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Associations between body morphology, mating success and mate preferences among Slovak males and females

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With 2 tables

Summary: Human body morphology is thought to be correlated with sexual behaviour and sociosexuality (defined as an increased willingness to engage in sex without commitment) influences the perception of certain cues of physical attractiveness. Based on a sample of Slovak university students, we investigated relationships between 1) male and female mating success and reported body morphology (body mass index, BMI and waist-to-hip ratio, WHR) and 2) mate preference characteristics and mating success. Both males and females reported a similar number of long-term sexual partners and frequency of engaging in extra-pair copulation (EPC). The mating success of both sexes was positively mediated by self-perceived attractiveness. However, female BMI was inversely associated with mating success whereas increasing BMI was positively associated with male mating success (the total number of lifetime sexual partners) as well as with the likelihood of engaging in EPC. Unrestricted sociosexuality positively correlated with direct and indirect benefits from mating and negatively with the religious/political background of a potential mate and with the desire for a home/children. These results confirm the hypothesis that human body morphology is associated with sexual behaviour and that cues of direct/indirect benefits in a potential mate positively correlate with sociosexuality.

Key words: attractiveness, extra-pair copulation, human, morphology, sociosexuality.

Introduction

Understanding the evolutionary significance of physical attractiveness has dramatically changed since Darwin (1874) incorrectly concluded that perceived attractiveness was subjective and sharply differed between cultures (Etcoff 1999, Langlois 2000). Judgement of attractiveness has been viewed of late as being similar across cultures and consistent between raters (Buss 1989, Perrett 1994, Cunningham et al. 1995, Jones 1995, Perrett et al. 1998, Langlois 2000, Prokop & Fančovičová 2012). Modern adaptationists (Andresson 1994, Barber 1995, Thornhill & Moller 1998, Grammeret al. 2003, Pawlowski & Jasienska 2008) suggest that an individual's attractiveness is positively associated with mating and/or reproductive success (Thornhill & Gangestad 1994, Rhodes et al. 2005, Hönekopp et al. 2007, Weeden & Sabini 2007, Jokela 2009, Prokop & Fedor 2011).

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Mate choice criteria of human males and females differ (Schmitt 2005, Buss 2011). Males value the physical attractiveness of a potential mate more highly than females, while females emphasis a male's resources and/or cues of male earning potential (e.g. Buss 1989, Pawlowski & Koziel 2002, Furnham 2009). It has been suggested that men value attractiveness in females because it is a reliable cue to a female's reproductive value (Symons 1979, Buss 1989, Pawlowski & Dunbar 1999, Gallup et al. 2008), and that male resources will contribute to the survival of a female's offspring (Buss 1989, Buss 2011, Nettle & Pollett 2008). Mating behaviour, particularly engaging in sexual intercourse, is therefore expected to vary with preferences for certain characteristics in a desired partner. Males have a preference for attractive mates while females have a preference for resource-rich mates. These preferences consequently influence the mates desired which will in turn influence the characteristics of the partners they engage in sexual intercourse with.

Individual differences in human morphology are related to differences in mating/reproductive success (Gallup et al. 2008, Gallup & Frederick 2010). Females who have sex with bilaterally symmetrical/attractive males (Thornhill et al. 1995, Shackelford et al. 2000), or females with prominent tubercle of the upper lip (Brody & Costa 2011) report more orgasms. Males with attractive faces have higher quality sperm (Soler et al. 2003, but see Peters et al. 2008) and a higher genetic diversity of major histocompatibility complex (MHC) which determines immune diversity (Roberts et al. 2005, Lie et al. 2008). Male physical strength (Gallup et al. 2007), shoulder to hip ratio (Hughes & Gallup 2003), muscle mass (Lassek & Gaulin 2009) and/or body mass index (Faurie et al. 2004, but see Hughes et al. 2004) are predictors of male attractiveness to females. Obesity or high values of body mass index (BMI) are, however, strong negative predictors not only for female attractiveness but also for male attractiveness (e.g. Fan et al. 2005). Physical attractiveness is associated with mating success, particularly with an earlier age for first sexual intercourse, with the total number of lifetime sexual partners, with the likelihood of engaging in extra-pair sex (Thornhill & Gangestad 1994, Gangestad & Thornhill 1997, Rhodes et al. 2005, Weeden & Sabini 2007) and with reproductive success (i.e., the number of produced offspring) (Jokela 2009, Prokop & Fedor 2011). An optimal female waist-to-hip ratio (WHR) of 0.7 (Singh 1993a,b, Singh 1995, Furnham 1997, Singh et al. 2010) predicts first sexual intercourse at an earlier age and more sexual and extra-pair partners (Hughes & Gallup 2003), as it detects fertility (DeRidder et al. 1990, Zaastra et al. 1993) and health (Singh 1993a,b, Petursson et al. 2011).

Increased sociosexuality, defined as a willingness to engage in sex without commitment, was positively correlated with a preference for larger female breasts by males (Zelazniewicz & Pawlowski 2011). Males who tend to pursue a short-term sexual strategy have a stronger preference for lower (and thus more attractive) WHR in females (Brase & Walker 2004, Schmalt 2006). Boothroyd et al. (2008) have demonstrated that unrestricted sociosexuality was generally associated with a greater attractiveness in female faces and greater masculinity in male faces. Little is known, however, regarding how mate choice criteria are related to male and female sexual strategies. In this study, we first extended the current research on human body morphology (particularly, BMI in both sexes and WHR in females), self-perceived attractiveness and short-term mating strategies. Second, we investigated how mate choice criteria, derived from Mate Preference Inventory (Buss 1989), are associated with sociosexuality. We hypothesized that 1) body morphology would have a different impact on

mating success in males and females, because a higher BMI (except for obese individuals) is associated with higher muscle mass in males, although females with a higher BMI are perceived as less attractive. Thus, a high BMI will be associated with high mating success in males, but with low mating success in females. Further, we hypothesized that 2) individuals with an unrestricted sociosexuality score would seek direct (material) and indirect (genetic) benefits from mating more than individuals with a restricted sociosexuality. Finally, we predict that 3) mating success will be positively associated with self-perceived attractiveness, since more physically attractive individuals have more opportunities to engage in sexual relationships.

Methods

The sample

The analysed participants were 536 Caucasian individuals, 158 males and 378 females enrolled at three public universities in Slovakia. Participants were not compensated for their participation. A total of 13 students who reported engaging in sexual behaviours exclusively with same-sex partners or bisexuals were excluded from the study, because we did not have a sufficient sample to examine this group of individuals. The remaining sample (n = 523) was comprised of 150 males and 373 females. All the participants were single and childless and no females reported being pregnant. The participants were predominantly Christians (367 Catholic) or atheists (49). Data for this study was collected over the winter semester of 2007.

Measures

Basic demographic data and body measures

Students were asked for the following personal data: sex, age, religion, sexual orientation (homosexual, heterosexual, bisexual), marital status (single, divorced, married), height, body weight and height (from which we determined the body mass index, BMI, defined as kg/m^2), waist and hip circumference (from which we determined waist-to-hip ratio, WHR). WHR was not included in the analyses of male sexual behaviour, because only 82 males (55 %) reported the requested data. We acknowledge that self-reports are less reliable than values obtained from direct measurements, however, a large number of studies have found strong correlations between self-report values with those obtained by technicians (e.g. Rimm et al. 1990, Freudenheim & Darrow 1991, Weaver et al. 1996, Oliveira et al. 2009).

Mating success

Mating success was determined by items that reflect a higher likelihood of successful reproduction. In particular, earlier sexual experiences allow for production of more offspring than later sexual experiences, a higher number of sexual partners and EPC increase the likelihood of production of more offspring with various sexual partners. We asked participants the following questions in connection with mating success: “Have you ever engaged in penile-vaginal intercourse?” (Virginity), “If yes, how old were you when you engaged in your first penile-vaginal intercourse?” (Age of first sexual intercourse), “How many of your sexual relationhips lasted more than 12 months?” (Number of long-term relationships), “How many of your sexual relationships lasted less than 12 months?” (Number of short-term relationships), “Are you actually involved in a romantic relationship?” (Relationship status). Other items assessed infidelity behaviours: “While you were in a relationship with your current girlfriend/boyfriend, did you ever have sexual intercourse with another person than your current girlfriend/boyfriend? ” (Extra-pair copulation, EPC), “If yes, how many of them?”

(Number of extra-pair partners). Most of these questions were adopted from Grello et al. (2006). Participant's self-perceived attractiveness was assessed by the 5-point Likert-type scale ("How attractive are you on the 5 point scale ([1 very unattractive, 3 average and 5 very attractive])? (Little et al. 2001).

Sociosexuality

A composite score of the attitudes towards the sociosexuality scale (SCS), measuring attitudes to sexual relationships, was calculated using the mean of ratings given to questions about general views on sexual relationships. The items were partly modified according to Rhodes et al. (2005) and partly self-constructed. Similar questionnaires can be also found in Simpson & Gangestad (1991) or Penke & Asendorpf (2008). Participants were asked whether they agreed or disagreed (1 = disagreed, 5 = agreed) with the following statements: Sex without love is OK; Casual sex outside of existing relationships is OK; Sex on the first date is OK; I would need to know my partner emotionally and psychologically before having sex (reverse scored); I would like to have sex if I met someone with the same willingness; If I had an opportunity to have sexual intercourse with someone, I would accept him/her; If I met someone attractive to me, I would definitely have a sex with him/her; I would prefer sex with a friend rather than with a stranger; I could have more sexual partners if I were more attractive; I would have no problem having sex with someone who is attractive to me; I frequently imagine sex with another person than my actual partner. The reliability of these items was high (Cronbach alpha = 0.87). A high attitude score indicated unrestricted sociosexuality.

Mate preferences

The survey used to assess mate preferences was developed by Hill (1945) (Mate Preference Inventory). In the present study, the participants rated the importance of 18 mate characteristics (see also Buss 1989) on the following 4-point scale: 3 points = indispensable, 2 = important, 1 = desirable, but not very important, and 0 = irrelevant or unimportant. The dimensions derived from the Mate Preference Inventory are believed to be universal across cultures (Buss 1989).

Statistical analyses

Data were first inspected for normality (Kolmogorov-Smirnov test) and then $\log_{10}(x + 1)$-transformed to achieve normality, if necessary. Both parametric and non-parametric tests were used depending on the distribution of data. All the statistical tests were two-tailed and performed in Statistica (Version 8, StatSoft 2007, Tulsa, OK, USA, http://www.statsoft.com). Means are presented with standard errors (SE).

Results

Domains of the Mate Preference Inventory

Data from the 18 item Mate Preference Inventory (Cronbach's alpha = 0.71) were submitted to a Principal Components Analysis with Varimax rotation. Six components accounted for 55.9 % of the total variance of the results derived. Out of these, four components were interpretable, because three items loaded with more than one component (factor loadings > 0.4) (Sociability, Similar educational background and Emotional stability and maturity) and components 4 and 6 were only represented by two and one item, respectively. The remaining four components explained 43.74 % of the total variance of the results.

Component 1 (eigenvalue = 3.21) accounts for 17.84 % of the inter-item variance in preference ratings, and includes "good financial prospects" (0.72), "favorable social status or ratings" (0.75) and "good looks" (0.44). In light of the fact that two of the three items refer to material benefits from mating, we labelled this component "Direct benefits from mating".

Component 2 (eigenvalue = 1.81) accounts for 10.06 % of the inter-item variance in preference ratings, and includes "chastity" (0.49), "similar religious background" (0.78) and "similar political background" (0.76). We labelled this component "Religious/Political background".

Component 3 (eigenvalue = 1.69) accounts for 9.36 % of the inter-item variance in preference ratings, and includes "dependable character" (0.52), "desire for home and children" (0.73) and "ambition and industriousness" (0.49). We labelled this component "desire for family".

Component 5 (eigenvalue = 1.17) accounts for 6.48 % of the inter-item variance in preference ratings, and includes "mutual attraction-love" (0.75), "good health" (0.56) and "education and intelligence" (0.64). We labelled this component "indirect benefits from mating".

All these components are relatively independent revealing a low correlation between one other (Pearson $r < 0.20$). Only Direct and Indirect benefits correlated moderately (Pearson $r = 0.37$, $p < 0.001$).

Sex differences in reported sexual behaviour

Males and females differed slightly in age (mean (yrs) ± SE, males: 20.52 ± 0.11, n = 150, females: 20.08 ± 0.07, n = 373, overall range: 18–26 yrs, Mann-Whitney U-test, U = 24 360.0, $p = 0.02$). There were no significant differences in the proportion of virgin males and females (males: 30 %; females: 32 %, Chi-square test, $\chi^2 = 0.29$, df = 1, $p = 0.59$) as well as of males and females who reported having at least once engaged in EPCs (males: 19 %, females: 17 %, Chi-square test, $\chi^2 = 0.23$, df = 1, $p = 0.63$) or in their total number of extra-pair partners (males: 0.28 ± 0.06, range: 0–7, n = 149, females: 0.20 ± 0.04, range: 0–5, n = 373, Mann-Whitney U-test, U = 27 361.0, $p = 0.78$). More females than males reported being currently in a romantic relationship (62 vs. 47 %, Chi-square test, $\chi^2 = 10.44$, df = 1, $p = 0.001$).

After excluding virgin participants, the mean age of first sexual intercourse (males: 17.30 ± 0.16, n = 105, females: 17.21 ± 0.10, n = 249, Mann-Whitney U-test, U = 12 802.50, $p = 0.67$), or total number of long-term partners (males: 0.88 ± 0.07, n = 105, females: 0.98 ± 0.05, n = 246, Mann-Whitney U-test, U = 12 056.0, $p = 0.21$) did not differ between the sexes. However, males tended to report more short-term partners than females (males: 3.25 ± 0.31, n = 105, females: 2.61 ± 0.20, $n = 246$, Mann-Whitney U-test, U = 11 426.50, $p = 0.06$).

Effects of sex, virginity, and relationship status on sociosexuality

The mean SCS score significantly and positively correlated with the lifetime number of sexual partners (partial correlation controlled for age and sex, $r = 0.23$, $p < 0.001$, n = 523). Moreover, after controlling for sex and age and excluding virgin participants, the mean SCS score correlated positively with the number of short-term part-

ners (Partial r = 0.21, $p < 0.01$, n = 354), negatively with the number of long-term partners (Partial r = –0.22, $p < 0.01$, n = 354) and with the age of first sexual intercourse (Partial r = –0.12, $p < 0.05$, n = 354). This suggests that the SCS score adequately reflects variation in sociosexuality. Stepwise forward multiple regression with the SCS score and the independent variables listed in Table 1 resulted in a significant model ($R^2 = 0.32$, $F(4,518) = 59.59$, $p < 0.001$). Males had a higher SCS score than females (mean ± SE, males: 2.35 ± 0.07, n = 150; females: 1.81 ± 0.04, n = 373), sexually experienced participants had a less restricted SCS score than virgin participants (mean ± SE, 2.38 ± 0.04, n = 357 *vs* 1.78 ± 0.07, n = 166, respectively) and participants who were not involved in a romantic relationship had a higher SCS score than those actually involved in a romantic relationship (mean ± SE, 1.80 ± 0.07, n = 305 *vs* 2.36 ± 0.04, n = 218, respectively). These results indicated that male and female SCS scores differed, thus we analysed male and female reproductive strategies separately.

Effects of physical attractiveness on female mating success

Multiple regression (forward stepwise method) with lifetime sexual partners (log transformed and controlled for age) as a dependent variable and BMI, WHR and self-reported attractiveness as an independent variable, resulted in a significant model ($R^2 = 0.05$, $F(2,287) = 6.90$, $p < 0.001$). Only BMI and self-reported attractiveness entered the model ($\beta = –0.15$ and 0.14, $t = –2.63$ and 2.43, $p = 0.008$ and 0.02, respectively). This suggests that female mating success was negatively associated with [higher] BMI and positively associated with self-perceived attractiveness. The mean value of WHR (only calculated for females) was M = 0.77 (SE = 0.007) and the coefficient of the variation was CV = 18.43. The mean BMI calculated for the entire sample was M = 21.4 (SE = 0.13) with CV = 17.81.

Binary logistic regression revealed that female virginity (dependent variable) was strongly associated with BMI (Wald's $\chi^2 = 10.91$, df = 1, $p = 0.0009$); the higher the BMI, the higher the likelihood of female virginity. The effects of age, WHR, and self-perceived attractiveness were not significant (all p's > 0.08). Virgin females had higher BMI's than their non-virgin counterparts (mean ± SE, 21.39 ± 0.24, n = 114 vs 20.33 ± 0.16, n = 248, respectively).

Table 1. Multiple regression (forward stepwise method) with SCS score as dependent variable.

	β	SE of β	B	SE of B	t(518)	*p*
Intercept			–57.06	8.98	–6.36	<0.001
Sex	0.38	0.04	0.64	0.06	10.33	<0.001
Virginity	–0.32	0.04	–0.51	0.06	–8.02	<0.001
Relationship status	0.30	0.04	0.45	0.06	7.44	<0.001
Age	0.06	0.04	0.03	0.02	1.57	0.12

Further analysis of non-virgin females (n = 252) revealed that self-perceived physical attractiveness (BMI, WHR and age were excluded from the model) was positively associated with engaging EPCs (forward stepwise logistic regression, Wald's $\chi^2 = 3.81$, $p = 0.05$). ANCOVA with the same covariates (BMI, WHR, age and self-reported attractiveness) and with the total number of extra-pair partners defined as a dependent variable revealed the significant effect of self-perceived attractiveness ($F(1,191) = 7.7$, $p = 0.005$), although the other variables were not significant (all p's > 0.40).

Effects of physical attractiveness on male mating success

Multiple regression (forward stepwise method) with lifetime sexual partners (log transformed and controlled for age) as a dependent variable and BMI, and self-reported attractiveness as an independent variable revealed that both self-reported attractiveness and BMI entered the model ($\beta = 0.23$ and 0.09, $t = 2.82$ and 1.11, $p = 0.005$ and 0.28, respectively, entire model: $R^2 = 0.06$, $F(2,146) = 4.55$, $p = 0.01$). This suggests that male mating success was positively associated with self-reported attractiveness and with a higher BMI (although not significantly). Binary logistic regression revealed that male virginity (dependent variable) was strongly associated with self-perceived attractiveness (Wald's $\chi^2 = 7.51$, df = 1, $p = 0.006$). The effect of age and BMI was not significant (both $p > 0.50$). This suggests that virgin males perceived themselves as less attractive than non-virgin males. A further analysis of non-virgin males (n = 105) revealed that only BMI (independent variable) was significantly associated with engaging EPCs (dependent variable) (forward stepwise logistic regression, Wald's $\chi^2 = 4.61$, $p = 0.03$), although age and self-reported attractiveness were excluded from the model. The BMI of males, engaged in EPCs, was significantly higher that the BMI of their faithful counterparts. Interestingly, ANCOVA with the same covariates (BMI, age and self-reported attractiveness) and with the total number of extra-pair partners defined as a dependent variable also supported the significant effect of BMI on the total number of extra-pair partners ($F(1,99) = 4.76$, $p = 0.03$), although the other variables were not significant (all p's > 0.13).

Factors influencing mate preferences

The mean scores of each of the four components derived from the Mate Preference Inventory were defined as dependent variables in subsequent statistical analyses. A 4 (means of four mate preference components: within subjects) × 2 (sex: between subjects) × 2 (virginity: between subjects) multivariate analysis of covariance (MANCOVA) with age, self-perceived attractiveness, the total number of lifetime sexual partners and the mean SCS score as covariates were used to examine whether there are differences related to sex, virginity, age and self-perceived attractiveness in mate choice preferences. The results are shown in Table 2. Sex showed a significant effect on mate preferences, but the effects of other variables were weak or non-significant. Considering within subject effects, the mean scores of Desire for home/children (mean = 2.39 ± 0.02) and Indirect benefits components (mean = 2.30 ± 0.03) received higher means scores than Direct benefits component (mean = 1.32 ± 0.03) and Religious/Political background components (mean = 0.91 ± 0.04). Age and self-

Table 2. Results of ANCOVA on Mate Choice Preferences (n = 523 participants) (*$p < 0.05$, **$p < 0.01$, *** $p < 0.001$).

	SS	DF	MS	F
Age	0.37	1.00	0.37	0.67
SPA[1]	2.41	1.00	2.41	4.43*
SCS[2]	0.17	1.00	0.17	0.31
NSP[3]	0.05	1.00	0.05	0.10
Sex	5.27	1.00	5.27	9.68**
Virginity	0.13	1.00	0.13	0.25
Sex × Virginity	0.27	1.00	0.27	0.50
Error	280.51	515.00	0.54	–
Mate preference	3.59	3.00	1.20	4.61**
Mate preference×Age	0.76	3.00	0.25	0.98
Mate preference×SPA	0.45	3.00	0.15	0.58
Mate preference×SCS	20.81	3.00	6.94	26.71***
Mate preference×NSP	2.70	3.00	0.90	3.46*
Mate preference×Sex	3.00	3.00	1.00	3.86**
Mate preference×Virginity	2.53	3.00	0.84	3.25*
Mate preference×Sex×Virginity	0.05	3.00	0.02	0.06
Error	401.31	1545.00	0.26	–

[1]Self perceived attractiveness, [2]Sociosexuality score, [3]Number of sexual partners

perceived attractiveness did not correlate with any of the mate choice preference components. SCS positively correlated with Direct and Indirect benefits ($\beta = 0.24$ and 0.09, $p < 0.0001$ and 0.06, respectively) and negatively with Religious/Political background and with Desire for home/children ($\beta = –0.18$ and –0.24, both $p < 0.001$, respectively). The number of lifetime sexual partners revealed similar directions with mate choice components, although these correlations were not clearly significant (*p*-values ranged between 0.07 and 0.81). These results suggest that participants with more unrestricted sociosexuality tend to prefer direct and indirect benefits from mating more than participants with more conservative attitudes toward sex. In contrast, the religious/political background of a preferred mate as well as the desire for children were particularly valued by less promiscuous participants. Tukey HSD post-hoc test revealed that females gave higher importance to Desire for home/children than males. Females consistently scored higher in all four mate preference components, but when compared with males, these differences were not significant. The interaction Mate preference × Virginity can be explained by the higher mean scores of the virgin participants in the component Religious/political background and the lower mean score in Direct benefits component (Tukey HSD post-hoc test, $p = 0.001$) compared with non-virgin participants (Tukey HSD post-hoc test, $p < 0.0001$).

We were finally interested in whether there is an interaction between mate preference components, sex and SCS. We suggested in particular that females with increased SCS score would pursue direct and indirect benefits from mating more than males with an increased SCS score. The interaction term Mate preference × Sex × SCS was significant ($F(3,1557) = 2.79$, $p = 0.04$). Inspection of correlations between SCS and four mate preference components suggests that both sexes showed similar trends with one exception. Females with an increasing SCS score preferred

indirect benefits (Pearson r = 0.12, $p = 0.02$), but no similar patterns were found for males Pearson (r = 0.05, $p = 0.58$).

Discussion

This study investigates associations between mating strategies, body morphology and mate preferences. Two-thirds of the participants in our sample reported having had their first sexual intercourse at the age of approximately 17 which is similar to many other reports (Thornhill & Gangestad 1994, Schvaneveldt et al. 2001, Hughes et al. 2004, Kaestle et al. 2005, Rhodes et al. 2005, Grello et al. 2006, Weeden & Sabini 2007). Both sexes reported having had a similar number of lifetime sexual partners (Weeden & Sabini 2007), although males tended to have more short-term partners which corresponds with other research works (e.g. Rhodes et al. 2005). A number of researchers, in contrast, reported that males had more sexual partners than females (e.g. Thornhill & Gangestad 1994, Rhodes et al. 2005), however the lack of this effect is in all probability caused by the low age of participants in the present study. Participants in Thornhill & Gangestad (1994) and Rhodes et al. (2005), for example, were on average 3–4 years older than our participants. The total number of extra-pair partners was similar with respect to sex (see also Rhodes et al. 2005, Grello et al. 2006) which corroborates current ideas about similarities in male and female sexual strategies (Brown et al. 2009) although in some studies males tend to exceed females in the number of extra-pair partners (Gangestad et al. 1997, Hill 2002, Hughes et al. 2004, for discussion see Andrews et al. 2008).

Males in the present study had a higher SCS score than females (e.g. Rhodes et al. 2005, Grello et al. 2006) which supports the idea that males are more unrestricted in terms of sociosexuality than females (reviewed by Schmitt 2005). Virgin participants showed a lower SCS score than their more experienced counterparts. This suggests that virginity is associated with more conservative attitudes towards sexual relationships. Sexually experienced participants who were not actually involved in a romantic relationship showed, however, more liberal attitudes towards casual sex than participants who reported having been engaged in a romantic relationship. It is possible that increased readiness for sexual intercourse in single individuals is enhanced by testosterone (which is applicable to males, see Burnham et al. 2003, Gray et al. 2004) which motivates single individuals to search for potential mates and, ultimately, enhances mating success. There is significant evidence in non-human animals indicating that increased testosterone is associated with more extensive sexual displays (Salvador et al. 1996) and greater mating success (Alatalo et al. 1996) in males.

Body morphology revealed associations with mating strategies in both males and females which supports current research on human physical attractiveness and sexual selection (for reviews see Gallup et al. 2008, Gallup & Frederick 2010). We found no support for the superiority of female WHR and sociosexuality (Hughes et al. 2004). Instead, female BMI in this study appears to be the more important predictor of female sexual behaviour than WHR although the effect size is generally weak. These results were not influenced by the lower variation of WHR compared with BMI, because the coefficients of variation were similar for these variables. Self-reported height and weight are much more reliable, however, than self-reported waist and hips circumferences (B. Pawlowski, pers. comm.) and this could have influenced the

obtained results. Female BMI was a significant predictor of the age when engaging in first sexual intercourse. This is to say that females with a higher BMI remained virgins for a longer time than their slimmer counterparts. These results are complemented by Hughes et al. (2004) who found that increases in body mass postponed the onset of heterosexual intercourse in females. At least two independent explanations can account for this mechanism. First, BMI can delay sexual maturation and consequently the age of first sexual intercourse. This explanation is unlikely however, because females with a higher BMI have their first menstruation, a sign of sexual maturity, earlier than females with a lower BMI (e.g. Pierce & Leon 2005, Matchock & Susman 2006). The second possibility is that increased BMI decreases self-perceived attractiveness and attractiveness in turns influences sexual behaviour. Previous research showed that BMI was an important feature of female attractiveness (e.g. Tovée & Cornelissen 2001). In the present study, female BMI negatively correlated with self-perceived attractiveness (Pearson r = –0.10, p = 0.057, n = 362, data not shown) and self-perceived attractiveness was positively correlated with both liberal sexual attitudes and engaging in EPC. Generally, these results suggest that self-perceived attractiveness is partly influenced by reported BMI and correlates with sociosexuality (Hughes & Gallup 2003, Hughes et al. 2004, Rhodes et al. 2005, Weeden & Sabini 2007). Female WHR showed no association with sexual behaviour.

Both BMI and self-perceived attractiveness contributed to male sexual behaviour, although the effect of BMI was different than in females. Males with higher BMI and those who rated themselves as more physically attractive reported having higher mating success and began with an active sexual life earlier than their slimmer counterparts. Faurie et al. (2004) found that student athletes had both higher BMI and higher mating success than non-athletes, and Lassek & Gaulin (2009) found a positive association between muscle mass and mating success. It is possible that males with a higher BMI in this study had more muscle mass, which is an attractive feature of male physical attractiveness (e.g., Barber 1995, Gallup et al. 2007, Lassek & Gaulin 2009, Dixson et al. 2010). Self-perceived attractiveness contributed to male mating success independently from BMI, because, unlike in females, male BMI and self-perceived attractiveness did not correlate (Pearson r = –0.009, $p = 0.91$, n = 149, data not shown).

The results from the Mate Preference Inventory reveal that females scored higher in the Desire for home/children component which corresponds with the original findings by Buss (1989). Both sexes, however, valued indicators of good genes (Indirect benefits), material resources (Direct benefits) and religious/political orientation similarly. This provides no direct support for the idea that material resources are more desired by females than by males (Ardener et al. 1960, Buss 1989, Buss 2011, Buss & Schmitt 1993, Buss et al. 2001, Pawlowski & Koziel 2002). We also did not demonstrate that mate preferences were mediated by self-perceived attractiveness (Pawlowski & Dunbar, 1999, Little et al. 2001, Buston & Emlen 2003, Waynforth et al. 2005, Buss & Shackelford 2008). However, some caution must be paid when interpreting these data, because participant attractiveness was only judged subjectively. The religious/political background of potential mates played the least important role compared with other mate preference characteristics.

Unrestricted sociosexuality has been previously found to be correlated with the male preference for female breast attractiveness (Zelazniewicz & Pawlowski 2011) and the stronger preference for low WHR in females (Brase & Walker 2004, Schmalt

2006). Here we demonstrated that sociosexuality positively correlated with cues of direct and indirect benefits from mating, and a negative correlation with the Religious/Political background and with the Desire for home/children. These results corroborate ideas suggesting that EPC and/or searching for additional sexual partners is an adaptation for securing good genes (e.g. Gangestad & Simpson 2000, Gangestad et al. 2007) and has nothing to do with preferences for long-term partners (religious attitudes, desire for children). To support this, it was found that females in non-human animals often engage in EPC if they have the opportunity to copulate with a genetically superior male (Kempenaers et al. 1992, Hasselquist et al. 1996, Griffith et al. 2002, Dreiss et al. 2008). In contrast, Gangestad & colleagues (2000, 2007) suggest that females have adaptations for choosing a high-investing male as a long-term partner. We have however found that correlations between sociosexuality and direct benefits from mating were stronger than correlations between sociosexuality and indirect benefits from mating. This suggests that certain individuals can engage in a EPC/promisciuous mating strategy to obtain material resources. In summary, our results suggest that more liberal sexual attitudes and behaviours are pronounced in individuals who have a preference for cues associated with material resources and indicators of good genes. Casual sex can be therefore a tool for increasing material benefits from short-term relationships.

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