

ORIGINAL RESEARCH—PSYCHOLOGY

Women Who Prefer Longer Penises Are More Likely to Have Vaginal Orgasms (but Not Clitoral Orgasms): Implications for an Evolutionary Theory of Vaginal Orgasm

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ABSTRACT

Introduction. Research indicates that (i) women's orgasm during penile–vaginal intercourse (PVI) is influenced by fitness-related male partner characteristics, (ii) penis size is important for many women, and (iii) preference for a longer penis is associated with greater vaginal orgasm consistency (triggered by PVI without concurrent clitoral masturbation).

Aims. To test the hypothesis that vaginal orgasm frequency is associated with women's reporting that a longer than average penis is more likely to provoke their PVI orgasm.

Method. Three hundred twenty-three women reported in an online survey their past month frequency of various sexual behaviors (including PVI, vaginal orgasm, and clitoral orgasm), the effects of a longer than average penis on likelihood of orgasm from PVI, and the importance they attributed to PVI and to noncoital sex.

Main Outcome Measures. Univariate analyses of covariance with dependent variables being frequencies of various sexual behaviors and types of orgasm and with independent variable being women reporting vs. not reporting that a longer than average penis is important for their orgasm from PVI.

Results. Likelihood of orgasm with a longer penis was related to greater vaginal orgasm frequency but unrelated to frequencies of other sexual behaviors, including clitoral orgasm. In binary logistic regression, likelihood of orgasm with a longer penis was related to greater importance attributed to PVI and lesser importance attributed to noncoital sex.

Conclusions. Women who prefer deeper penile–vaginal stimulation are more likely to have vaginal orgasm, consistent with vaginal orgasm evolving as part of a female mate choice system favoring somewhat larger than average penises. Future research could extend the findings by overcoming limitations related to more precise measurement of penis length (to the pubis and pressed close to the pubic bone) and girth, and large representative samples. Future experimental research might assess to what extent different penis sizes influence women's satisfaction and likelihood of vaginal orgasm. **Costa RM, Miller GF, and Brody B. Women who prefer longer penises are more likely to have vaginal orgasms (but not clitoral orgasms): Implications for an evolutionary theory of vaginal orgasm. J Sex Med 2012;9:3079–3088.**

Key Words. Penis Length; Vaginal Orgasm; Intercourse

Introduction

When women have sex with men, their sexual pleasure is influenced by the male partner's sexual performance, as well as by his physical and psychological characteristics. For example, erectile

dysfunction and premature ejaculation by male partners can reduce female sexual pleasure [1–3], especially the likelihood of orgasm from penile–vaginal intercourse (PVI). Research also shows that male traits such as penis size and copulatory vigor are more relevant for women's attaining

orgasm from PVI than from other sexual activities. The likelihood of a woman attaining an orgasm through penile stimulation of the vagina without concurrent clitoral masturbation (henceforth, vaginal orgasm) is related to men's erectile function [4] and to duration of PVI, but not to duration of foreplay (in multivariate analyses controlling for both PVI and foreplay duration) [5]. Female orgasm during most recent PVI is associated with partner's physical and sexual attractiveness [6]. Consistency of female orgasm during PVI is associated with partner's higher body symmetry, a putative anatomical marker of health and fertility, which is correlated with physical attractiveness in humans [7]. However, in the same study, body symmetry was not related to a summary measure of orgasmic consistency across all forms of partnered sex [7], indicating that the effect was specific to PVI orgasm. Similarly, consistency of women's orgasm during PVI is predicted by partner's dominance, masculinity, and attractiveness, but these traits did not predict consistency of noncoital orgasm (partnered and solitary) [8]. The present study examines the hypotheses that vaginal orgasm frequency is associated with women's reporting that a longer than average penis is more likely to provoke their orgasm from PVI, within the context of an evolutionary view of vaginal orgasm evolving as part of a female mate choice system favoring somewhat larger than average penises. Our theory, linking greater likelihood of vaginal orgasm to having a man with a longer penis, is a special case of the evolutionary view that female orgasm evolved as a mate choice system [9] and is consistent with the view that vaginal orgasm can be a signal of greater fitness of both partners [10].

Increasing evidence shows that penis size is important for the sexual pleasure of many women and is arguably more relevant during PVI than during other sexual activities. Masters and Johnson speculated in 1966 that penis size should not predict women's sexual pleasure or orgasm likelihood during intercourse given the vagina's elasticity and its allegedly poor innervation [11] (cf. [12]), and although they offered no empirical evidence concerning women's penis size preferences, their claim has been routinely cited as gospel in sex research. However, there is evidence that the entire length of the vagina (and cervix) is well innervated and that (in addition to an overlapping general region) the cervix projects to a different region of the somatosensory cortex than the distal vagina, which in turn projects to a different region than the clitoris [12,13]. In addition, substantial

evidence shows that most women care about penis size to some degree and typically prefer a somewhat thicker and longer penis than average. For example, dissatisfaction with partner's penis size was associated with greater risk of female sexual dysfunction among Arabic women having regular coital activity (aged 18–53) [2]. In the same sample, 67% reported that penis size was important for sexual satisfaction, with 40% (of that majority subgroup) valuing girth more, 40% valuing girth and length equally, and 20% valuing length more [2]. In a sample of coitally experienced Croatian women aged 19–49 years, penile girth was found to be somewhat important for 53% and very important for 22%; penile length was somewhat important for 57% and very important for 18% [14]. In a Dutch sample of sexually active women, only 18% reported that penis girth was “totally unimportant” (as Masters and Johnson claimed), whereas 33% considered it important or very important; likewise, only 22% reported that penis length was totally unimportant, whereas 21% considered it important or very important [15]. More informative than such studies on the abstract “importance” of penis size are studies on what penis sizes women actually prefer. In three articles, Dixson and collaborators found that women from California (USA), New Zealand, Cameroon, and China rated stylized male figures with somewhat longer than average penises as more attractive [16–18]. In a representative Czech sample, 34% of the women with history of orgasm from PVI and enough coital partners to be able to make a comparison reported being more likely to have an orgasm from PVI with a man who has a longer than average penis length [5]. An Internet survey of 26,437 heterosexual women found that 94% of women who reported that their current partner's penis was “large” were “very satisfied” sexually, but only 32% of women whose partner's penis was “small” were very satisfied sexually, and 68% of those women wished that their partner's penis was larger [19]. In the same article, among 25,594 heterosexual men surveyed, about 45% desired a larger penis, and only 0.2% desired a smaller penis [19]. These desires may reflect lessons learned from real sexual experiences with women rather than, as often patronizingly claimed, internalization of culturally arbitrary masculinity stereotypes.

The human vagina, cervix, and the exposed clitoral glans have distinct afferent pathways and sensory cortex projections [13]; consequently, female orgasms can be triggered in many women by penile–vaginal or penile–cervical stimulation,

regardless of superficial clitoral stimulation [20,21]. If vaginal orgasm is favored by greater responsiveness to vaginocervical stimulation, then it seems plausible that women capable of vaginal orgasm would learn to value somewhat larger penises, as these can better stimulate the vagina and cervix. In contrast, among women with lower vaginocervical responsiveness to penile stimulation, the ability to attain vaginal orgasm would be reduced, as would the importance attributed to penis size. This hypothesis received support from the representative Czech sample, in which women who had vaginal orgasms more consistently were more likely to have an orgasm from PVI with a man with a longer than average penis [5]. Thus, the objective of the present study is to replicate and extend this finding by examining in a sample from a different country whether greater frequency of vaginal orgasm is associated with greater likelihood of reaching orgasm from PVI with men with longer than average penises. In addition, if penis size is relevant for vaginocervical response, but not for clitoral glans response, we hypothesize that orgasmic frequency provoked by superficial clitoral stimulation will be unrelated to women's rated importance of penis size. Finally, if preference for a longer penis is driven by greater vaginocervical sensitivity, then one might infer that women who reach orgasm from PVI more easily with longer penises value PVI relatively more and value noncoital sex relatively less. We also test these hypotheses.

Method

An online survey was advertised primarily in Scotland with potential respondents being informed that it was part of a study intended to better understand women's sexuality and inform ways of helping women to achieve their sexual potential (the issue of penis size was not mentioned in the advertisements for the study). The advertisement of the survey occurred primarily in Scottish universities (and to a lesser extent among students and staff of universities of other parts of the United Kingdom and North America). As part of the informed consent procedures, participants began responding only after reading that anonymity and confidentiality were assured, as well as being informed that they should answer the survey without anyone seeing or discussing the answers. The study was approved by the University of the West of Scotland Ethics Committee. The present data set has yielded several publications on the psychological, behavioral, and

anatomical correlates of female sexual function [22–24]. The quality of sexuality data collected by online surveys and by in-person surveys appears to be similar [25].

The present sample consists of 323 coitally experienced women. Exclusion criteria were being coitally inexperienced and responses suggesting a high risk of misreporting, as indicated by scores above the 86th percentile on the short version of the Marlowe-Crowne Social Desirability Scale [26] (see below).

The effect of penis size on the likelihood of having an orgasm from PVI was assessed by the question "All things being equal, are you more likely to have an orgasm from penis-in-vagina intercourse with a man who has a somewhat larger than average penis length? (Assume that average erect penis length is the length of a £20 note or any U.S. dollar bill)." Possible answers were a) more likely to have an orgasm with a longer penis, b) no difference—I orgasm equally well with long or average penis lengths, c) less likely to have an orgasm with a longer penis, d) I do not (or do not often) have an orgasm from intercourse, or e) I have not had enough penis-in-vagina intercourse partners to make a comparison. A dichotomous variable was created with those answering b and c being collapsed in the group for whom large penis size was not important for the likelihood of attaining orgasm from PVI vs. those who responded that penis size was important (answer a). Those with category d or e responses were excluded from further analyses related to size preference, leaving $N = 160$ for such analyses. The banknote size question was previously used in the cited Czech study which found that greater vaginal orgasm consistency was related to preference for a longer penis (a 145-mm-long Czech banknote size was given as the size reference) [5]. The £20 note is 149 mm long and U.S. dollar bills are 155 mm long. Studies of normal men's erect or stretched flaccid penis length usually find means between 120 and 167 mm [27].

Importance attributed to PVI and to noncoital sex was assessed by the following questions: "How important to you are the following activities (rate them from 1 = least important to 10 = most important)? a) penile-vaginal intercourse, b) other sexual activities."

The 13-item short form of the Marlowe-Crowne Social Desirability Scale [26] was used to exclude participants (above the 86th percentile) especially likely to misrepresent their sexual behaviors and preferences. The reliability of this short form (0.70) was shown to be similar to that of

the full scale (0.75) [26]. Moreover, a validity study showed that a mock job interview increased its scores in a Chinese sample [28].

Participants reported how many days they engaged in the following sexual behaviors and how many days they had orgasms from each of them in a recent representative month: PVI *without* additional simultaneous clitoral stimulation, PVI *with* additional simultaneous clitoral stimulation, clitorally focused masturbation (except vibrator), vaginally focused masturbation (except vibrator), masturbation with vibrator (alone or with a partner), clitorally focused manual stimulation by a partner, vaginally focused manual stimulation by a partner, receiving oral sex, and anal sex. Clitorally focused masturbation, vaginally focused masturbation, oral sex, and anal sex were differentiated as occurring with or without PVI in the same day [22,23,29,30]. This sexual behavior questionnaire and previous versions in other languages [31–33] have been used in studies demonstrating predicted differences between sexual activities. Recall and diary measures of sexual behavior frequencies in a previous version were strongly correlated [33].

Statistical Analyses

Univariate analyses of covariance were used to compare women who reported that they were more likely to attain orgasm from PVI with a longer than average penis to women for whom penis size was not important, with respect to frequencies of various sexual behaviors including orgasms from each behavior.

Binary logistic regression (backward conditional) was used to compare women who reported that they were more likely to attain orgasm from PVI with a longer than average penis to women for whom penis size was not important, with respect to rated importance of PVI and rated importance of noncoital sex.

Partial eta coefficients are measures of effect size comparable to Pearson's product-moment coefficients, and for the sake of clarity in comparing results, they are presented for the analyses of covariance.

All statistical analyses were performed with SPSS, version 17 (SPSS Inc., Chicago, IL, USA).

Results

Table 1 provides details of participant demographic details, and Table 2 provides details of past month sexual behavior frequencies.

Table 1 Participant demographics

	M (SD) or %
Age (years)	25.89 (7.85)
Place of origin	
Scotland	73.1
Other United Kingdom	8.0
Other Europe	7.7
United States	7.7
Canada	0.9
Rest of the world	2.5
Occupation	
University student	70.8
Employed full time	20.5
Employed part time	7.5
Self-employed	0.3
Unemployed	0.9

Table 3 displays women's ratings of how penis size influences the likelihood of achieving orgasm from PVI; among the 160 women qualified to judge size effects (because they have had PVI-induced orgasms and enough partners to make informed size comparisons), 33.8% report that they are more likely to have orgasms with longer

Table 2 Past month sexual behavior frequencies

	Mean (SD)
PVI (<i>without</i> simultaneous clitoral stimulation)	6.41 (6.67)
Vaginal orgasm	3.72 (5.85)
Masturbation during PVI	6.19 (6.94)
Masturbation orgasm during PVI	4.76 (6.12)
Clitorally focused masturbation	6.77 (7.91)
Clitorally focused masturbation orgasm	6.32 (7.78)
Vaginally focused masturbation	2.37 (4.82)
Vaginally focused masturbation orgasm	1.74 (4.33)
Vibrator use	2.79 (5.08)
Vibrator orgasm	2.69 (5.06)
Clitorally focused manual stimulation by partner (with same day PVI)	5.67 (6.53)
Orgasm from clitorally focused manual stimulation by partner (with same day PVI)	4.45 (6.00)
Clitorally focused manual stimulation by partner (no same day PVI)	3.17 (5.02)
Orgasm from clitorally focused manual stimulation by partner (no same day PVI)	2.42 (4.65)
Vaginally focused manual stimulation by partner (with same day PVI)	4.40 (6.22)
Orgasm from vaginally focused manual stimulation by partner (with same day PVI)	2.87 (5.34)
Vaginally focused manual stimulation by partner (no same day PVI)	2.04 (4.33)
Orgasm from vaginally focused manual stimulation by partner (no same day PVI)	1.20 (3.18)
Oral sex (with same day PVI)	4.13 (5.44)
Oral sex orgasm (with same day PVI)	3.38 (5.30)
Oral sex (no same day PVI)	1.80 (3.69)
Oral sex orgasm (no same day PVI)	1.36 (3.17)
Anal sex (with same day PVI)	0.50 (1.58)
Anal sex orgasm (with same day PVI)	0.31 (1.57)
Anal sex (no same day PVI)	0.16 (1.07)
Anal sex orgasm (no same day PVI)	0.14 (1.51)

PVI = penile–vaginal intercourse; SD = standard deviation

Table 3 Women's reports on how penis size influences the likelihood of reaching orgasm from penile–vaginal intercourse (PVI)

	Total sample % (N = 321*)	Subsample qualified to judge penis size importance % (N = 160)
More likely to have an orgasm with a longer penis	16.8 (54)	33.8 (54)
No difference—equally likely of having an orgasm with a longer and average penis	29.9 (96)	60.0 (96)
Less likely to have an orgasm with a longer penis	3.1 (10)	6.3 (10)
Never (or not often) had an orgasm from PVI	29.0 (93)	
Not enough PVI partners to make a comparison	21.2 (68)	

*There are two missing values in the penis size influence question.

penises, whereas 60.0% report that size makes no difference, and 6.3% report that they are less likely to have orgasms with longer penises.

Table 4 displays the descriptive statistics of the demographics of the subsample qualified to judge the importance of penis size for orgasm from PVI.

As shown in Table 5, women who report that they are more likely to reach orgasm from PVI with a longer than average penis report having more vaginal orgasms within a previous month compared with women for whom penis size is not important for PVI orgasm. Notably, the groups do not differ in the frequencies of clitoral orgasm, orgasm induced by vaginal masturbation, or any other sexual behaviors.

As depicted in Table 6, likelihood of attaining orgasm from PVI with a longer than average penis was independently predicted by greater importance attributed to PVI and lesser importance attributed to noncoital sex.

Table 4 Demographics and importance of sexual behaviors of the subsample qualified to judge the importance of penis size on the likelihood of reaching orgasm from PVI (N = 160)

Age (years), mean (SD)	26.58 (8.0)
Place of origin (%)	
Scotland	70.6
Other United Kingdom	10.0
Other Europe	6.9
USA	9.4
Canada	0.6
Rest of the world	2.5
Occupation (%)	
University student	66.3
Employed full time	24.4
Employed part time	8.8
Unemployed (benefits)	0.6
Importance of sexual behaviors, mean (SD)	
Importance of PVI	7.67 (2.64)
Importance of noncoital sex	7.41 (2.19)

PVI = penile–vaginal intercourse; SD = standard deviation

Discussion

This study replicates and extends earlier findings [5] by showing that the importance women give to penis size for reaching orgasm from PVI is associated with higher frequency of vaginal orgasms but is unrelated to frequency of orgasm from vaginal masturbation, frequency of clitoral orgasm, or frequency of any other sexual activities. The importance of a longer than average penis for attaining orgasm from PVI was independently predicted by greater importance given to PVI and lesser importance given to noncoital sex. These findings strengthen the view that penis size is more relevant for women who are more sexually responsive to penile stimulation of the vagina and cervix. Higher vaginocervical responsiveness among women who can more easily attain vaginal orgasm might be related, at least in part, to greater thickness and/or length of the urethrovaginal space [34,35], better vagus nerve function [30,33], more awareness of vaginal erotic responses [36,37], more attention to vaginal sensations during PVI [5], better pelvic region muscle function [38], better psychological functioning in at least some respects [4,20,22,29,32,39,40], better intimate relationship quality [4,20,31,40], and higher sexual desire [40,41].

The finding that women's ratings of the importance of penis size did not predict frequency of clitoral orgasm argues against the view that larger penises are valued by some women because of their greater ability to stimulate the clitoral glans during PVI (as Masters and Johnson implied [11]) or for their purely visual appeal, masculine symbolism, or cultural cachet. One might argue that more generally erotophilic or less inhibited women rate larger penises as more important and also have higher rates of all sexual activities and all kinds of orgasms. However, our differential results argue against that interpretation because the preference

Table 5 Univariate analyses of covariance comparing those women who are more likely to orgasm from PVI with a longer than average penis to those women who are not more likely to orgasm from PVI with a longer than average penis regarding frequency (days in a previous month) of sexual behaviors

	More likely to orgasm from PVI with a longer than average penis <i>M</i> (<i>SD</i>)	Not more likely to orgasm from PVI with a longer than average penis <i>M</i> (<i>SD</i>)	<i>F</i>	<i>df</i>	Partial <i>eta</i>
Sexual behavior frequencies					
PVI	8.76 (7.98)	6.78 (7.12)	2.53	158	0.13
Vaginal orgasm	7.28 (8.18)	4.68 (5.98)	5.16*	158	0.18
Clitoral masturbation during PVI	5.42 (6.92)	7.21 (7.34)	2.18	157	0.12
Orgasm from clitoral masturbation during PVI	4.74 (6.63)	6.07 (6.55)	1.44	157	0.09
Clitorally focused masturbation	7.82 (9.53)	8.83 (7.88)	0.48	155	0.05
Clitorally focused masturbation orgasm	7.55 (9.43)	6.20 (7.52)	0.92	155	0.08
Vaginally focused masturbation	2.33 (4.49)	3.34 (6.32)	1.06	152	0.08
Vaginally focused masturbation orgasm	1.73 (4.22)	2.55 (5.47)	0.89	152	0.08
Vibrator use	3.10 (5.99)	2.76 (4.43)	0.15	149	0.03
Vibrator orgasm	3.04 (6.00)	2.57 (4.26)	0.31	149	0.04
Clitorally focused masturbation by partner (with same day PVI)	6.40 (7.11)	6.62 (7.42)	0.03	149	0.00
Orgasm from clitorally focused masturbation by partner (with same day PVI)	5.62 (6.95)	5.54 (6.68)	0.01	149	0.00
Clitorally focused masturbation by partner (no same day PVI)	2.47 (4.45)	3.49 (5.94)	1.17	151	0.09
Orgasm from clitorally focused masturbation by partner (no same day PVI)	2.06 (4.42)	2.71 (5.19)	0.59	151	0.06
Vaginally focused masturbation by partner (with same day PVI)	5.81 (6.65)	5.03 (6.94)	0.44	151	0.05
Orgasm from vaginally focused masturbation by partner (with same day PVI)	3.98 (6.59)	3.72 (5.75)	0.07	151	0.00
Vaginally focused masturbation by partner (no same day PVI)	2.38 (4.99)	2.00 (3.88)	0.27	147	0.04
Orgasm from vaginally focused masturbation by partner (no same day PVI)	1.54 (4.27)	1.21 (2.53)	0.34	147	0.04
Receiving oral sex (with same day PVI)	4.71 (5.97)	4.22 (5.43)	0.26	150	0.04
Orgasm from receiving oral sex (with same day PVI)	3.98 (5.54)	3.56 (5.24)	0.21	150	0.03
Receiving oral sex (no same day PVI)	1.73 (3.91)	1.56 (2.94)	0.09	146	0.03
Orgasm from receiving oral sex (no same day PVI)	1.42 (3.66)	1.20 (2.33)	0.20	147	0.03
Anal sex (with same day PVI)	0.72 (1.66)	0.62 (1.56)	0.13	147	0.03
Orgasm from anal sex (with same day PVI)	0.53 (1.58)	0.31 (1.04)	1.04	147	0.08
Anal sex (no same day PVI)	0.12 (0.43)	0.09 (0.44)	0.15	142	0.03
Orgasm from anal sex (no same day PVI)	0.08 (0.38)	0.08 (0.43)	0.00	142	0.00

* $P < 0.05$ PVI = penile–vaginal intercourse; *M* = mean, *SD* = standard deviation, *df* = degrees of freedom

for a longer penis is associated only with vaginal orgasm frequency, not with frequency of other forms of orgasm or other sexual activities. In addition to the stimulation of the cervix and more of the vagina, it is possible that men with longer penises are better lovers (and the longer penis might signal greater likelihood of that), but the effect is specific to intercourse-induced orgasm.

Table 6 Binary logistic regression (backward conditional) predicting reported effect of penis size on likelihood of attaining orgasm from PVI from importance attributed to PVI and importance attributed to noncoital sex

	More likely to reach orgasm from PVI with a longer than average penis <i>B</i>	OR (95% CI)
Importance of PVI	0.23	1.26 (1.02–1.55)*
Importance of noncoital sex	–0.21	0.82 (0.67–0.999)*

* $P < 0.05$

CI = confidence interval; OR = odds ratio; PVI = penile–vaginal intercourse

The lack of significant associations between preference for a longer penis and noncoital sexual activities is not likely to have resulted from lack of statistical power because the size of the subsample of women qualified to judge penis size ($N = 160$) has adequate power (>0.80) to detect significant correlations equal or above $r = 0.22$, and the non-significant direct associations between preference for a longer penis and noncoital orgasms were well below that (partial $\eta^2 \leq 0.08$).

In this study, 33.8% of women with a history of orgasm from PVI and a sufficient lifetime number of male sexual partners to be able to make comparisons reported that they were more likely to attain orgasm from PVI with a longer than average penis, whereas only 6.3% of such women report that they are less likely to have orgasms with longer penises. This 33.8% prevalence is nearly the same as that found in a large representative Czech sample similarly qualified to judge and responding to a similar question (34.1%) [5]. In other studies, a higher proportion of Arabic and Croatian women reported

that penis size was important or very important (67.2–75.4%) [2,14], but such studies did not ask about the specific importance of larger than average penises; an average penis size can be considered important by many women if compared with a shorter than average penis. Notably, the roughly 30% of women reporting that penis size is not important in these studies is similar to the estimated prevalence of 30% of women who have not had vaginal orgasms [32]—a prevalence that was again confirmed in this study. Our results might slightly underestimate women's true size preferences because our references for an "average" penis length (the £20 note at 149 mm long and the U.S. dollar bill at 155 mm long) are slightly longer than the approximately 148-mm mean erect penis length found when averaging results across several studies [27].

Interestingly, penis size is associated with other male traits associated with increased likelihood of women reaching orgasm from PVI. Moderately larger penis size was associated with higher woman-rated physical attractiveness of men [16–18] and with other objectively measured traits associated with the physical attractiveness of men, such as height and slimness [42–45], which is consistent with the finding in a large sample that self-reported penis size is related to self-reported height, slimness, and physical attractiveness [19]. Several studies have also found that flaccid, stretched, or erect penis length is related to index finger length (implying bigger hands) or digit ratio (an indicator of prenatal testosterone exposure) [43,46–48], and these correlates might themselves be indicators to women of both likelihood of a larger penis and the other benefits associated with ability to manipulate the environment more effectively. These findings suggest that penis size is allometrically related to lean body size and may be phenotypically and genetically correlated with other sexually selected traits, perhaps tapping into an underlying dimension of genetic quality (reflecting low number and severity of deleterious mutations—see [49–51]).

Vaginal orgasm (or orgasm during PVI) is more likely to occur when women and/or their male partners show specific indicators of mate value such as (i) better physical or psychological health [4,10,20,22,29,30,32,40,41], (ii) when their male partners have other indices of mate value, such as higher physical attractiveness [6,8], masculinity [8], body symmetry [7], and copulatory courtship ability (indicated by greater erectile potency and longer PVI duration) [4,5], and (iii) when couples find themselves in more reproductively propitious rela-

tionships, as cued by higher sexual desire, higher sexual satisfaction, and higher relationship satisfaction [4,10,20,31,40,41]. Taken together, these results raise the possibility that vaginal orgasm evolved at least in part as a female mate choice adaptation to favor males with larger penises, better copulatory courtship ability, and other sexually selected traits by promoting repeated copulations with such males especially when relationship quality, the woman's health, and environmental circumstances favor reproduction [10,52]. Hence, vaginal orgasm might be contingent in part on (and thus a signal of) the quality of both partners [10]. Given the correlational nature of the findings, it is also possible that vaginal orgasm promotes female health and better intimate relationships. This would still be in accordance with vaginal orgasm being an adaptation to promote successful reproduction through increasing fertility and/or reinforcing repeated copulation with favored males.

Consistent with vaginal orgasm having evolved to promote desire for PVI in favorable circumstances, there is a host of studies showing that vaginal orgasm and PVI frequency are associated with greater sexual desire and passion [31,40,41], sexual satisfaction [4,40,53–55], and less risk of sexual dysfunctions [41,56,57], whereas other sexual activities are not as clearly related to better sexual function; indeed, they are often unrelated or correlated with impaired sexual function [2,41,53–56,58–61].

One plausible explanation for the relationships between female PVI orgasm and male attributes is the so-called "cryptic female mate choice," that is, female preferences expressed during copulation that affect likelihood of fertilization and/or of remating with the same male. The female choice is "cryptic" in the sense that observable male copulations may not translate into reproductive success because females can still exercise "choice" among males and/or their sperm after copulation begins [62], including acquiring the information for "deciding" if they should remate with a given male or not. Cryptic female choice has shaped the evolution of male intromittent genitalia and copulatory behavior across many species [63]. Thus, male genitalia are not only subject to selection for fertilization efficiency and sperm competition ability but also for ability to stimulate female nervous systems in ways that maximize the likelihoods of sperm storage, repeated matings with the same male, ovulation, and fertilization [64]. Thus, the functions of human vaginal orgasm need not be limited to maximizing short-term fertilization probability, e.g.,

through sperm upsuck by the cervix (contra [65]). Rather, females in our species have evolved (from the Pleistocene environment of evolutionary adaptedness) several ways of sampling male lovers and their penis sizes through copulatory courtship with relatively low risk of pregnancy, including the following: (i) adolescent subfertility (potentially allowing teens in natural-fertility foraging societies to calibrate their preferences for penis size and copulation ability) [66]; (ii) extended sexual receptivity throughout the ovulatory cycle (allowing adult females to try new males without much risk of pregnancy unless they copulate repeatedly with favored males) [67]; and (iii) reduced ovulation during the 1–3 years of on-demand breast-feeding typical in foraging societies [68]—all of which open the way for differential rates of female orgasm with different male lovers to influence female mate choice and fertility [52].

Note that hypotheses about adaptive functions of vaginal orgasm do not rely on Freudian psychoanalytic concepts but can be grounded in the extensive biological literature on female choice for male genital morphology and copulatory behavior [63]. We view vaginal orgasm as at least partially a cryptic female choice system, sensitive to many relationship, health, and partner variables. However, the finding that the ability to attain vaginal orgasm is related to the psychological development of the woman, as cause and/or effect [22,29,32], is congruent with the view that vaginal orgasm is likelier to be favored by women's better mental health among other fitness-related characteristics. Far from being genetically reductive, the cryptic choice view helps pinpoint aspects of women's sexual histories, partner traits, and environmental circumstances that should adaptively influence orgasm likelihood and sexual function and that might be targets for therapeutic intervention.

The replicated relationship between preference for longer penises and more frequent vaginal orgasms, together with studies showing that penis size is correlated with other sexually selected male traits and is considered important by a substantial proportion of women, suggests that a larger penis is a sexually relevant attribute in female choice. It also supports the hypothesis that the distinctive size and morphology of the male human penis evolved at least partly through the choices made by ancestral females for tens of thousands of generations, through a vaginal orgasm system which, rather than triggering sexual satisfaction with any male, favors only certain males under certain conditions [52]. The resulting male anxiety about penis size may not

reflect internalized, culturally arbitrary masculine stereotypes, but an accurate appreciation that size matters to many women—just as men feel legitimate anxiety when they enter the mating market about their intelligence, personality traits, sense of humor, social status, wealth, and other traits known to be favored by women across cultures [69–71].

This study has some limitations. First, we focused on penis length rather than girth because women may have a clearer idea about what is an average length (especially when aided by the reference of a common object: a banknote); however, in some previous research, women valued girth a bit more than length [2,15], so future research may show that girth is more predictive of PVI satisfaction and vaginal orgasm. Alternatively, the greater ability of longer penises to stimulate the cervix and thus the emotionally related vagus nerve [21] might prove more important than girth. Second, our results are correlational; future experimental research might assess to what extent different penis sizes influence women's PVI satisfaction and likelihood of vaginal orgasm. Third, there are likely errors in the women's estimation of men's erect penis length, but we know of no reason for there to be a systematic bias in such estimation. Fourth, the suprapubic fat pad can decrease visible penis length more than functional penis length, so future studies might use more precise measures of erect penis length to both the pubis and pressed close to the pubic bone. Future studies might also incorporate measures of women's satisfaction with men's penis length [2] and make use of large representative samples (such as the sample used in the previously cited Czech study which found that vaginally orgasmic women were more likely to have a vaginal orgasm with a man who has a longer than average penis) [5] rather than convenience samples. These correlational findings can be a useful guide for informing future controlled clinical research studies.

Conclusion

Women's frequency of vaginal orgasm is associated with preference for deeper penile–vaginal stimulation, as indicated by greater importance given to longer than average penises. In contrast to the assertions common in sexology, penis size appears important to many women, and this is consistent with evolutionary hypotheses concerning the mate choice functions of vaginal orgasm and with the biological literature showing cryptic female choice for male genital morphology across

many species. Like many men's desire to have a longer than average penis, the desire of (especially vaginally orgasmic) women to have a man with a longer than average penis may reflect lessons learned from real sexual experiences rather than internalization of arbitrary stereotypes.

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Statement of Authorship

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