

# Slimmer Women's Waist is Associated with Better Erectile Function in Men Independent of Age

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Received: 28 October 2011 / Revised: 27 May 2012 / Accepted: 10 November 2012  
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**Abstract** Previous research has indicated that men generally rate slimmer women as more sexually attractive, consistent with the increased morbidity risks associated with even mild abdominal adiposity. To assess the association of women's waist size with a more tangible measure of perceived sexual attractiveness (as well as reward value for both sexes), we examined the association of women's age and waist circumference with an index of men's erectile function (IIEF-5 scores), frequency of penile-vaginal intercourse (PVI), and sexual satisfaction in a representative sample of Czechs (699 men and 715 women) aged 35–65 years. Multivariate analyses indicated that better erectile function scores were independently associated with younger age of self and partner and women's slimmer waist. PVI frequency was independently associated with women's younger age and women's slimmer waist. Sexual satisfaction was independently associated with men's younger age and slimmer waist for both sexes. Better erectile function, greater PVI frequency, and greater sexual satisfaction were associated with women's slimmer waist, independently of both sexes' ages. Possible reasons for the waist effects were discussed, including women's abdominal body fat decreasing their own desire through neurohormonal mechanisms and decreasing their partner's desire through evolutionarily-related decreased sexual attractiveness.

**Keywords** Attractiveness · Abdominal obesity · Erectile dysfunction · Sexual satisfaction

## Introduction

Many studies have found that men rate women with a lower waist-to-hip ratio (WHR), a measure of sexually dimorphic fat distribution, as more attractive (Singh, 2002; Singh, Dixon, Jessop, Morgan, & Dixon, 2010). Indeed, even a study of blind men revealed that low WHRs were more attractive to touch (Karremans, Frankenhuys, & Arons, 2011). Brain imaging with fMRI demonstrated that the right and left orbital frontal cortex (areas involved in reward) showed significantly greater activation when men viewed images of women with narrower waists and lower WHRs (Platek & Singh, 2010). Another fMRI brain imaging study found that when WHR and a measure of adiposity (body mass index) (BMI) were varied, changes in BMI but not WHR were associated with attractiveness ratings and subcortical regions (caudate) related to reward (Holliday, Longe, Thai, Hancock, & Tovee, 2011). Studies using eye-tracking technology show that the waist is an important region that men use to judge the attractiveness of women's bodies (Dixon, Grimshaw, Linklater, & Dixon, 2011). Other studies found that measures of adiposity (waist, body volume divided by height, BMI) were a more powerful inverse predictor of perceived attractiveness than WHR (Fan, Dai, Qian, Chau, & Liu, 2007; Rozmus-Wrzesinska & Pawlowski, 2005).

This is not surprising, given evolutionary selection pressures, because accumulation of excess body fat, especially abdominally, is associated with elevated risk of metabolic, cardiovascular, and neoplastic disorders (Singh, 2002). The elevated risk of such disorders could result in poorer fitness and hence less desirability as a mating partner. The lesser

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attractiveness of women who carry more abdominal fat tends to be moderated by food scarcity, such that in environments in which food is scarce, the evolutionary issue of risk of fetal death due to maternal malnutrition leads to a preference for more body fat than in environments in which there is little problem with food scarcity (Wetsman & Marlowe, 1999) (a small percentage of men in industrialized countries have found obese women especially attractive, but this preference has been discussed in light of possible paraphiliac aspects [Swami & Furnham, 2009]). Studies examining the attractiveness of less abdominal adiposity in women have generally relied on attractiveness scales although one study found that waitresses with lower BMI received larger tips (Lynn, 2009), but have not examined the more tangible and reproductively proximal issue of the effect on men's erections. In addition, the association of waist circumference with the reinforcement value of penile-vaginal intercourse (PVI), operationalized as both frequency of PVI and ratings of sexual satisfaction, also merit examination.

Given the association of slimness with both indices of health and the not unrelated issue of attractiveness (Weeden & Sabini, 2005), it is not surprising that slimness in both sexes was associated with greater frequency of specifically PVI (but not of other sexual behaviors) in a sample of non-obese healthy young adults; this effect was independent of cohabitation with a sexual partner (Brody, 2004, 2010a). In addition to these correlational findings, a randomized clinical trial demonstrated that augmented intake of the nutrient ascorbic acid led to specifically greater PVI (but not other sexual behavior) frequency and improved mood in women (Brody, 2002). In addition to these findings linking slimness and better nutritional status to greater frequency of specifically PVI (but not sexual behaviors that lack the potential to be reproductive), the broader literature indicates that it was specifically PVI that was associated with indices of better psychological and physical health (Brody, 2010b). Multivariate analyses controlling for various sexual behaviors also indicated that it was PVI but not other sexual activities that was associated with greater sexual satisfaction (Brody & Costa, 2009).

Although BMI might be a more common measure of adiposity than waist circumference, waist circumference is a better measure of central adiposity and its related morbidity risks, including coronary heart disease risk in women (Lofgren et al. 2004). Waist circumference might also be a better long-term predictor of all-cause mortality in women than in men (Mason, Craig, & Katzmarzyk, 2008).

Based upon the findings noted above, we hypothesized that women's slimmer waist and younger age (both associated with reproductive fitness) would be independently associated with men's better erectile function (a tangible indicator of at least psychophysiological readiness for PVI that might be determined in part by partner attractiveness) as well as with greater PVI frequency (an indicator of the reinforcement

value of PVI with that partner as well as a mechanism for maintaining intimate relationship quality) (Brody, 1997; Costa & Brody, 2007) and sexual satisfaction (a psychological response that might promote pair-bonding). We also examined the association of the same sexual variables with men's waist and age.

## Method

### Participants

In the year 2010, a nationally representative sample of heterosexual citizens of the Czech Republic aged 35–65 years was collected by representatives of a marketing agency (STEM/MARK) under the supervision of the 1st Faculty of Medicine, Charles University. Participants were approached in their homes and received no compensation. They provided informed consent (there was a statement of confidentiality of responses and the right to discontinue participation at any time), had any questions answered regarding the survey items meaning, and then completed the survey forms in private. The middle-age range was chosen to provide both age-related risk of erectile dysfunction as well as potentially more years of sexual experience on average than a younger sample. Sixty percent of those approached participated in the survey. The representativeness of the actual participants in the survey corresponded to the national census with regard to age distribution, education, size of municipality, and region. The rationale for using participants who were not both members of the same couple includes prioritizing a representative sample and decreasing risk of a couple comparing responses (Weiss & Brody, 2011). The 649 women who provided complete data had a mean (SD) age of 48.1 (8.6) years, and the 685 men who provided complete data had a mean (SD) age of 49.6 (8.7) years.

### Measures

#### *Erectile Function (IIEF-5)*

Perhaps the most commonly used instrument to screen for erectile dysfunction has been the 5-item version of the International Index of Erectile Function (IIEF-5) (Cappelleri & Rosen, 2005; Rosen, Cappelleri, Smith, Lipsky, & Pena, 1999). Adequate duration of erection was among the functions examined by the IIEF-5 and greater duration of PVI (well beyond the range associated with premature ejaculation) was associated in one large representative sample with greater likelihood of both a global measure of woman's partnered orgasm as well as in another large representative sample with specifically vaginal orgasm (elicited by PVI without concurrent clitoral masturbation) (Brody & Weiss, 2010; Weiss & Brody, 2009b). A previous study using the

present large representative sample of middle-aged Czechs found that IIEF-5 scores generated by men and by women did not differ with regard to mean, score distribution, or correlations with own satisfaction with sex life, life in general, partnership, and own mental health (Weiss & Brody, 2011), indicating that in this nationally representative sample, men's and women's ratings of erectile function were similar, and similarly associated with measures of satisfaction. The same wording for the IIEF-5 was used for both sexes with the added instruction that the woman should complete it on behalf of her partner.

### *Sexual Satisfaction*

The sexual satisfaction item from the Life Satisfaction (LiSat) scale (Fugl-Meyer, Melin, & Fugl-Meyer, 2002) was used. The LiSat scale consists of rating one's sexual satisfaction ("My sexual life is....") on a 9-point Likert-type scale ranging from 1 = very unsatisfying to 9 = very satisfying. It has been used in various studies of sexual satisfaction (Brody, 2007; Brody & Costa, 2009; Brody & Weiss, 2011; Fugl-Meyer et al., 2006). It produces similar results to the satisfaction scale from the Multidimensional Sexuality Questionnaire (Tao & Brody, 2011).

### *Waist Circumference*

Participants were provided with a paper tape measure and instructed to measure their waist.

### *Sexual Behavior and Demographics*

Participants completed a questionnaire which included demographic questions and past month days of penile-vaginal intercourse (PVI) as: 0–4, 5–8, 9–12, or 13 or more.

### *Procedure*

### *Statistical Analyses*

SPSS for Windows version 13.0 (SPSS Inc., Chicago, IL, USA) was used for statistical analyses. Analyses were two-tailed, with an alpha set at .05. The sample size allowed a power of over 0.95 to detect small ( $d = 0.2$ ) effect sizes.

## **Results**

### *Sample Characteristics*

The women had a mean (SD) waist of 84.2 (15.1) cm, and the men had a mean (SD) waist of 95.5 (14.8) cm. IIEF-5 mean

(SD) scores were 20.2 (4.8) as reported by women and 20.0 (4.7) as reported by men. Sexual satisfaction mean (SD) score was 5.8 (2.3) for both sexes and PVI frequency mean was about 8 times monthly for both sexes (percentage of men/women reporting each PVI category:  $\leq 4$ : 36/38.2, 5–8: 26.8/36.2, 9–12: 14.9/12.3,  $\geq 13$ : 16.6/12). The additional 102 men and 71 women who did not provide waist circumference did not differ from those who provided waist measurement with regard to age, sexual satisfaction score, or IIEF-5 score. Men but not women non-responders (to the waist measurement question) reported a slightly lower frequency of PVI ( $t = 2.06$ ,  $df = 581$ ,  $p = .04$ ; mean difference: 0.27) than responders. Other demographic characteristics of the sample, distribution of IIEF-5 scores, and details of the similarity of IIEF-5 ratings provided by men and women in this sample are provided elsewhere (Weiss & Brody, 2011). Table 1 presents correlations between the variables.

### *Calculation of IIEF-5 Scores from Age and Waist of Both Sexes*

Table 2 presents both univariate and multiple regression calculations of erectile function (IIEF-5) scores from age, partner age, and waist for each sex. The multiple regression revealed that better erectile function was independently associated with men's and women's younger age as well as with women's slimmer waist. In this and all other multiple regressions, the variance inflation factors were all under 4 (age and partner age were the only variables with variance inflation factors over 2). Figure 1 displays the univariate association between women's waist and men's IIEF-5 score.

### *Calculation of PVI Frequency from Age and Waist of Both Sexes*

Table 3 presents both univariate and multiple regression calculation of PVI frequency from age, partner age, and waist for each sex. The multiple regression revealed that PVI frequency was independently associated with women's younger age and women's slimmer waist.

### *Calculation of Sexual Satisfaction from Age and Waist of Both Sexes*

Table 4 presents both univariate and multiple regression calculations of sexual satisfaction score from age, partner age, and waist for each sex. The multiple regression revealed that sexual satisfaction score was independently associated with men's younger age and both sexes' slimmer waists. Figure 2 displays the univariate association between women's waist and women's sexual satisfaction score. For exploratory purposes, an additional multiple regression predicting sexual satisfaction from age,

**Table 1** Univariate correlations

	Age of partner	IIEF-5 score	PVI frequency	Waist (cm)	Sexual satisfaction
<i>Men</i>					
Age					
Correlation	.86	−.36	−.32	.17	−.33
<i>p</i>	<.001	<.001	<.001	<.001	<.001
Age of partner					
Correlation		−.38	−.36	.20	−.32
<i>p</i>		<.001	<.001	<.001	<.001
IIEF-5 score					
Correlation			.35	−.09	.42
<i>p</i>			<.001	.017	<.001
PVI frequency					
Correlation				−.12	.45
<i>p</i>				.006	<.001
Waist (cm)					
Correlation					−.12
<i>p</i>					.001
<i>Women</i>					
Age					
Correlation	.84	−.38	−.38	.32	−.28
<i>p</i>	<.001	<.001	<.001	<.001	<.001
Age of partner					
Correlation		−.39	−.36	.30	−.24
<i>p</i>		<.001	<.001	<.001	<.001
IIEF-5 score					
Correlation			.27	−.22	.41
<i>p</i>			<.001	<.001	<.001
PVI frequency					
Correlation				−.21	.40
<i>p</i>				<.001	<.001
Waist (cm)					
Correlation					−.18
<i>p</i>					<.001

PVI penile-vaginal intercourse, IIEF-5 erectile function

partner age, waist, PVI frequency, and IIEF-5 score for each sex was performed. The results, presented in Table 5, indicated that sexual satisfaction for both sexes was associated with greater PVI frequency and better erectile function, and also with younger age for men.

## Discussion

Multivariate analyses indicated that better erectile function scores were independently associated with younger age of self and partner and with women's slimmer waist. PVI frequency was independently associated with women's younger age and women's slimmer waist. Sexual satisfaction was

independently associated with men's younger age, and slimmer waist for both sexes.

The inverse association between men's age and both erectile function and sexual satisfaction for both sexes was likely due to age-related declines in endothelial function and perhaps declines in androgen and other neurohormonal factors. In addition, relatively younger men (especially in the context of this middle-aged sample) tended to be more attractive. Thus, sexual satisfaction may be linked to men's age partly because women were more satisfied by a relatively younger, more attractive mate. This increased attraction could have led to behaviors by women that increased the man's erectile function. To some extent, age effects in this context could be associated with relationship duration and the effects might be difficult to disentangle. Future research might collect relationship duration data, preferably in the context of a longitudinal study.

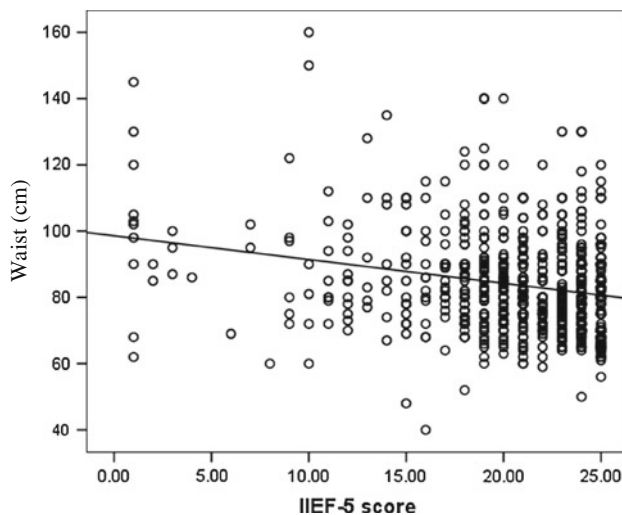
The inverse association between women's age and both erectile function and PVI frequency might have been due to some combination of (1) younger females (on average) having greater sexual stimulus value for males, an effect consistent with evolutionary selection pressures and observed in other species as well (e.g., younger but mature female macaques received about five times as many copulations and about 22 times as many ejaculations as older but still cycling females [Jensen, Sassenrath, & Blanton, 1982]) and (2) an increasing risk of sexual dysfunction in older women (Weiss & Brody, 2009a) (at least postmenopausal women without hormone replacement) with possible secondary effects on the partner. To some degree, declining PVI frequency and poorer erectile function might have explained lesser sexual satisfaction for both sexes (Brody & Costa, 2009; Tao & Brody, 2011; Weiss & Brody, 2011). Better quality erections were associated with greater sexual, life, partnership, and mental health satisfaction for both men and their women (Weiss & Brody, 2011). PVI is contingent on an adequate erection and both frequency of specifically PVI and orgasmic response to PVI per se were associated with a wide range of measures of better physical and psychological health and better intimate relationship satisfaction (Brody, 2010a, b; Brody & Costa, 2008, 2009; Brody & Preut, 2003; Brody & Weiss, 2011; Costa & Brody, 2007; Tao & Brody, 2011).

Although there are several possible explanations for the observed independent effect of women's slimmer waist on better erectile function, PVI frequency, and sexual satisfaction, the most compelling explanation was that slimmer women are, on average, more sexually attractive to men (resulting in greater PVI frequency, stronger erections, and greater satisfaction). In addition, various psychological factors were associated with both slimness and relationship function, which might have contributed to the observed associations. Various physiological mechanisms could also have contributed to both overweight and impaired sexual function (such as poorer

**Table 2** Univariate and multiple regression calculation of erectile function (IIEF-5) scores from age, partner age, and waist

Independent variables	Univariate correlation		Multiple regression model	
	<i>r</i>	<i>p</i>	$\beta$	<i>p</i>
<b>Men</b>				
Age	−.38	<.001	−.17	.024
Partner age	−.39	<.001	−.23	.003
Waist (cm)	−.13	.002	−.05	ns
Multiple R			.40	
<b>Women</b>				
Age	−.40	<.001	−.16	.02
Partner age	−.41	<.001	−.24	<.001
Waist (cm)	−.23	.009	−.10	.01
Multiple R			.44	

PVI penile-vaginal intercourse,  $\beta$  standardized regression coefficient

**Fig. 1** Scatterplot of women's waist (cm) against men's erectile function (IIEF-5, rated by women)

central dopaminergic tone in the overweight) (Ferreira, Sobrinho, Santos, Sousa, & Uvnas-Moberg, 1998; Pijl, 2003), with secondary effects for the partner. The drug-like effects of suboptimal food choice might not only momentarily reduce stress, but also undermine motivation and capacity for enjoying PVI (Brody, 2004).

Women's tactile sensitivity was associated with both greater PVI frequency and greater likelihood of vaginal orgasm in the past month (Brody, Houde, & Hess, 2010). Given that female mice fed a diet which led to obesity manifested both functional sensory nerve conduction deficits and tactile allodynia (Obrosova et al., 2007), overweight might both have reduced the pleasurable aspects of PVI, as well as perhaps increased the risk of experiencing sexual contact as unpleasant. Indeed, compared to a control group, obese women were more likely to report experiencing disgust during intercourse (as well as more avoidance of intercourse, lesser sexual satisfaction, and

**Table 3** Univariate and multiple regression calculation of PVI frequency from age, partner age, and waist

Independent variables	Univariate correlation		Multiple regression model	
	<i>r</i>	<i>p</i>	$\beta$	<i>p</i>
<b>Men</b>				
Age	−.31	<.001	−.01	ns
Partner age	−.37	<.001	−.35	<.001
Waist (cm)	−.12	.009	−.05	ns
Multiple R			.37	
<b>Women</b>				
Age	−.37	<.001	−.22	.003
Partner age	−.25	<.001	−.14	.06
Waist (cm)	−.21	<.001	−.10	.018
Multiple R			.39	

PVI penile-vaginal intercourse,  $\beta$  standardized regression coefficient

more symptoms of urinary incontinence during intercourse) (Melin, Falconer, Rossner, & Altman, 2008).

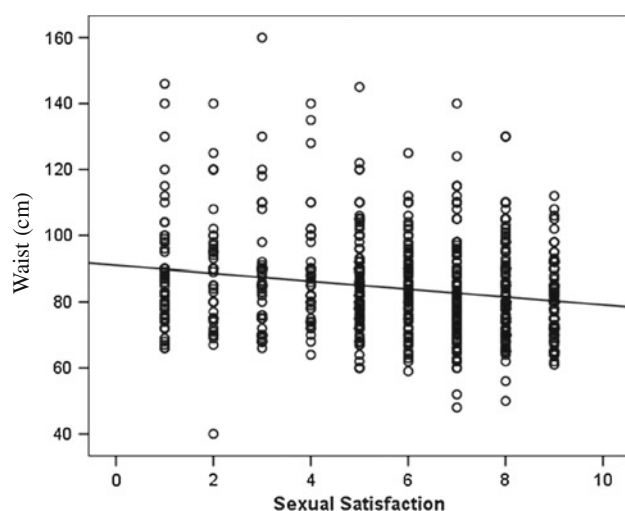
Hostility, anger, and depression longitudinally predicted the development of higher levels of adiposity (Goldbacher & Matthews, 2007). Similarly, lower levels of the psychological trait of conscientiousness were associated both cross-sectionally with overweight and longitudinally with weight gain (Terracciano et al., 2009). These personality features could also have had effects on sexual function and other aspects of an intimate relationship, especially given that conscientiousness was associated with greater intimacy (Ahmetoglu, Swami, & Chamorro-Premuzic, 2010).

The finding that the significant univariate inverse associations between men's waist and both IIEF-5 score and PVI frequency became nonsignificant upon multivariate analysis

**Table 4** Univariate and multiple regression calculation of sexual satisfaction score from age, partner age, and waist

Independent variables	Univariate correlation		Multiple regression model	
	<i>r</i>	<i>p</i>	$\beta$	<i>p</i>
<b>Men</b>				
Age	-.37	<.001	-.27	.001
Partner age	-.34	<.001	-.10	ns
Waist (cm)	-.16	<.001	-.09	.02
Multiple R			.38	
<b>Women</b>				
Age	-.22	<.001	-.05	ns
Partner age	-.24	<.001	-.17	.021
Waist (cm)	-.16	<.001	-.09	.035
Multiple R			.26	

$\beta$  standardized regression coefficient

**Fig. 2** Scatterplot of women's waist (cm) against women's sexual satisfaction

is not as unusual as it might appear. Although men's waist has been identified as a risk factor for erectile dysfunction in several studies controlling for age, when the age group is limited to the middle-aged (as opposed to samples of the young or old), men's waist circumference has been found not to be significantly associated with erectile dysfunction (Riedner, Rhoden, Ribeiro, & Fuchs, 2006). However, we found that even upon multivariate analysis, men's waist circumference was associated with less sexual satisfaction.

The additional exploratory multiple regression indicated that when PVI frequency and IIEF-5 scores were part of the prediction model, sexual satisfaction was no longer related to waist size. This suggests that the waist effects on satisfaction might be attributable to some degree to decreased erectile function and/or decreased PVI frequency.

**Table 5** Multiple regression calculation of sexual satisfaction score from age, partner age, waist, PVI frequency, and IIEF-5 score

	$\beta$	<i>p</i>
<b>Men</b>		
Age	-.16	.033
Age of partner	.05	ns
Waist (cm)	-.08	.058
PVI frequency	.34	<.001
IIEF-5 score	.22	<.001
<b>Women</b>		
Age	.02	ns
Age of partner	.02	ns
Waist (cm)	-.03	ns
PVI frequency	.33	<.001
IIEF-5 score	.28	<.001

$\beta$  standardized regression coefficient, PVI penile-vaginal intercourse, IIEF-5 erectile function

The magnitudes of the independent waist effects were small, but they were significant. For example, the association of women's waist with sexual satisfaction was smaller than the association of women's sexual satisfaction with either men's erectile function (Weiss & Brody, 2011) or PVI frequency (Brody & Costa, 2009; Tao & Brody, 2011). Longitudinal studies of the protective effect of women's slimmer waist against all-cause mortality showed no significant attenuation when adjusted for age, smoking status, alcohol consumption, and leisure-time physical activity (Mason et al., 2008), implying that the waist effect was not only independent of age, but also not confounded by other established risk factors.

One limitation of this study was that it was cross-sectional, rather than longitudinal. Future research might examine longitudinal effects of indices of weight (including waist) and weight change on erectile function, specifically PVI frequency and sexual satisfaction. Waist was self-measured, but it seems likely that any errors in measurement and reporting would be random (or simply associated with larger waist and perhaps younger age) (Park et al., 2011), rather than biased with respect to the sexual function measures. However, future research might use professionals to measure waist in a large representative sample such as ours. In addition, future research could examine whether the observed effects were due, in part, to women's parity. As in any correlational or risk-factor epidemiological study, unmeasured third variables could be an issue.

It was noteworthy that the association of women's slimmer waist with all measures of sexual function was independent of both partners' age. The continuation of the slimness benefits on erectile function past women's reproductive age suggested some combination of enduring pair-bonding and health benefit

effects of PVI (with potential grandparental benefits to descendents).

The findings were generally in accord with evolutionary perspectives. Men's erectile function scores were independently associated with younger age of self and partner, and women's slimmer waist (all factors generally associated with greater reproductive fitness). Similarly, PVI frequency was independently associated with women's younger age and women's slimmer waist. Sexual satisfaction was independently associated with men's younger age, and slimmer waist for both sexes. Better erectile function, greater PVI frequency, and greater sexual satisfaction were associated with women's slimmer waist, independently of both sexes' ages. Thus, capacity for potentially reproductive sexual behavior, frequency thereof, and a psychological response that might support pair-bonding were all linked to women's slimmer waist. Women's larger waist can increase the risk of a variety of fitness-reducing conditions and might also have reflected personality processes that were associated with lesser fitness. Previous studies found that slimmer women were generally rated as more attractive than women with a larger waist. The present findings extend those attitudinal findings to the tangible realm of men's sexual function.

**Acknowledgments** The survey was supported by a grant from Eli Lilly & Co. (Czech Republic).

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