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Associations of Sexual Desire with Demographic and Relationship Variables

Toivo Aavik[2]✉, Karin Täht[2], Uku Vainik[2] & René Mõttus[1,2]

Sexual desire plays an important role in human well-being and relational dynamics, yet its demographic and relational predictors remain insufficiently understood. Leveraging a uniquely large and representative sample (*N* = 67,334) from the Estonian Biobank, we examined how gender, age, sexual orientation, relationship status, recent childbirth, number of children, relationship satisfaction, education, and occupation relate to self-reported sexual desire. Men reported substantially higher desire than women ($\eta^2 = 0.18$), a difference that persisted across most ages and demographic groups. Sexual desire declined with age, more steeply for women, and was positively associated with bisexual and pansexual orientation, recent childbirth, and relationship satisfaction. Multivariate models explained 28.3% of the variance in sexual desire, with gender and age emerging as the strongest predictors. Notably, gender moderated several associations, including those with age, parenthood, and relationship satisfaction. These findings provide the most comprehensive account to date of how basic demographic and relational variables jointly shape sexual desire in the general population, offering a robust foundation for theory development and applied sexual health research.

Keywords Sexual desire, Gender differences, Relationship satisfaction, Sexual orientation, Demographic predictors, Estonian biobank

Sexual desire is a vital component of human relationships and well-being, shaped by demographic, relational, psychological, and cultural factors[1–3]. Understanding these influences is essential for advancing theoretical models and improving clinical interventions, yet previous research has been limited by small sample sizes and inconsistent findings. For example, we do not yet have a clear answer to even the simplest question: How much of the variance in sexual desire can be explained by the basic demographic and relationship variables, and to what extent does each variable matter when the others are controlled for? It is unclear how more complex questions about desire could be properly addressed without clear answers to these most basic descriptive questions. To address this, we examined the variability of sexual desire in a large-scale Estonian Biobank cohort that covers about 7% of Estonia's adult population, incorporating diverse demographic and relational variables, including age, gender, marital status, sexual orientation, recent childbirth, number of children, relationship satisfaction, educational attainment, and occupation. Previous studies have addressed these variables individually, but rarely in combination and in sufficiently large and representative samples to mutually adjust for each other and reliably assess their interactions.

Gender, age, and sexual orientation

Gender differences in sexual desire are among the most consistent findings in sexuality research, with men reporting higher levels of desire than women[4,5]. Explanations for this difference highlight both biological (e.g., testosterone levels) and sociocultural factors (e.g., societal norms regulating desire expression)[1,6,7]. While biological factors like testosterone are undoubtedly involved, male desire is also profoundly influenced by psychological variables (e.g., depression, anxiety, erotic thoughts), relational aspects (e.g., communication, emotional connection, feeling desired by a partner), and societal and cultural norms (e.g., masculinity scripts, pressure for high desire)[8]. Relational satisfaction, emotional intimacy, and (lack of) communication are significant predictors of desire in both genders, but the underlying mechanisms differ, often reflecting cultural norms and gendered expectations[9–11]. This may also contribute to gender differences.

Also, sexual desire tends to decline with age, likely driven by biological changes, such as reductions in testosterone and estrogen, shifting relational priorities and increasing health concerns[12–14]. One large-scale study with over 8,000 participants[14] found that men maintain higher levels of sexual desire into older age, while

[1]Department of Psychology, University of Edinburgh, Edinburgh, UK. [2]Institute of Psychology, University of Tartu, Tartu, Estonia. ✉email: toivo.aavik@ut.ee

women experience a sharper decline, particularly after menopause. Another community-based study with 2,341 participants[15] confirmed that age-related declines in sexual desire are more pronounced in women, with the gap between men and women widening over time. Also, a longitudinal study from over 11,000 observations[16] found that men's sexual desire remained relatively stable, whereas women's desire showed greater variability over time.

Women, particularly post-menopause, experience a steeper decline than men, whose desire may remain more stable until later in life[17,18]. For example, using a large U.S. probability sample of 3,990 adults aged 18–59 years, Herbenick et al.[19] found that while age-related declines in sexual function were observed in both genders, diversity in sexual behaviors and partner type played significant roles in maintaining sexual pleasure and arousal, particularly in men. Erectile and lubrication difficulties increased with age, but higher behavioral diversity was linked to greater orgasm likelihood in both men and women, suggesting compensatory mechanisms that may sustain sexual desire despite biological aging. In a smaller sample of 146 sexually active women, Satinsky et al.[20] did not directly examine sexual desire decline, but reported that increased body weight was not a significant predictor of sexual behavior. Although indirect, this finding may suggest that biological aging factors such as body weight alone do not fully explain sexual changes, and that other influences may also play a role.

For example, sexual orientation could also play a role in desire. Bisexual and pansexual individuals often report higher levels of desire due to broader attraction patterns and relational flexibility, while asexual individuals consistently report the lowest levels, reflecting an orientation distinct from hypoactive sexual desire disorder[5,8,21]. However, given that a large majority of the population identifies as heterosexual, with estimates typically ranging from approximately 84% to 94%[22], large sample sizes are essential to draw reliable conclusions about sexual desire differences across orientations. A study[5] by Peixoto (2023) with 1,013 participants (552 women and 461 men, including 211 sexual minority individuals) found that men reported higher levels of solitary and attractive person-related sexual desire than women across all orientations. Sexual minority participants also reported higher levels of these desires compared to heterosexuals, reinforcing the idea that sexual orientation plays a role in shaping patterns of sexual desire. Gendered patterns persist across all orientations, with men generally reporting higher levels of desire than women, though the magnitude of differences varies[25].

Socioeconomic factors

Addressing educational attainment and occupation could offer unique insights into how broader social roles intersect with desire. However, there is limited work yet on linking them with desire. Some studies suggest that higher education levels may be associated with greater sexual desire, particularly among middle-aged and older women[26] (N = 210). However, other studies[27] (N = 168), found no significant link between educational attainment and sexual desire, indicating that the relationship may be more complex or non-existent. Higher education levels may be associated with greater openness and sexual assertiveness in women, enabling challenges to traditional gender norms[28,29]. Overall, the association between educational attainment and sexual desire appears to be shaped by multiple intersecting psychological and social factors, which merit further exploration in diverse and large samples.

Occupation presents an even more complex picture. For example, those in high-stress professions, such as healthcare, could have either reduced desire due to work pressure or increased desire linked to burnout, particularly among men[30,31]. A study on healthcare professionals (N = 150) found that higher work pressure was significantly associated with lower sexual desire[30]. Job insecurity has also been linked to declines in desire, particularly among younger workers. For example, a large-scale study (N = 7,247) found that men experiencing job insecurity had a 53% higher risk of decreased sexual desire, while women had a 47% higher risk compared to those with job stability[32]. While these findings support the role of occupational stress in shaping sexual desire, other research highlights that occupational factors may relate to desire in more complex ways. For example, a study of menopausal women (N = 210) reported a significant association between occupation and sexual desire, although the direction and specific nature of this relationship were not specified. These results suggest that occupational context may influence desire through mechanisms not limited to stress alone, possibly involving relational or psychosocial dimensions.

Parental roles and relationship factors

Relational and normative life-course variables, such as relationship status and parenthood, can also shape sexual desire. Cohabiting individuals report varying levels of desire depending on relationship challenges, particularly for women. However, most studies on these topics rely on moderate sample sizes, making generalizability a concern. Postpartum hormonal changes and caregiving responsibilities can contribute to declines in desire among women[33,34] (255 mixed-sex new parent couples), whereas men's desire is often unrelated or even positive related to family size[33]. Larger family sizes correlate with lower desire in women due to increased caregiving demands, though this relationship is moderated by shared responsibilities and relational quality[35] (total N = 1093 woman). While these studies provide valuable insights, future research with larger and more diverse samples is needed to fully understand how relational dynamics shape sexual desire over the life course.

The relationship between sexual desire and recent childbirth can be complex, influenced by both biological and psychosocial factors. A longitudinal study[36] with 207 newlywed couples showed that women's sexual desire declined more steeply over time compared to men, with childbirth exacerbating this decline. Breastfeeding is also linked to lower sexual desire and satisfaction[37]. Postpartum reductions in women's sexual desire are further associated with declines in both partners' relationship satisfaction. However, short-term sexual difficulties may also be influenced by psychological factors, such as perceived traumatic childbirth, which is linked to lower sexual quality of life - a broad concept encompassing satisfaction with sexual activity, frequency, intimacy, and emotional well-being associated with sexual relationships[38] (N = 376). Additionally, greater parity was not associated with sexual desire later in life[39] (N = 1,094). Further, infant sleep patterns and maternal fatigue are critical but often overlooked contributors to decreased sexual desire. A study of 203 couples found that disrupted

sleep in the postpartum period negatively impacts sexual desire and satisfaction in both partners[40]. While the immediate postpartum period presents significant challenges to sexual function, with adequate support and communication, many couples may regain pre-pregnancy levels of sexual satisfaction within the first year postpartum[41] (N = 113 women).

Finally, sexual desire and relationship satisfaction are linked, though findings may vary by gender and relationship dynamics. Lower individual sexual desire tracks lower relationship satisfaction, particularly among women[42] (N = 133 couples), while discrepancies between desired and actual sexual frequency reduce satisfaction and stability[43] (N = 8,096 couples). However, matching partners' sexual desire does not uniquely predict satisfaction—individual desire levels may matter more[44] (N = 366 couples). In a longitudinal study, sexual and relationship satisfaction changed together rather than one causing the other[45] (N = 87). Recent findings highlight that relationship satisfaction can mediate the effects of sexual desire on overall well-being, particularly in long-term relationships[46] (N = 141 couples). Additionally, authors emphasize that sexual communication between partners plays a crucial role in mitigating dissatisfaction caused by discrepancies in sexual desire[47] (N = 431 young people). Additional factors may complicate this link: sexual boredom mediates desire and satisfaction, especially in women[48] (N = 1,155 women), while for men, sexual satisfaction predicts later relationship satisfaction, whereas for women, relationship satisfaction more strongly predicts sexual satisfaction[49,50] (N = 113 couples; and N = 204 couples). In sum, the association between sexual desire and relationship satisfaction is complex, shaped by individual, gendered, and relational factors that interact over time.

This study

We investigated differences in sexual desire across various demographic and relational variables using a large population dataset from the Estonian Biobank. Previous research on sexual desire has usually relied on smaller and often demographically homogeneous samples and rarely addressed a broad range of demographic factors at the same time, limiting the ability to generalize findings across populations, mutually adjust the associations and robustly assess interactions among the variables. By utilizing data from over 73,000 participants, we could address these limitations, allowing us to robustly identify nuanced patterns among demographic and relational factors in relation to sexual desire, including their interactions that smaller studies cannot reliably describe.

Specifically, we studied variability of sexual desire with age, gender, relationship status, sexual orientation, recent childbirth, number of children, relationship satisfaction, educational attainment, and occupational level. These variables were chosen because prior research suggests that they may be related to sexual desire, with some of them likely in interaction. We predicted that age and gender would be the strongest correlates of desire, with men and younger people reporting higher sexual desire than women and older people. Moreover, we predicted that age and gender could interact in relation to age (e.g., women's desire declining faster) and that gender could also interact with other variables, such as sexual orientation, relationship satisfaction, and recent childbirth, number children, relationship status, educational attainment and occupational level.

At its core, we sought to answer a simple yet fundamental question: to what extent can easily accessible demographic variables, such as age, gender and other variables examined in this research, individually, collectively and interactively explain the variance in sexual desire? Owing to the large and representative population sample, we could offer the most robust yet answer to this question. As a result, we aimed to advance theoretical models of sexual desire, offer practical insights for clinical interventions, and provide a foundation for future investigations into the sociocultural and other factors shaping human sexuality. We acknowledge that our simple, unidimensional operationalization of desire reflected the typical constraints of large-scale biobank surveys, while that sexual desire can be seen a multifaceted construct, encompassing solitary and dyadic components and context-dependent expressions. Although highly reliable, our two-item measure captured only a general component of desire and did not allow a differentiation between types, such as those proposed in multidimensional tools like the Sexual Desire Inventory[51].

Results

Bivariate associations

The correlation of sexual desire with two continuous variables, age and relationship satisfaction, were r = -0.16 and 0.08 ($p < 0.001$), respectively (i.e., $\eta^2 = 0.03$ and 0.006), indicating that the association between sexual desire and relationship satisfaction is quite low in magnitude. We show group sizes, average standardized desire scores with standard deviations for these groups, and effect sizes (η^2) of the bivariate differences between the groups in the Table 1.

Men had significantly ($F(1, 67{,}333) = 15{,}202$, $p < 0.001$) higher desire scores ($M = 0.65$, $SD = 0.81$) compared to women (M = -0.28, $SD = 0.94$), with standardized effect size of $\eta^2 = 0.18$, $\beta = 0.93$. As for sexual orientation, heterosexual participants made up the largest group (94.88%) and inevitably had mean desire close to sample mean. The highest average desire score was observed in participants who identified as bisexual, while the lowest desire score was found in the asexual group, with the group differences highly significant ($F(4, 67{,}330) = 697.4$, $p < 0.001$; $\eta^2 = 0.04$). Desire also differed significantly among relationship status groups ($F(1, 67{,}333) = 400.3$, $p < 0.001$), albeit with small effect size ($\eta^2 = 0.006$): partnered participants had higher average sexual desire ($M = 0.05$; $SD = 0.98$) than those who were living alone ($M = -0.13$; $SD = 1.05$). Next, ANOVA showed small ($\eta^2 = 0.01$) but statistically significant differences in average desire scores for participants with different numbers of children ($F(5, 67{,}329) = 165.9$, $p < 0.001$), the highest average desire score among those with no children. Likewise, those with a birth within the last year had significantly higher average desire scores ($F(1, 67{,}333) = 73$, $p < 0.001$), albeit with a small effect size ($\eta^2 = 0.001$).

There were also statistically significant differences among educational attainment levels in average desire scores ($F(3, 67{,}331) = 56.5$, $p < 0.001$), albeit with a small effect size ($\eta^2 = 0.003$). Participants with an undergraduate degree had the highest sexual desire scores, while those with postgraduate degrees had the lowest.

Variables		*N*(%)	Desire M(SD)	Effect Size
Gender	Female	46 879 (69.62)	-0.28 (0.94)	0.18
	Male	20 456 (30.38)	0.65 (0.81)	
Sexual orientation	Heterosexual	63,889 (94.88)	0.009 (0.99)	0.04
	Bisexual	1470 (2.18)	0.40 (0.99)	
	Homosexual	622 (0.92)	0.34 (1.00)	
	Pansexual	376 (0.56)	0.30 (1.04)	
	Asexual	976 (1.45)	-1.54 (0.53)	
Marital status	Living alone	17 273 (25.65)	-0.13 (1.05)	0.006
	Living with partner	50 062 (74.35)	0.05 (0.98)	
Number of children	0	14 963 (22.22)	0.19 (0.98)	0.01
	1	13 093 (19.44)	-0.06 (0.99)	
	2	24 444 (36.30)	-0.08 (1.00)	
	3	11 325 (16.82)	-0.02 (1.00)	
	4	2 573 (3.82)	0.12 (1.01)	
	5	937 (1.39)	0.03 (1.06)	
Recent childbirth	Yes	3 371 (5.00)	0.14 (0.96)	0.001
	No	63 964 (95.00)	-0.01 (1.00)	
Level of education	Basic education	3638 (5.40)	0.11 (1.05)	0.003
	Secondary education	23 233 (34.50)	-0.02 (1.03)	
	Bachelor's degree	17 249 (25.62)	0.06 (0.98)	
	Master's or Doctoral degree	23 215 (34.48)	-0.05 (0.97)	
Occupation	Senior official or manager	7 416 (11.01)	0.29 (0.98)	0.03
	Top-level specialist	14 001 (20.79)	0.06 (0.99)	
	Mid-level specialist	22 533 (33.46)	-0.04 (0.98)	
	Office or customer service worker	8 352 (12.40)	-0.25 (0.97)	
	Sales worker	4 968 (7.38)	-0.14 (1.01)	
	Skilled worker or craftsman	5 209 (7.41)	0.09 (1.01)	
	Machine operator or vehicle driver	1 716 (2.55)	0.42 (0.92)	
	Elementary worker	2 533 (3.76)	-0.24 (1.04)	
	Professional military personnel	355 (0.53)	0.59 (0.89)	
	Never worked	252 (0.37)	-0.004 (1.06)	

Table 1. The characteristics of demographic groups: sizes of groups, average standardized desire scores with standard deviation, effect sizes of differences in group averages. Multivariate associations: main effects.

Also, occupational groups differed significantly in average desire scores ($F(9, 67{,}325) = 222.5$, $p < 0.001$) with a comparatively larger effect size ($\eta^2 = 0.03$). For example, professional military personnel, machine operators, vehicle drivers, and senior official managers tended to score highest, while elementary workers and office or customer service workers scored lower (Table 1).

We emphasize that since these associations were not mutually adjusted, they were likely mutually confounded. For example, the elevated average desire among military personnel may reflect their relatively younger age profile, as military personnel are typically under 40 and thus substantially younger than other occupational groups. Likewise, differences between machine operators and other elementary workers may have reflected gender representation differences. Addressing this requires assessing multivariate associations.

The main aim of this study is to determine the predictive power of basic demographic and relationship factors for sexual desire, alongside their unique contributions and interactions with gender. Table 2 presents the results of two multiple linear regression models predicting sexual desire based on demographic variables, including gender, age and squared age term (age^2), sexual orientation, relationship status, number of children, birth of child during last year, relationship satisfaction, education, and occupation. Interaction terms were included to account for all possible interactions between gender and the other variables. Models including only main effects for all the variables are presented in Supplementary Table 1; it explained 27.7% of variance in desire.

In the first model (Model 1), we dropped relationship satisfaction, which allowed us to include those participants not currently in a relationship. The model without relationship satisfaction (Model 1) was statistically significant, $F(51, 67283) = 522.9$, $p < 0.001$, explained 28.3% of the variance in desire (adjusted $R^2 = 0.283$). The all-variables model (Model 2) was also statistically significant, $F(51, 49953) = 386.8$, $p < 0.001$, and similarly explained 28.2% of the variance in desire (adjusted $R^2 = 0.282$). This difference in explained variance reflects sampling variance, with the comparative homogeneity of the partnered-only subsample resulting in smaller effect sizes, all else equal.

	Model 1		Model 2	
Variables	*β*	*p*	*β*	*p*
(Intercept)	-0.05	< 0.049	-0.16	< **0.001**
Age	-0.27	< **0.001**	-0.21	< **0.001**
Age²	-0.05	< **0.001**	-0.05	< **0.001**
Gender (Male)	0.61	< **0.001**	0.74	< **0.001**
Child count (1)	-0.02	0.115	-0.05	0.005
Child count (2)	-0.03	0.050	-0.08	< **0.001**
Child count (3)	0.02	0.144	-0.02	0.336
Child count (4)	0.06	0.022	0.02	0.565
Child count (5)	-0.02	0.597	-0.04	0.390
Sexual orientation (Bisexual)	0.34	< **0.001**	0.36	< **0.001**
Sexual orientation (Homosexual)	0.10	0.080	0.11	0.107
Sexual orientation (Pansexual)	0.19	< **0.001**	0.22	**0.001**
Sexual orientation (Asexual)	-1.04	< **0.001**	-1.03	< **0.001**
Education (Secondary)	-0.02	0.374	-0.02	0.386
Education (Bachelor's degree)	0.02	0.927	-0.01	0.642
Education (Master's or Doctoral degree)	-0.03	0.232	-0.05	0.077
Relationship status (Partnered)	-0.10	< **0.001**		
Child birth (Yes)	-0.09	< **0.001**	-0.06	0.002
Occupation (Top-level specialist)	-0.06	< **0.001**	-0.03	0.079
Occupation (Mid-level specialist)	-0.13	< **0.001**	-0.11	< **0.001**
Occupation (Office or customer service worker)	-0.16	< **0.001**	-0.14	< **0.001**
Occupation (Sales worker)	-0.16	< **0.001**	-0.13	< **0.001**
Occupation (Skilled worker or craftsman)	-0.19	< **0.001**	-0.14	< **0.001**
Occupation (Machine operator or vehicle driver)	-0.23	< **0.001**	-0.18	0.009
Occupation (Elementary worker)	-0.27	< **0.001**	-0.24	< **0.001**
Occupation (Professional military personnel)	0.11	0.297	0.19	0.139
Occupation (Never worked)	-0.34	< **0.001**	-0.16	0.088
Age × Gender (Male)	0.07	< **0.001**	-0.01	0.453
Age ² × Gender (Male)	-0.03	< **0.001**	0.0	0.618
Gender (Male) × Education (Secondary)	0.02	0.574	0.01	0.720
Gender (Male) × Education (Bachelor's degree)	0.01	0.852	0.01	0.816
Gender (Male) × Education (B Master's or Doctoral degree)	0.01	0.153	-0.02	0.592
Gender (Male) × Child count (1)	0.15	< **0.001**	0.18	< **0.001**
Gender (Male) × Child count (2)	0.22	< **0.001**	0.29	< **0.001**
Gender (Male) × Child count (3)	0.22	< **0.001**	0.29	< **0.001**
Gender (Male) × Child count (4)	0.28	< **0.001**	0.33	< **0.001**
Gender (Male) × Child count (5)	0.38	< **0.001**	0.43	< **0.001**
Gender (Male) × Sexual orientation (Bisexual)	-0.10	0.065	-0.06	0.430
Gender (Male) × Sexual orientation (Homosexual)	-0.07	0.296	-0.08	0.36
Gender (Male) × Sexual orientation (Pansexual)	-0.15	0.183	-0.02	0.878
Gender (Male) × Sexual orientation (Asexual)	-0.41	< **0.001**	-0.22	0.182
Gender (Male) × Relationship status (Partnered)	0.13	< **0.001**		
Gender (Male) × Child birth (No)	0.03	0.354	-0.02	0.519
Gender (Male) × Occupation (Top-level specialist)	0.01	0.821	-0.02	0.524
Gender (Male) × Occupation (Mid-level specialist)	0.01	0.773	-0.02	0.513
Gender (Male) × Occupation (Office or customer service worker)	0.02	0.536	0.01	0.763
Gender (Male) × Occupation (Sales worker)	0.14	**0.001**	0.09	0.045
Gender (Male) × Occupation (Skilled worker or craftsman)	0.11	**0.001**	0.04	0.272
Gender (Male) × Occupation (Machine operator or vehicle driver)	0.09	0.159	0.04	0.621
Gender (Male) × Occupation (Elementary worker)	0.09	0.051	0.03	0.573
Gender (Male) × Occupation (Professional military personnel)	-0.20	0.091	-0.27	0.051
Gender (Male) × Occupation (Never worked)	-0.09	0.467	-0.39	0.066
Continued				

	Model 1		Model 2	
Satisfaction with relationship			0.09	**< 0.001**
Gender (Male) × Satisfaction with relationship			-0.11	**< 0.001**

Table 2. Results of two multiple linear regression models (Model 1 and model 2) for predicting sexual desire. *Note.* β = standardized regression coefficient. Reference categories: Gender = Female; Child count = 0; Sexual orientation = Heterosexual; Education = Basic; Relationship status = Not partnered; Occupation = Senior official or manager, Childbirth = No. Multivariate associations: interactions with gender

Most of the independent variables in the models were statistically significantly related to sexual desire (Table 2), with gender and age being the key predictors in both models. The highest standardized coefficients in both models were for gender ($\beta = 0.61$, $p < 0.001$ (Model 1), $\beta = 0.74$, $p < 0.001$ (Model 2)), meaning that men reported significantly higher levels of desire. However, this means that gender difference was smaller in the multivariate model compared to the univariate gender difference ($d = 0.93$), suggesting it had been confounded by other variables. Age negatively predicted desire ($\beta = -0.27$ and -0.21, $p < 0.001$, respectively for the two models), meaning that as people get older, their sexual desire tends to decrease, even when other demographic variables are controlled for; in fact, this association was even stronger than the univariate correlation. The quadratic effect of age was also statistically significant ($\beta = -0.05$, $p < 0.001$ for both models), with declines being steeper in early adulthood.

Additionally, in both models sexual orientation emerged as an important factor, with bisexual individuals reporting higher levels of desire ($\beta = 0.34$, $p < 0.001$, $\beta = 0.36$, $p < 0.001$, respectively) than heterosexual individuals, while asexual individuals reported significantly lower desire ($\beta = -1.04$ and -1.03, $p < 0.001$, respectively for the two models). Pansexual individuals also reported higher desire compared to heterosexual individuals ($\beta = 0.19$ and 0.22, $p < 0.001$, respectively). Relationship status was included only in Model 1 (Model two only included partnered individuals, so there was no variation in relationship status); it was a statistically significant predictor of desire, with partnered individuals reporting lower desire compared to single individuals ($\beta = -0.10$, $p < 0.001$). The number of children had a small but significant negative association with desire in Model 2, with those with two children ($\beta = -0.08$, $p < 0.001$) scoring higher than those having no children; having more than two children did not have a statistically significant effect on desire. Satisfaction with relationship, only included in Model 2, was positively and statistically significantly related to desire, but its association was similar to the univariate correlation ($\beta = 0.09$, $p < 0.001$).

While education was not a significant predictor of sexual desire, several occupation categories were associated with lower levels of desire than the reference category (senior official or manager) in both models. For example, those who never worked ($\beta = -0.34$, $p < 0.001$, $\beta = -0.16$, $p < 0.001$, respectively for the two models) and elementary workers ($\beta = -0.27$ and $\beta = -0.24$, $p < 0.001$, respectively for the two models) had significantly lower levels of sexual desire when other variables were controlled for.

Overall, the results indicate that gender and age were the strongest predictors of sexual desire, with additional associations with relationship status, sexual orientation, and occupation. But, as we expected, gender also significantly moderated the effects of several variables, such as age (in Model 1), number of children (in both models), and relationship status (in Model 1). Finally, gender also interacted with relationship satisfaction in relation to desire, with the satisfaction-desire relationship more positive for women. Overall, adding the interaction terms accounted for 0.6% of additional variance in sexual desire. While this is not a large increase, interactions with gender added important nuances to some of the main effects.

We illustrate the interaction effects between gender and other demographic variables graphically in Fig. 1; these analyses included both single and partnered individuals. For each interaction, the dependent variable was sexual desire residualized for all demographic variables not used in the interaction. For instance, residual desire for the interaction between gender and age (Fig. 1.A) represents the residuals from a linear regression model for desire in which all other demographic variables were accounted for.

Men reported higher sexual desire than women across most ages. Men's desire appears to peak around their late 30s to early 40s before gradually declining. Women also show a decrease in desire with age, but their levels remain consistently lower than men's. For example, in the 18–29 age group, the standardized gender difference (β) in sexual desire was 0.59. This increased to approximately 0.91 in ages 30–39, 0.95 in 40–49, 1.04 in 50–59, and peaked at 1.14 in the 60 plus group.

The association between relationship status and sexual desire was such that the gender gap in sexual desire was larger among partnered individuals ($\beta = 0.96$) than among those who were single ($\beta = 0.85$, Fig. 1.B), indicating a stronger relationship-status difference when people were partnered.

The strongest interaction effects were observed between gender and child count. For one-child families, the interaction coefficients were $\beta = 0.15$ in Model 1 and $\beta = 0.18$ in Model 2 ($p < 0.001$), indicating that having one child is associated with an additional 0.15 or 0.18 increase in desire score for males compared to females, when controlling for other predictors. A similar pattern emerged for two-, three-, and four-child families, with interaction coefficients ranging from $\beta = 0.22$ to 0.33 ($p < 0.001$). The largest interaction effect occurred in families with five children ($\beta = 0.38$ in Model 1; $\beta = 0.43$ in Model 2; $p < 0.001$), reflecting an increasingly stronger positive gender difference in desire with more children. This suggests that having more children may reflect time, energy, and trade-offs that impact women's, but not men's desire levels. Alternatively, the number of children a couple has may reflect the desire differential and its relationship correlates in that couple.

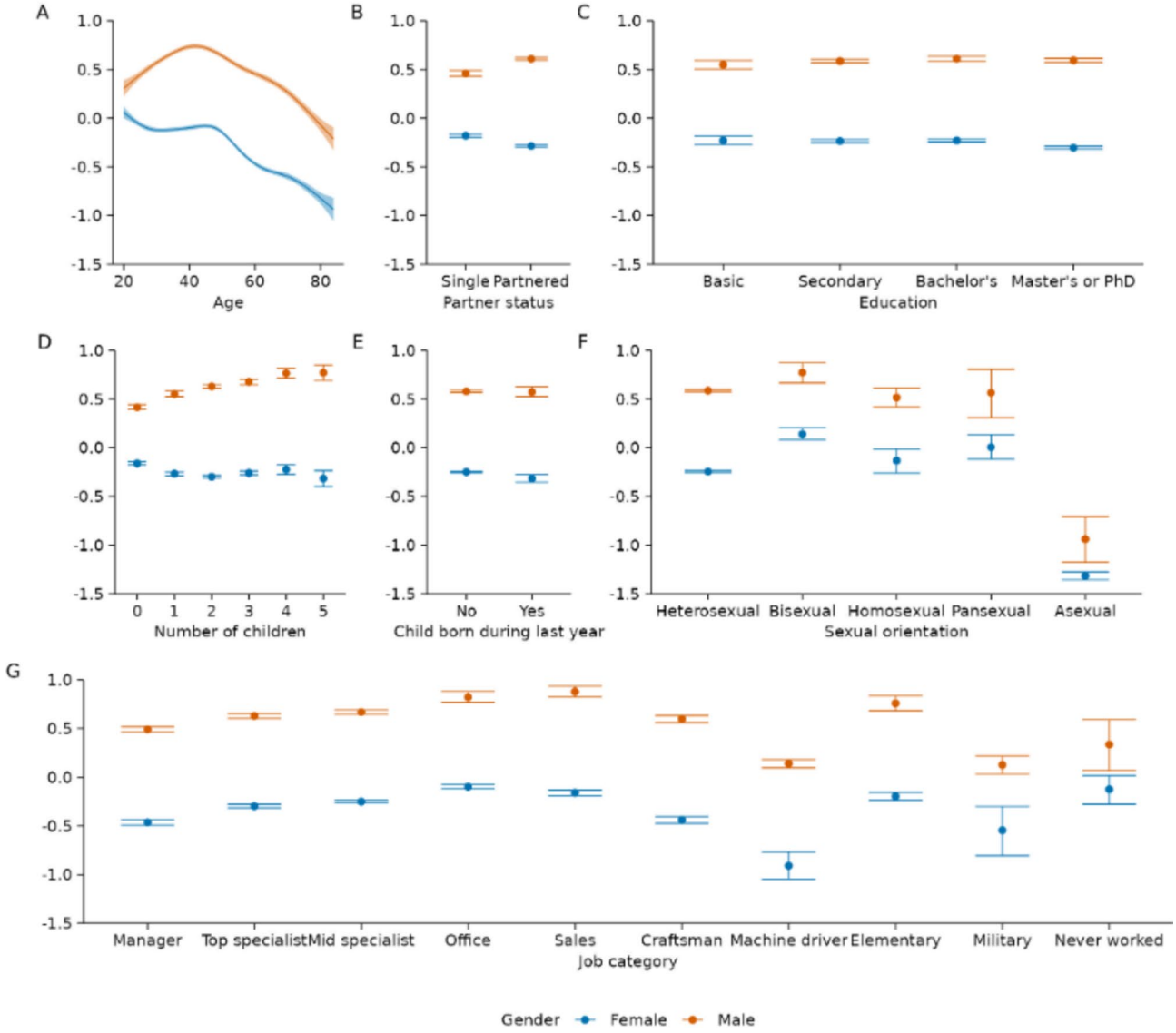

Fig. 1. Interaction of gender with other demographic variables for desire[1]. *Note*. Education: Basic = Basic education, Secondary = Secondary education, Bachelor's = Bachelor's degree, Master's or PhD = Master's or Doctoral degree; Job category: Manager = Senior official or manager, Top specialist = Top-level specialist, Mid specialist = Mid-level specialist, Office = Office or customer service worker, Sales = Sales worker, Craftsman = Skilled worker or craftsman, Machine driver = Machine operator or vehicle driver, Elementary = Elementary worker, Military = Professional military personnel. [1]For each panel, Desire(z) represents the residualized variable desire (controlled for those demographic variables not shown in this particular panel).

Education levels had a relatively small effect on desire (Fig. 1.C). Men showed higher sexual desire across all education levels, but the gender gap was noticeably larger among individuals with master's or doctoral degrees. Desire also shows variability across occupation categories (Fig. 1.G), with men reporting consistently higher levels of desire than women across all categories but to somewhat different degrees for a few occupational groups. Interactions between gender and sexual orientation were generally non significant, except for the asexual group in Model 1 ($\beta = -0.41$, $p < 0$ 0.001), suggesting that asexual males reported significantly lower desire than the reference group.

Discussion

Sexual desire is a fundamental component of human relationships. Its patterns and predictors vary significantly across demographic groups, but the details of these variations have not been fully and reliably documented yet. Our large study considered the individual and interactive roles of several demographic factors in sexual desire, including age, gender, sexual orientation, relationship status, number of children, recent childbirth, educational

attainment, and occupation. The findings showed that demographic factors alone - even without accounting for psychological or relational influences - explained 28% of the variance in sexual desire.

Gender and sexual desire

In particular, we documented robust gender differences in sexual desire, with men consistently reporting higher levels of desire than women. This aligns with longstanding evidence suggesting that men exhibit higher levels of sexual desire[4,5]. Biological factors, such as testosterone levels, and sociocultural norms that promote greater sexual agency in men, likely contribute to these differences[13]. However, our observed effect size ($\eta^2 = 0.18$) exceeded the medium-to-large effect sizes documented in previous meta-analyses[52]. This could be due to the high reliability of our measure, and our biobank participants providing high-quality data because they got personal feedback on their survey results. This could also be due to many previous studies focusing on narrower age groups where gender differences are somewhat smaller.

Yet, a particularly notable finding is just how substantially higher men's sexual desire was compared to women's throughout most of the adult life span. While prior research has consistently shown that men report greater levels of sexual desire than women[2,5], our findings underscore the magnitude of this difference at different ages. Even the peak of average woman's sexual desire at ages around 20 to 30 remains lower than men's average levels across much of adulthood. It is only after the age of 60 + that men's declining sexual desire falls below the highest levels ever reported by women. Of course, we emphasize that this is about averages: there is substantial variation among individuals, so at any given age, there are many women with higher sexual desire than most men of that age.

Also, our findings suggest that men's sexual desire is not only higher on average but also tends to remain more stable across the lifespan compared to women's. This stability may be partly related to hormonal factors such as testosterone, yet it is also shaped by other mechanisms. For instance, sexual behaviors (e.g., masturbation frequency) have been shown to explain differences in desire more strongly than testosterone itself[53], alongside broader sociocultural influences[15]. By contrast, women's average sexual desire was more variable, possibly influenced by reproductive cycles, hormonal fluctuations, and sociocultural factors that shape desire expression across different life stages[16,36]. These findings also align with previous research indicating gender differences in sexual desire and the influence of biological and sociocultural factors[1,7,42], thereby reinforcing the general robustness of gender differences in sexual motivation. At the same time, our results indicate that the impact of aging on male sexual desire is delayed, with a noticeable decline emerging mainly in later life. This pattern aligns with evidence of gradual age-related decreases in testosterone rather than continuous production across the lifespan[54], while also suggesting that factors beyond testosterone—such as sexual behaviors and sociocultural influences—help sustain relatively high levels of desire throughout much of adulthood[53]. The stability of men's desire and the variability of women's across the lifespan are key patterns observed in our data.

Age and sexual desire

Therefore, age also emerged as a significant predictor of sexual desire, albeit in gender-graded ways. As expected, sexual desire declined with age in both men and women, but the decline was more pronounced in women, particularly after the age of 50. These findings are consistent with prior research demonstrating that age-related declines in sexual desire are mediated by hormonal changes, health issues, and relational factors[13,14]. Men's sexual desire tends to remain relatively stable until later in life, reflecting differences in biological and relational influences[1].

A noteworthy finding was that men's sexual desire peaked around the age of 40, exceeding even early adulthood levels, and only declined to match younger men's levels by 60+. This pattern is surprising because it does not align with the well-documented trajectory of testosterone decline, which begins gradually after the early 30s and continues throughout life[55,56]. This finding partially contradicts our initial hypothesis that predicted a straightforward decline in sexual desire with age, although the general trend of decline in later life was observed. The mid-life peak in men suggests that factors beyond biological aging, such as relational dynamics, may play a more significant role than initially anticipated. For example, men in their 40s are more likely to be in stable long-term relationships, which have been associated with increased sexual activity and emotional intimacy[7,57]. However, other research suggests that desire may also decline over time in long-term partnerships, depending on relational quality and dynamics. The unexpected mid-life peak in men is a novel contribution that warrants further exploration of relational and psychological influences on male sexual desire. As men age past mid-life, changes in relationship status may contribute to the eventual decline in sexual desire. The increasing prevalence of relationship dissolution in older men may partially explain their steeper decline in sexual desire after the age of 60+, as loss of a partner or reduced relationship quality could contribute to this shift[58,59]. Likewise, men's levels of desire may be starting to adapt to their partner's declining levels of desire.

Relational context variables also played important roles in sexual desire. Men living with a partner reported the highest levels of sexual desire. Assuming that most relationships are healthy, these findings align with evidence that relational satisfaction and emotional intimacy are significant predictors of sexual desire[57]. The observed discrepancies in sexual desire between partnered and unpartnered individuals underscore the role of daily interactions and shared emotional closeness in sustaining sexual interest[10].At the same time, the inverse relationship between relationship duration and sexual desire, particularly for women, points to the potential for habituation and shifts in relational dynamics over time[7]. For example, research has shown that women often experience a decline in sexual desire as relationship duration increases, partly due to decreased novelty and increased caregiving responsibilities, which may reduce opportunities for erotic autonomy and spontaneity[60].

Parental responsibilities and family size were also associated with variations in sexual desire, but this relationship varied with gender. Specifically, among men, greater number of children did not predict lower but higher desire, possibly due to increased family bonding or social role reinforcement[61]. Alternatively, higher

levels of desire may contribute to men having more children. Among women, however, parenthood often leads to a decline in sexual desire due to increased stress and changes in hormonal levels[35,62]. Likewise, in our data, women with more children tended to have slightly lower desire levels. This may suggest that greater parental involvement affects sexual desire differently for men and women, reflecting differences in time availability, relational investment, and stress burden. These findings highlight the importance of considering gendered dynamics in the distribution of parental responsibilities and their impact on relational and sexual well-being[33].

Educational attainment and occupational context showed smaller but notable effects on sexual desire. These findings align with studies suggesting that higher education is associated with greater openness and assertiveness in sexual expression, particularly for women[26,63]. Conversely, occupational stress, especially in high-pressure roles, could be associated with lower sexual desire, particularly for women, who may face greater challenges in balancing work and relational demands[64]. Future research should explore whether these effects are driven by work-related stress, time constraints, or changing gender expectations in professional and family roles.

Limitations and future directions

One important limitation concerns the measurement of sexual desire. We used two general items capturing self-reported sexual urges and thoughts. While these provide a reliable composite of general sexual desire, they did not distinguish between its dimensions such as solitary versus dyadic desire or partner-specific versus general attraction. Prior psychometric work[51] supports a multidimensional structure of desire, including at least three components. More detailed instruments such as the SDI-2 would offer greater specificity but were impractical in our biobank context due to survey length constraints.

Demographic factors accounted for nearly 30% of the variance in sexual desire in this study, underscoring their significant roles. However, previous studies suggest that psychological and relational factors can explain even greater variance (up to 40%), highlighting the need for models that integrate both demographic and psychological predictors[65,66]. For example, recent research suggests that personality traits and life experiences also play a role in shaping long-term patterns of sexual desire, an area that warrants further exploration[67,68]. Specifically, traits such as openness, extraversion, and impulsivity have been linked to higher sexual desire, while neuroticism and attachment insecurity may suppress it[67,69].

Additionally, future studies should explore how individuals' self-reported sexual desire aligns with assessments from significant others. Given that self-perception can be influenced by gender norms and social desirability, comparing self-ratings to partner evaluations may provide a more comprehensive understanding of sexual desire dynamics[70]. This could address potential biases in self-reporting and provide a more nuanced view of desire discrepancies within relationships. By integrating personality traits, major life events, and multiple perspectives on desire, future research could refine models of sexual motivation and offer a more comprehensive framework for understanding its variation across individuals and life stages.

Methods

Transparency and openness

The data cannot be publicly shared as they are part of an extensive ongoing biobank study, Estonian Biobank (EstBB). However, researchers can apply for access to the data (https://genomics.ut.ee/en/content/estonian-biobank). The EstBB is regulated by the Human Genes Research Act, which was adopted in 2000 specifically for the operations of the EstBB. Individual-level data analysis in the EstBB PS21 was carried out under ethical approval 1.1–12/626 (13.04.2020) from the Estonian Committee on Bioethics and Human Research (Estonian Ministry of Social Affairs), using data according to release application 3–10/GI/11,571 from the EstBB. As this study was part of a broader data collection effort[71], parts of the data set have been previously analyzed in multiple other studies such as[72]. However, no study yet has focused on sexual desire assessments of the EstBB. Statistical analyses were carried out with R language, Version 4.3.1[75]. The following packages were used: tidyverse (Version 2.0.0)[76], ggplot2 (Version 3.4.2)[77], psych (Version 2.3.6)[78], and effectsize[79,80]. The R code is available at https://osf.io/m9sw3/. Analyses were not preregistered.

Sample

Participants were members ("gene donors") of the EstBB, a population sample of approximately 200,000 adults comprising about 20% of Estonian adult residents or past residents currently living abroad[81]. Participants' self-rated sexual desire and satisfaction with relationship flirting were collected through an online EstBB Personality Study (PS21) survey between November 2021 and April 2022, with email invitations sent to 182,405 gene donors[71]. To encourage participation, the study was advertised on national radio, television, newspapers and magazines, and on social media; participants were also offered feedback on their Big Five personality trait scores. Participants could choose to participate in either Estonian or Russian, but we only used data provided in Estonian to avoid confounding language differences with group differences. The initial sample size was N = 73,670. After excluding respondents with missing values and those older than 84, the final sample consisted of N = 67,334 participants, aged 20 to 84 years (M = 47.15, Mdn = 47.00, SD = 14.34). The sample's gender (sex assigned at birth) distribution was as follows: 70% (46,879) were women (their age ranged from 20 to 84; M = 47.0; Mdn = 47.0; SD = 14.3) and 30% (20,456) were men (their age ranged from 20 to 84, M = 47.5, Mdn = 47.0; SD = 14.2).

Measures

To assess sexual desire, we used two items: "I have strong sexual urges" and "I do not think much about sex". As the responses to these two questions were correlated ($r = -0.65$), we created a new variable for sexual desire by calculating the standardized average of the first question and the reverse-coded second question. The average sexual desire (standardized) score for the entire sample was $M = 0.00$ ($SD = 1.00$). Two-week test–retest reliability for the desire scale was higher, $r = 0.81$ ($N = 545$; data described in Anni et al., 2024). Satisfaction with romantic

relationship was measured with one question, only reported by those in a relationship: "I'm satisfied with how I get along with my partner (spouse, partner)."

Participants' age was calculated as the difference between their date of birth embedded within their national ID codes and the survey time, ranging from 20 to 84; $M = 47.15$; $Mdn = 47.0$; $SD = 14.34$. Gender was taken from participants' ID codes which represents sex assigned at birth or, in rare cases unknown to us, it represented legal sex after gender change. Participants reported their sexual orientation using five categories: heterosexual, homosexual, bisexual, pansexual, and asexual (the distribution of the sample across groups is presented in Table 1). Participants reported their marital status using five categories: living alone, living with a mate, married, divorced, widowed; for our analyses, we created two categories: (1) Living alone (including those who are single, divorced, or widowed) and (2) Living with a partner (including those who are married or living with a partner). Participants reported their number of children, ranging from 0 to 5. Participants were also asked to indicate whether they had a child or children born during the last year.

Educational attainment was measured as the highest level of education completed by participants, self-reported and categorized as follows: (1) Early childhood education or no formal education, (2) Primary education, (3) Basic education, (4) Vocational education based on basic education, (5) General secondary education or vocational secondary education (including secondary specialized or technical education based on basic education), (6) Vocational training based on secondary education, (7) Bachelor's degree or equivalent (including applied higher education and diploma studies), (8) Master's degree or equivalent, (9) Doctorate or equivalent. For analyses, the variable was coded as an ordinal variable (ranging from 1 to 4). Categories 1 to 4 were coded as 1 (Basic education), categories 5 and 6 were coded as 2 (Secondary education), category 7 was coded as 3 (Bachelor's degree), and categories 8 and 9 were coded as 4 (Master's or Doctoral degree).

Occupation. Participants were also asked: Which of the following best describes your primary occupation (currently or before retiring from work)? They could choose one response from ten predefined occupational categories, all of which are presented in Table 1.

Statistical analysis

To examine the significance and magnitude (η^2) of the differences in mean desire across the individual demographic groups (bivariate associations), we used analysis of variance (ANOVA). Given that both age and desire were continuous variables, we calculated their Pearson correlation (r). We used multiple linear regression analyses to assess how well the predictor variables explain sexual desire. Effect sizes are reported as standardized beta coefficients (β), which indicate the unique contribution of each predictor. Given the large sample size, we adopted a conservative alpha threshold of $p < 0.001$ and emphasized effect sizes (η^2 and β) throughout. As small effects are expected in population-level psychological research, we interpret findings in the context of prior work where even minimal associations (e.g., $r < 0.10$) have been found to be meaningful over time (Funder & Ozer, 2019).

To assess the multivariate predictive power of demographic variables and their hypothesized interactions with gender for sexual desire, we conducted linear regression with desire as the dependent variable. The predictor variables included age (continuous), sexual orientation (categorical), relationship status (categorical), number of children (continuous), childbirth within the last year (categorical), educational attainment (categorical), occupation (categorical), and satisfaction with the relationship. Since only participants in a relationship answered the question about satisfaction, and to retain the full sample for the analysis of other variables, we also conducted another regression that did not include relationship satisfaction among the independent variables. To illustrate the interactions between gender and other demographic variables, we present eight interaction plots.

Data availability

The data cannot be publicly shared as they are part of an extensive ongoing biobank study, Estonian Biobank (EstBB). However, researchers can apply for access to the data ([https://genomics.ut.ee/en/content/estonian-biobank](https:/genomics.ut.ee/en/content/estonian-biobank)). The EstBB is regulated by the Human Genes Research Act, which was adopted in 2000 specifically for the operations of the EstBB.

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Declarations

Competing interests
The authors declare no competing interests.

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Correspondence and requests for materials should be addressed to T.A.