**: 92–98.
- 21 Hawley PH (1999) The ontogenesis of social dominance: A strategy-based evolutionary perspective. *Dev Rev.* **19**: 97–132.
- 22 Healey MC, Prince A (1998) Alternative tactics in the breeding behaviour of male coho salmon. *Behaviour.* **135**: 1099–1124.
- 23 Henley NM (1995) Body politics revisited: What do we know today? In: Kalbfleisch PJ, Cody MJ, editors. *Gender, power, and communication in human relationships.* Hillsdale: Erlbaum.
- 24 Hews DK, Thompson CW, Moore IT, Moore MC (1997) Population frequencies of alternative male phenotypes in tree lizards: geographic variation and common-garden rearing studies. *Behav Ecol Sociobiol.* **41**: 371–380.
- 25 Hirsch LR, Paul L (1996) Human male mating strategies .1. Courtship tactics of the "quality" and "quantity" alternatives. *Ethol Sociobiol.* **17**: 55–70.
- 26 Hoff G (2006) Power and Love: Sadomasochistic Practices in Long-Term Committed Relationships. *Electronic J of Human Sexuality.* **9**. <http://www.ejhs.org/volume9/Hoff-abst.htm> (Accessed 13 February 2011).
- 27 Jozifkova E, Konvicka M (2009) Sexual Arousal by Higher- and Lower-Ranking Partner: Manifestation of a Mating Strategy? *J Sex Med.* **6**: 3327–3334.
- 28 Kaighobadi F, Shackelford TK (2008) Female attractiveness mediates the relationship between in-pair copulation frequency and men's mate retention behaviors. *Pers Individ Differ.* **45**: 293–295.
- 29 Kayser M, Brauer S, Weiss G, Schiefenhovel W, Underhill P, Shen PD, Oefner P, Tommaseo-Ponzetta M, Stoneking M (2003) Reduced Y-chromosome, but not mitochondrial DNA, diversity in human populations from West New Guinea. *Am J Hum Genet.* **72**: 281–302.
- 30 Kokko H, Morrell LJ (2005) Mate guarding, male attractiveness, and paternity under social monogamy. *Behav Ecol.* **16**: 724–731.
- 31 Kolmes K, Stock W, Moser C (2006) Investigating bias in psychotherapy with BDSM clients. *J Homosex.* **50**: 301–324.
- 32 Levitt EE, Moser C, Janison KV (1994) The Prevalence and Some Attributes of females in the Sadomasochistic Subculture: A Second Report. *Arch Sex Behav.* **23**: 465–473.
- 33 Llaurens V, Raymond M, Faurie C (2009) Ritual fights and male reproductive success in a human population. *J Evol Biol.* **22**: 1854–1859.
- 34 Lockard JS, Adams RM (1981) Human Serial Polygyny – Demographic, Reproductive, Marital, and Divorce Data. *Ethol Sociobiol.* **2**: 177–186.
- 35 McKibbin WF, Shackelford TK, Goetz AT, Starratt VG (2008) Why do men rape? An evolutionary psychological perspective. *Rev Gen Psychol.* **12**: 86–97.
- 36 Mealey L (1985) The relationship between social status and biological success: A case study of the Mormon religious hierarchy. *Ethol Sociobiol.* **6**: 249–257.
- 37 Moore MM (2010) Human Nonverbal Courtship Behavior-A Brief Historical Review. *J Sex Res.* **47**: 171–180.
- 38 Potts M (1997) Sex and the birth rate: Human biology, demographic change, and access to fertility-regulation methods. *Popul Dev Rev.* **23**: 1–2.
- 39 Renaud CA, Byers ES (2005) Relationship between sexual violence and positive and negative cognitions of sexual dominance. *Sex Roles.* **53**: 253–260.
- 40 Roberts SC, Havlicek J, Flegr J, Hruskova M, Little AC, Jones BC, Perrett DI, Petrie M (2004) Female Facial Attractiveness Increases During the Fertile Phase of the Menstrual Cycle. *Proc Roy Soc Lond B.* **271**: S270–S272.
- 41 Sanderson SK (2001) Explaining monogamy and polygyny in human societies: Comment on Kanazawa and Still. *Soc Forces.* **80**: 329–335.
- 42 Sandnabba NK, Santtila P, Nordling N (1999) Sexual Behavior and Social Adaptation Among Sadomasochistically-Oriented Males. *J Sex Res.* **36**: 273–82.
- 43 Simmons LW, Rhodes G, Peters M, Koehler N (2004) Are human preferences for facial symmetry focused on signals of developmental instability? *Behav Ecol.* **15**: 864–71.
- 44 Starks PT, Blackie CA (2000) The relationship between serial monogamy and rape in the United States (1960–1995) *Proc Roy Soc Lond B.* **267**: 1259–1263.
- 45 Taborsky M (1994) Sneakers, Satellites, and Helpers – Parasitic and Cooperative Behavior in Fish Reproduction. *Adv Stud Behav.* **23**: 1–100.
- 46 Taborsky M (2001) The evolution of bourgeois, parasitic, and cooperative reproductive behaviors in fishes. *J Hered.* **92**: 100–110.
- 47 Thornhill R, Palmer, CT (2000) *A natural history of rape.* Cambridge, England: The MIT Press.
- 48 Trivers RL, Willard DE (1973) Natural selection of parental ability to vary the sex ratio of offspring. *Science.* **179**: 90–92.
- 49 Weatherhead PJ, Boag PT (1995) Pair and Extra-Pair Mating Success Relative to Male Quality in Red-Winged Blackbirds. *Behav Ecol Sociobiol.* **37**: 81–91.
- 50 Weinberg TS (2006) Sadomasochism and the social sciences: A review of the sociological and social psychological literature. *J Homosex.* **50**: 17–40.