



Perception of intensity of sperm competition on the part of males



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ABSTRACT

Preferences for certain pornographic themes are hypothesized to have been influenced by our evolutionary history, where sperm competition could play a significant role. The mating system in our australopithecine ancestors, as well as in modern human societies, however, suggests that polygyny (characterized by low risk of sperm competition) has predominated over multi-male multi-female mating systems where high sperm competition is expected. In this study, a sample of men ($N = 96$) was investigated for their preferences for sexually explicit material showing low (sexual interaction with three women), moderate (one man and one woman) and high intensity of sperm competition (one woman and two men). The participants showed a strong and highly consistent preference for pictures showing moderate and low intensity of sperm competition. These preferences were not influenced by sociosexuality, pornography consumption or attitudes toward pornography. It is suggested that these preferences may mirror psychological adaptations for sperm competition which are activated when the risk of cuckoldry is high. Certain circumstances, where preferences for cues associated with high intensity of sperm competition would be adaptive, are discussed.

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1. Introduction

Humans and African apes share a number of morphological similarities, confirmed by strong genetic similarities between gorillas (96%), chimpanzees (98%) and the human genome (King & Wilson, 1975; Scally, Dutheil, Hillier, et al., 2012). The genomic divergence of gorillas and chimpanzees from the common ancestor of humans is dated to about 8.5–12 Mya and the chimpanzee–human last common ancestor is dated to about 5.5–7 Mya (Scally et al., 2012). Human biology and behavior may be derived from a chimpanzee-like (Wrangham & Peterson, 1996) or gorilla-like model (Geary, Bailey, & Oxford, 2011). Although chimpanzees are genetically closer to humans, several traits seem to have been inherited from the common ancestor of all hominids, not uniquely from the human–chimpanzee last common ancestor (Duda & Zrzavý, 2013; Geary & Flinn, 2001). In contrast, humans, of course, possess apomorphies, distinct attributes unique for humans (e.g., an absence of fur) which only evolved after the chimpanzee–human split (Rogers, Iltis, & Wooding, 2004).

The majority (>80%) of traditional human societies were polygynous (Murdock, 1967; Smith, 1984), similarly as it is proposed for our australopithecine ancestors (Dixson, 2009; Geary et al., 2011)

as well as it is with extant gorillas (Harcourt & Stewart, 2007). This is in sharp contrast with the promiscuous mating of chimpanzees living in large, multi-male, multi-female communities (Goodall, 1986). However, only a small percentage of men in traditional societies were (and are) actually polygynous. Most men and women did not live within a polygynous relationship structure even within societies that validate polygyny (Marlowe, 2003). By adopting this perspective, polygyny in humans can be viewed as socioculturally-driven (rather than derived from evolutionary origins) within stratified, intensive agriculture-based societies (Goody, 1976) rather than the default human mating strategy (Boserup, 1970; Isiugo-Abanihe, 1994). The polygynous mating system suggests that sexual competition is intense, but those that achieve dominance achieve higher reproductive success. For gorillas, sexual competition is low for dominant males because they live in isolated groups, as compared to multi-male, multi-female groups (Dixson, 2009; Geary et al., 2011). Regardless of whether sperm competition (a competition between the sperm of two or more males to fertilize the ova of a single female, Parker, 1970) played a significant role in our evolutionary past (see Dixson, 2009; Leivers & Simmons, 2014; Pham & Shackelford, 2014; Shackelford et al., 2002 for discussions), the moderate size of testes relative to body size (Harcourt, Purvis, & Liles, 1995), the masculine secondary sexual adornments (Dixson, 2009), the low levels of extra-pair paternity (1–3%, see Larmuseau et al., 2013; Simmons, Firman, Rhodes, & Peters, 2004; Voracek, Haubner, & Fisher,

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2008) and behaviors designed to reduce female infidelity (Buss, 1989; Kaighobadi, Starratt, Shackelford, & Popp, 2008) suggest that evolution for sperm competition is relaxed (Leivers & Simmons, 2014). In contrast with chimpanzees, where males provide no parental investment, human males contribute to the care of their offspring (Geary, 2000) and in their children's children (i.e., grandparenting) (Clutton-Brock, 1991), suggesting that paternal investment far exceeds any other species. This produces high reproductive cost per cuckoldry event and males therefore prefer female partners according to indicators of low risk of sperm competition (Buss, 1989; Hartung, 2012; Shackelford, Goetz, LaMunyon, Quintus, & Weekes-Shackelford, 2004). This is similar with gorillas where paternity certainty of a dominant male is high (>95%, Bradley, Doran-Sheehy, Lukas, Boesch, & Vigilant, 2004), but in contrast with unrestricted mating system of chimpanzees, where not only high-ranking, but also middle- and low-ranking males father offspring (Newton-Fisher, Thompson, Reynolds, Boesch, & Vigilant, 2010). The most recurrent context of sperm competition in humans is female infidelity, which produces a low-intensity sperm competition (i.e., only one other rival male placing his sperm into competition) (Pham & Shackelford, 2014). Perhaps surprisingly, certain studies have revealed that men prefer cues associated with high sperm competition intensity (i.e., a woman copulating with two or more men) (McKibbin, Pham, & Shackelford, 2013; Pound, 2002). Hald (2006) found, however, with a large sample of Danish participants that a higher percentage of men preferred group sex featuring one man with more women than group sex featuring one woman with more men. Recent support for preference for sperm competition in men is consequently mixed. I hypothesize that cues indicating a high risk of sperm intensity will be rated as less sexually attractive by men compared with cues associated with a moderate or low risk of sperm intensity (Hypothesis 1).

Preference for cues associated with sperm competition in men may be influenced by sociosexuality, defined by Simpson and Gangestad (1991) as individual differences in willingness to engage in uncommitted sexual relations. Furthermore, pornography consumption may be another predictor of preference for sperm competition cues, because online pornography depicting sexual activity involving a female and multiple males is more prevalent than those involving a male and multiple females (Pound, 2002). Sexually unrestricted individuals have a higher sex drive (Ostovich & Sabini, 2004), a higher lifetime number of sexual partners (Lukaszewski, Larson, Gildersleeve, Roney, & Haselton, 2014; Prokop & Fedor, 2013), engage in extrapair sex more often (McIntyre et al., 2006) and display more coercive behavior (Kennair & Bendixen, 2012). Pornography consumption is positively associated with high sociosexuality (Zheng & Zheng, 2014), with negative attitudes toward monogamy and marriage (Peter & Valkenburg, 2008) and intimate extrapair behavior (Gwinn, Lambert, Fincham, & Maner, 2013). All these associations suggest sociosexuality and consumption of pornography may be associated with a propensity to engage in less traditional sexual activities, such as sexual activity involving more than two partners. Sexually unrestricted individuals, who invest more in mating and less in parenting (Beall & Schaller, 2014), may be more attracted by sexual scenarios with more men mating with one woman. This is because their high number of lifetime sexual partners may compensate for possible risk associated with paternity loss due to the presence of rival men. This preference is costly, in contrast, for sexually more restricted individuals, who have a preference for a monogamous mating strategy. Hypothesis 2 suggests that sociosexuality, frequent consumption of pornography and liberal attitudes toward pornography are positively associated with a preference for cues of high risk of sperm competition in men.

2. Methods

2.1. Participants

The research was carried out in February 2014. A total of 100 men (1 homosexual and three bisexuals removed resulting in 96 men) recruited at the university comprised the sample. The age of the participants ranged between 19 and 38 years of age ($M = 24$, $SE = 0.25$, $N = 96$). The online questionnaire began with instructions that it was focused exclusively on men aged 18+ and that the questionnaire contained sexually explicit material. The demographic questions were (a) age, (b) gender (all the participants reported being men) and (c) sexual orientation (heterosexual, homosexual, bisexual).

2.2. Measuring of sociosexuality

To assess attitudes toward sexual behavior, the Revised Sociosexual Orientation Inventory (SOI-R; Penke & Asendorpf, 2008; Cronbach $\alpha = 0.82$) was used. This is a 9-item scale which provides an overall measurement of sociosexual orientation (example statement: "How many different partners have you had sexual intercourse with on one and only one occasion?") as well as three subdivisions: the behavior subscale measures the number of casual sex partners and the frequency of change in partners; the attitude subscale measures the participant's disposition toward short-term sexual encounters; and the desire subscale measures the frequency of sexual fantasies or arousal in relation to potential mates with whom the individual is not currently in a committed relationship with. A high SOI-R score indicates an unrestricted sociosexual orientation, in other words, a propensity to engage in more short-term sexual relationships. The mean SOI score in this study was $M = 35.28$ ($SE = 1.28$, $N = 96$).

2.3. Measuring of attitudes toward pornography

The 13-item Attitudes Toward Pornography Scale (ATPS, Cronbach $\alpha = 0.84$) was adopted from Evans-Decicco and Cowan (2001). The participants were asked to respond to both positive and negative statements about pornography (e.g., "It is a harmless activity" and "It increases violence toward women") on a 7-point Likert-type scale, ranging from 1 (strongly disagree) to 7 (strongly agree). Higher scores indicate a more positive attitude toward pornography. Negatively worded items were scored in reverse order. The mean ATPS score in this study was $M = 4.45$ ($SE = 0.11$, $N = 96$).

2.4. Measuring of pornography consumption

Consumption of pornography was measured with a single item modified after Hald (2006) "How frequently do you watch pornographic films?" Possible responses were 1 = never (11.5%), 2 = 1–2 times per month (25%), 3 = at least once per week (35.4%), 4 = 4–5 times per week (18.7%), 5 = daily (9.4%). The mean score of pornography consumption was $M = 2.9$ ($SE = 0.12$, $N = 96$). The pornography consumption score moderately correlated with the ATPS scale (Pearson $r = .35$, $p < .001$, $N = 96$). To avoid multicollinearity, both ATPS and consumption of pornography scores were submitted to multiple regression separately.

2.5. Measuring of preferences for sperm competition

A list of the most famous female porn stars was found via Google. The porn star's freely available videos were only downloaded if the particular porn star played in all of the three scenarios differing in sperm competition intensity: a porn star with two

other women (low intensity of sperm competition, coded as Level 1), a porn star with one man (moderate intensity of sperm competition, coded as Level 2) and a porn star with two men (high intensity of sperm competition, coded as Level 3). The presence of the same porn star in all three videos was advantageous, because the physical attractiveness of the principal actress was held as constant. Porn stars did not apparently differ in their facial expressions, or breast/genital exposure (all actors were naked and had shaved genitals). Their poses were not uniform (lying or sitting on sexual partner), but were randomly distributed with respect to each of the three scenarios. All heterosexual trials showed penile-vaginal intercourse, lesbian trials showed fingering. One photographic picture with explicit sexual interaction was made from each of the three videos for each porn star. As a result, 10 separate porn actresses appearing in three different videos (30 videos in total) with the three different types of sperm competition intensity (10 pictures per each level of sperm competition intensity) were used in the research. All the actors in all the pictures were young Caucasians. The participants' choices of pictures were highly consistent (Cronbach $\alpha = 0.90$). A mean composite score of the participants' choices was used in the statistical analyses. Higher scores indicate a high preference for sperm competition intensity and low scores indicate a low preference for sperm competition intensity.

2.6. Procedure

The research was carried out online which affords a high degree of anonymity (Locke & Gilbert, 1995; Musch, Broder, & Klauer, 2001). This would seem to be a particular advantage in the present research, where many of the questions are extraordinarily personal. Before the web page with the online survey was available, each participant received a unique numerical code to secure their individual identity. The participants were initially asked demographic questions, then responded to the SOI, ATPS scale and the pornography consumption. The pictures on sperm competition were presented on 10 slides (3 pictures per one slide). Each slide contained three pictures differing in the risk of sperm competition with the same porn star acting in all three scenarios. The pictures on each slide were placed in random order. The participants were asked to select one of the three pictures which was perceived as the most sexually arousing with a forced choice method. Each of the 96 participants made 10 choices from 10 three-option scenarios, equaling 960 total choices. Employing the forced choice method should reveal a greater accuracy by allowing for a direct comparison of the risk of cues which differ in the level of sperm competition (Leivers & Simmons, 2014).

2.7. Statistical analysis

Multiple regression with the mean sperm competition score as the dependent variable was employed to test associations between possible predictors and preferences for sperm competition. The variance inflation factor (VIF) was calculated to examine possible collinearity between variables. All the VIF values ranged between 1.1 and 2.06 suggesting that there was no collinearity between the variables (O'Brien, 2007). Results are presented with the ATPS scale, but insertion of pornography consumption instead of ATPS yielded almost identical results.

3. Results

The medium preference score ($M = 1.9$, $SE = 0.04$, range = 1–3) suggests that pictures associated with a moderate intensity of sperm competition (1 woman with 1 man) were preferred the most. The highest preference was shown for pictures with 1

woman and 1 man ($N = 601$ choices), followed by pictures with 3 women ($N = 245$ choices). Pictures with cues of high intensity of sperm competition (1 woman and 2 men) were preferred the least ($N = 114$ choices). Analysis of particular choices revealed significant differences between the three groups of pictures ($\chi^2 = 595.4$, $df = 2$, $p < .001$). Linear multiple regression with preferences for sperm competition intensity (dependent variable), SOI, age, pornography consumption and attitudes toward pornography (predictors) resulted in a non-significant model ($R^2 = 0.04$, $F(3,92) = 1.23$, $p = .30$, Table 1). SOI positively correlated both with pornography consumption and attitudes toward pornography (Pearson $r = 0.53$ and 0.52 , both $p < .001$, $N = 96$), but none of these variables were associated with preferences for sperm competition cues (Table 1). All other correlations between independent variables were not significant (all $p > .15$).

4. Discussion

This study revealed that cues associated with moderate and low intensity of sperm competition are more arousing than cues associated with high sperm competition, at least for Caucasian university students who participated in this research. The highest preferred pictures were those showing sexual interaction between one man and one woman providing support for Hypothesis 1. The preference for sperm competition was not influenced by sociosexuality, attitudes toward pornography or pornography consumption. Hypothesis 2 was therefore not supported.

These results are, at first glance, in sharp contrast with those reported by Pound (2002) and McKibbin et al. (2013). Pound (2002) found that online pornography images showing sexual activity involving a female and multiple men were more prevalent than those involving a male and multiple females and that men have a preference for sexual scenes with one female and two or more men. McKibbin et al. (2013) showed that the number of images on a DVD cover and screenshots depicting two or more men interacting with one woman predicts the DVD sales rank, suggesting that pornographic material showing a high intensity of sperm competition is more arousing than that showing a low intensity of sperm competition. When asking for preferences regarding sexually explicit pictures varying in the risk of sperm competition (Study 4, Pound, 2002), however, images of two or more females were viewed at very similar rates as images involving a woman with multiple men. Sales ranks of DVD covers analyzed by McKibbin et al. (2013) are not direct measures of arousal associated with pornographic material. Sales ranks are, in addition, influenced particularly by people who are interested in buying pornographic material, creating a non-random sample of people who need not represent the rest of the population.

Preferences for cues associated with a moderate intensity of sperm competition support sperm competition psychology in humans because men prefer seeing 1 man and 1 woman having sex (Pham & Shackelford, 2014). From this point of view, preferences for cues associated with risk of sperm competition in men exist, similarly as it is proposed by Pound (2002) and McKibbin et al. (2013), but preferences for intense of sperm competition (i.e., low preferences for pictures showing sexual interactions of

Table 1
Multiple regression on preference for sperm competition.

| | β | SE of β | B | SE of B | $t(92)$ | p |
|-----------|---------|-----------------|---------|-------------|---------|--------|
| Intercept | | | 0.85 | 0.26 | 3.24 | <0.001 |
| SOI | 0.18 | 0.12 | 0.005 | 0.003 | 1.57 | 0.19 |
| Age | 0.0009 | 0.10 | 0.00008 | 0.009 | 0.009 | 0.99 |
| ATPS | -0.21 | 0.12 | -0.07 | 0.04 | -1.76 | 0.08 |

two men and one woman) are lower. Higher sexual arousal by seeing pictures with a moderate intensity of sperm competition may be explained by evolved psychological adaptations which are activated when men are placed in sperm competition (e.g., when their partner engage in extra-pair copulation).

Low intensity of sperm competition (three women in sexual interaction) was preferred by men more than high intensity of sperm competition. Hald (2006) found that a preference for group sex with more women and one man (a low intensity of sperm competition) was cited by Danish men more frequently (22.2%) than a preference for group sex with more men and one woman (12.7%). A desire for a threesome with two women would be reproductively beneficial in an evolutionary sense, because it increases the chance of producing offspring (Hughes, Harrison, & Gallup, 2004). Kilgallon and Simmons (2005) found that men produced higher masturbatory ejaculates when viewing pornography depicting three women (relative to those viewing pornography depicting 2 men and 1 woman) suggesting that men are able to adjust their ejaculates according to a number of potential sexual partners. A relatively lower preference for sexually explicit pictures showing three women compared with a moderate risk of sperm competition pictures (1 man and 1 woman) can be explained by negative attitudes toward lesbian (Herek, 1988) and an apparent absence of normal (i.e., heterosexual) vaginal sexual intercourse which is the most preferred pornographic theme by men (Hald, 2006).

The preference for pictures showing a high intensity of sperm competition differed from zero which suggests that these preferences could be associated with certain reproductive benefits. In certain circumstances, such as during war, rape of women by men increases (Thornhill & Palmer, 2000). Multiple men are often involved in inseminating a victim over a short period of time which can bring reproductive benefits to a man (siring offspring without further paternal investment). This provides some support for multiple male-multiple female mating systems as part of the evolutionary origins of human sexuality. Alternatively, men are simply aroused by the possibility of a sexually receptive female irrespective of power dynamics. Kilgallon and Simmons (2005), for example, found that men produce more competitive ejaculates when viewing pictures with the intense sperm competition, thereby supporting some physiological adaptations to sperm competition. One alternative is that the preference for intense sperm competition is associated with aggression. Hald, Malamuth, and Yuen (2010) found positive association between pornography use and attitudes supporting violence against women. Pictures showing a high risk of sperm competition may possibly indicate more aggression or at least male dominance over females.

Neither sociosexuality, nor pornography consumption nor attitudes toward pornography influenced the preference for risk of sperm competition by men. It is probable that sexually unrestricted individuals and/or those who consume more pornography, have a preference for a wider range of sexually explicit material, but not necessarily material showing a high intensity of sperm competition. Reproductive costs associated with paternity loss when rival men are present are probably higher than the possible benefits associated with voluntary intrasexual competition (Hughes et al., 2004).

In conclusion, cues associated with high intensity of sperm competition were not found to be sexually arousing as suggested by previous research. Sexual interaction between one man and one woman were preferred the most by men. These preferences may mirror psychological adaptations for sperm competition which are activated when the risk of cuckoldry is high. Further research investigating aggression of the participants and their preferences for pornographic material depicting high intensity of sperm competition may be applied to investigate preferences for risk of sperm competition. Finally, investigation of men's

preferences for visual point of view (first-person vs. third-person) in pornographic movies may help us to understand the role of other men in the scene and, ultimately, the role of sperm competition in sexual arousal. Because behavior does not fossilize, it seems that the evolution of human mating systems is not likely to be resolved in the near future.

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