

WOMEN'S SEXUAL HEALTH

Risk Factors for Sexual Pain Among Physically Active Women



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ABSTRACT

Introduction: Sexual pain is common among women but little is known about associations with exercise and physical activity.

Aim: To determine the prevalence of sexual pain among physically active women and to evaluate cycling and other potential risk factors.

Methods: This is a secondary data analysis of a study on the urinary and sexual wellness of physically active women recruited through sporting clubs and targeted social media advertising. We used multivariable logistic regression to assess the role of cycling and exercise in reporting any, frequent, or severe sexual pain, controlling for demographic, relationship, and health risk factors.

Main outcome measure: Sexual pain, including frequency and severity, was measured using the Female Sexual Function Index.

Results: A total of 2,039 women were included, with 1,097 (54%) reporting any level of sexual pain, 364 (18%) experiencing frequent pain, and 378 (19%) reporting severe pain. Less than 5% of women reported diabetes or hypertension, and the cohort had a median body mass index of 23.3 (interquartile range 21.4–25.7). Increasing age and body mass index were protective against any sexual pain, as was cycling (odds ratio [OR] 0.73 [95% CI 0.59–0.90]). Participants who reported being “moderately satisfied” (OR 0.53 [95% CI 0.31–0.91]) or “very satisfied” (OR 0.33 [95% CI 0.19–0.56]) with their emotional closeness to a sexual partner had decreased odds of any sexual pain.

Conclusion: Experiencing any sexual pain is common in physically active women, with a prevalence of over 50%; however, weekly energy expenditure from exercise was not associated with sexual pain. Cycling participation and higher levels of emotional closeness and intimacy were associated with less pain. Patients between the ages of 18 and 30 years who were normal or underweight incurred the highest risk of sexual pain. **Fergus KB, Cohen AJ, Cedars BE, et al. Risk Factors for Sexual Pain Among Physically Active Women. Sex Med 2020;8:501–509.**

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INTRODUCTION

Sexual pain during or following vaginal penetration is a common symptom among women and is associated with a

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variety of pathophysiologically diverse disorders and diagnoses such as endometriosis, genito-pelvic pain or penetration disorder, pelvic inflammatory disease, and vulvodynia. Prevalence estimates of penetrative sexual pain range from 3% to 18% in the general population.¹ Pain during penetrative intercourse has a considerable impact on sexual functioning, intimate relationships, efforts to conceive, and self-image.^{2,3} Yet female sexual wellness is often overlooked during medical training.⁴ On a relative scale, surprisingly few studies have investigated sexual dysfunction in women in comparison with the volume of literature on male sexual dysfunction.

As sexual pain in women can be caused by a large number of medical conditions,³ classifying and quantifying risk poses a challenge to investigators. Prior studies have identified various surgical and gynecologic procedures, urologic, gastrointestinal,

nervous system, musculoskeletal system-related disorders, childbirth, psychological factors, and sociodemographic factors as sources of risk.^{5–8} Recent evidence suggests female cyclists experiencing perineal pressure have a point prevalence of female sexual dysfunction (FSD) as high as 54%, with a particular association among those reporting genital pain or numbness during cycling.⁹ Yet frequency and duration of cycling were notably not associated with FSD,⁹ and other studies have identified exercise as a protective factor against FSD of which sexual pain is a sub-component.^{10–13} However, using the composite outcome variable of FSD may mask the effect of exercise on sexual pain, and it remains unknown whether exercise is protective against sexual pain specifically, and if not, what factors influence pain.

To date, there is a paucity of data regarding the association between the amount and type of exercise activity and sexual pain in women. The purpose of this study is to assess the relationship between exercise and sexual pain and to determine other risk factors associated with sexual pain in this population. We hypothesize that cyclists with genital numbness in our sample will have a higher prevalence of sexual pain compared to the general population, whereas increasing levels of exercise activity—while helpful for overall sexual function—will have no association with sexual pain.

MATERIALS AND METHODS

Study Population

The study population consists of physically active women aged over 18 years who volunteered to participate in an online, multinational cross-sectional study of sexual and urinary wellness. We used targeted social media recruitment methods and direct outreach to sporting clubs (cycling, running, and swimming) that have been published previously.¹⁴ Women were recruited between April and December of 2016 in the United States, Great Britain, Canada, New Zealand, and Australia. Participants filled out an anonymous survey inquiring about exercise activity as well as urinary and sexual function outcomes. A total of 6,217 participants initiated the survey, 3,375 completed the survey, and finally 2,039 were included in our analysis.

We excluded participants that were not sexually active ($n = 309$) or had incomplete female sexual function inventory (Female Sexual Function Index, FSFI) data ($n = 355$). This is a secondary analysis of the 3,375 women that originally completed the survey. The FSFI scale is validated and used for the purpose of evaluating female sexual function.¹⁵ Those patients missing exploratory risk factor variables for potential inclusion in the final model were also excluded ($n = 672$). This survey was approved by an Institutional Review Board.

Evaluation of Risk Factors

For the purposes of this study, we define sexual pain as discomfort during or following vaginal penetration. Potential risk

factors for sexual pain included demographic, health, and intimate relationship characteristics. Demographic and relationship characteristics in the survey included age, race/ethnicity, and marital status. Health characteristics include body mass index (BMI; kg/m^2), presence of diabetes or hypertension, tobacco or alcohol consumption, history of urinary tract infection, and energy expenditure (metabolic equivalent [MET]-hours) and activities (swimming, cycling, running, multiple). To calculate energy expenditure, we multiplied hours exercised per week and estimated weekly MET-hours using the Compendium of Physical Activities.¹⁶ In regards to genital lesions related to repetitive cycling, participants were asked, “Have you ever developed any nodules (nodular induration or a bump in your skin) on your genital area?” as well as, “have you ever felt numbness in your genital area?” We measured emotional closeness with question 14 on the FSFI, which is a 5-level ordinal categorical variable ranging from “very dissatisfied” to “very satisfied” with emotional closeness between the participant and her partner. We chose this predictor variable a priori based on prior literature demonstrating associations between emotional factors and women’s sexual function.^{17–20}

Sexual Pain Outcome

The primary outcome of interest was the presence or absence of sexual pain or discomfort, which was ascertained with the FSFI.²¹ Participants were asked over the past 4 weeks if they experienced discomfort or pain “during vaginal penetration” and “following vaginal penetration,” with Likert scale response options ranging from “almost never or never” to “almost always or always.” The FSFI also asks participants to rate their “level (degree) of discomfort or pain during or following vaginal penetration,” with Likert scale response options ranging from “very low or none at all” to “very high.”²¹ As there is no clear and validated clinical cutoff score for the pain domain of the FSFI,¹⁵ we dichotomized the pain domain of the FSFI as follows: a score of 6 (“almost never, never, very low, or none at all”) was categorized as no pain; those below this threshold were categorized as having pain. We then categorized pain in 2 additional ways: first, frequent sexual pain, if they experienced it $\geq 50\%$ of the time; and second, severe quality of pain if they experienced a moderate, high, or very high level of pain. These cutoffs were determined a priori, and designed to capture a more comprehensive and inclusive assessment of sexual pain among women.

Statistical Analysis

We used descriptive statistics to report demographic, health, and relationship characteristics. Statistical tests to compare those with sexual pain and those without included 2-sided unpaired t -tests for normally distributed continuous variables and chi-squared tests for categorical variables. We determined the odds of any, frequent, or severe sexual pain using univariate logistic regression, choosing only variables with $P < .05$ and a priori plausibility for the final multivariable model. We also conducted

a test of trend for the emotional closeness variable included in the final model. Statistical tests yielding $P < .05$ for a 2-sided test were considered significant. STATA version 15 (StataCorp LLC, College Station, TX) was used for all statistical tests.

RESULTS

Demographic and Health Characteristics

2,039 women met the study inclusion criteria. A comparison of the cohort with those excluded is provided in [Supplementary Table 1](#), which was notable for differences in age and marital

status as well as a higher proportion of alcohol use among those included. The included cohort was healthy with less than 5% reporting diabetes or hypertension, and a median BMI of 23.3 (interquartile range: 21.4–25.7). The majority of women in the study were aged 18–40 years (65%, $n = 1,326$), white (85%, $n = 1,733$), and married or partnered (56%, $n = 1,143$) ([Table 1](#)). In total, 1,097 (54%) women reported some level of sexual pain or discomfort ([Figure 1](#)). The proportion of women experiencing frequent pain was 18% ($n = 364$); a total of 19% reported severe pain ($n = 378$). Statistically significant differences with regards to age, marital status, emotional closeness to

Table 1. Demographic and health characteristics by sex

| | Sexual pain | | <i>P</i> |
|--|----------------|------------------|----------|
| | No | Yes | |
| | <i>n</i> = 942 | <i>n</i> = 1,097 | |
| Demographic characteristics | | | |
| Age, <i>n</i> (%) | | | <.001 |
| 18–30 y | 287 (30.5) | 561 (51.1) | |
| 31–40 y | 244 (25.9) | 234 (21.3) | |
| 41–50 y | 246 (26.1) | 148 (13.5) | |
| ≥51 y | 165 (17.6) | 154 (14.0) | |
| Race/ethnicity, <i>n</i> (%) | | | .366 |
| White | 790 (83.9) | 943 (86.0) | |
| Black/African American | 14 (1.5) | 8 (0.7) | |
| Hispanic/Latino | 54 (5.7) | 54 (4.9) | |
| Asian | 40 (4.3) | 49 (4.5) | |
| Other* | 44 (4.7) | 43 (3.9) | |
| Relationship characteristics | | | |
| Marital status, <i>n</i> (%) | | | <.001 |
| Single | 298 (31.6) | 431 (39.3) | |
| Married | 365 (38.8) | 380 (34.6) | |
| Partnered | 180 (19.1) | 218 (19.9) | |
| Divorced/separated | 92 (9.8) | 60 (5.6) | |
| Widowed | 7 (0.7) | 8 (0.7) | |
| Emotional closeness during sex | | | <.001 |
| Very dissatisfied | 22 (2.3) | 55 (5.0) | |
| Moderately dissatisfied | 59 (6.3) | 105 (9.6) | |
| About equally satisfied and dissatisfied | 59 (6.3) | 112 (10.2) | |
| Moderately satisfied | 208 (22.1) | 299 (27.3) | |
| Very satisfied | 594 (63.1) | 526 (48.0) | |
| Health characteristics | | | |
| Body mass index, mean (SD) | 24.4 (4.2) | 23.7 (3.7) | <.001 |
| Diabetes diagnosis, <i>n</i> (%) | 5 (0.5) | 12 (1.1) | .163 |
| Hypertension diagnosis, <i>n</i> (%) | 43 (4.6) | 29 (2.6) | .019 |
| Current tobacco use, <i>n</i> (%) | 33 (3.5) | 27 (2.5) | .165 |
| Current alcohol use, <i>n</i> (%) | 703 (74.6) | 788 (71.8) | .156 |
| UTI ever, <i>n</i> (%) | 506 (53.7) | 628 (57.3) | .110 |
| Genital nodules, <i>n</i> (%) | 247 (26.2) | 384 (35.0) | <.001 |
| Genital numbness, <i>n</i> (%) | 255 (27.1) | 379 (34.6) | <.001 |
| Weekly MET-hours, mean (SD) | 64.7 (50.7) | 67.4 (56.3) | .813 |
| Cycling activity, <i>n</i> (%) | 668 (70.9) | 724 (66) | .017 |

MET = metabolic equivalent; UTI = urinary tract infection.

*Other: American Indian/Alaska Native; Native Hawaiian/Other Pacific Islander; more than one race; "other."

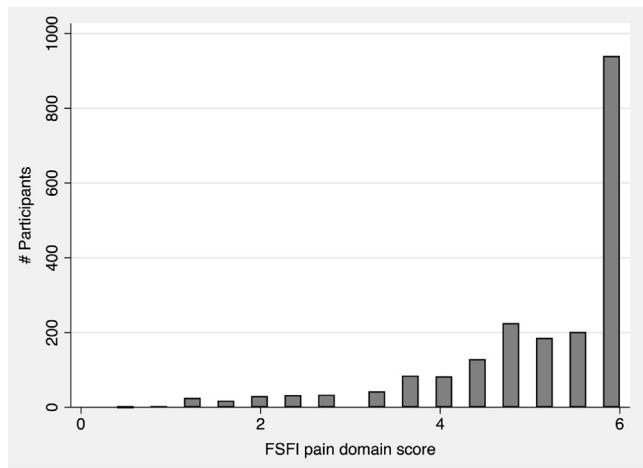


Figure 1. Distribution of pain domain score of the FSFI. The FSFI pain domain score ranges from 1.2 to 6, with a score of 6 representing those reporting sexual pain almost never or never over the past 4 weeks, and a score of 1.2 representing sexual pain almost always or always. A score of zero represents those that are sexually inactive; these subjects were excluded in this study ($n = 309$). FSFI = Female Sexual Function Inventory.

sexual partner, BMI, hypertension, cycling participation, genital numbness, genital nodules, and exercise activity were noted when sexual pain was dichotomized. A smaller proportion of cyclists was found among those reporting any sexual pain compared to those without sexual pain. The proportion of women reporting sexual pain decreased with increasing BMI and increased emotional closeness to one's partner (Figure 2). Figure 3 shows the detailed responses to FSFI questions pertaining to sexual pain stratified by age.

Risk Factors for Sexual Pain and Discomfort

Univariate analysis revealed energy expenditure in weekly MET-hours was not associated with sexual pain, and cycling participation conferred reduced odds (odds ratio [OR] 0.80 [95% CI 0.66–0.96]) of any sexual pain. Multivariate analyses including covariates meeting pre-specified thresholds for women reporting any, frequent, and severe sexual pain are summarized in Table 2. Increasing age in 5-year increments (OR 0.88 [95% CI 0.84–0.92]) and BMI in integers (OR 0.96 [95% CI 0.94–0.98]) were protective against any sexual pain. After adjustment, cycling participation was significantly associated with reduced odds of any sexual pain (OR 0.73 [95% CI 0.59–0.90]), with even further reductions in the odds of frequent and severe sexual pain. In a sub-analysis among cyclists only, genital numbness while cycling (OR 1.4 [95% CI 1.11–1.75]) and genital nodules (OR 1.65 [95% CI 1.31–2.08]) were significantly associated with sexual pain. Race/ethnicity was not associated with sexual pain in univariate analysis and thus not included in the final model. Health factors not included in the model include smoking status, diabetes mellitus, weekly MET-hours, and history of urinary tract infection, as these factors did not meet our threshold in univariate analysis.

In the multivariate analysis, being “moderately satisfied” or “very satisfied” with emotional closeness to a sexual partner was associated with decreased odds of any sexual pain. This ordinal variable was tested for linear trend in all 3 models and found to be statistically significant ($P \leq .001$). When controlling for emotional closeness, marital status was no longer associated with sexual pain and discomfort in the multivariate model.

DISCUSSION

We found a high prevalence of sexual pain (54%) in a healthy cohort of women. Severe pain was reported in 19%, which more closely approximates the prevalence estimates expected in the general population.¹ We found that risk factors for pain included lower age and BMI, less emotional closeness to sexual partner, and the presence of genital nodules and genital numbness among cyclists.

Cycling participation was protective against sexual pain in our sample of physically active women in adjusted analyses after adjustment. As sexual pain is a sub-component of FSD, this finding partially reaffirms the expected lack of association between cycling frequency and duration with FSD discussed by Greenberg et al.⁹ Furthermore, our sub-analysis revealed that genital numbness during cycling is a strong risk factor for sexual pain among cyclists only, which also agrees with the findings of prior studies.⁹ Moreover, genital nodules from cycling were also a strong risk factor for sexual pain, and providers encountering patients with nodules should inquire about sexual pain. Given these findings, it is likely that the effects of cycling are multifactorial. On the one hand, it is possible that cardiometabolic and psychological benefits of exercise through cycling improve sexual function and possibly reduce sexual pain.^{10–13} On the other hand, vulnerable patients susceptible to genital numbness while cycling are at risk of sexual pain and FSD. Prior studies have identified muscle hypertonus as a risk factor for sexual pain,²² which may be increased in cyclists and other athletes. Further research is necessary to explore what factors unmeasured in this study predispose women to experience both genital numbness during cycling and pain during sex.

Our study also confirms prior findings that younger age in premenopausal women is a risk factor for sexual pain.^{5,23} This trend of increasing age as a protective factor against sexual pain applies only until women reach the likely postmenopausal age groups; this mirrors the findings of studies suggesting postmenopausal women are at increased risk of dyspareunia, the most common cause of sexual pain.^{24,25} However, the complete pathophysiologic mechanism for this remains unknown, as hypoestrogenism and vaginal dryness do not completely explain the phenomenon.²⁴

Women with lower BMI in our study had increased sexual pain in this cross-sectional sample. Prior studies investigating BMI have tested associations between normal and elevated BMI with regard to sexual function finding no difference.^{26–28} Esposito et al, in contrast, identified an inverse correlation

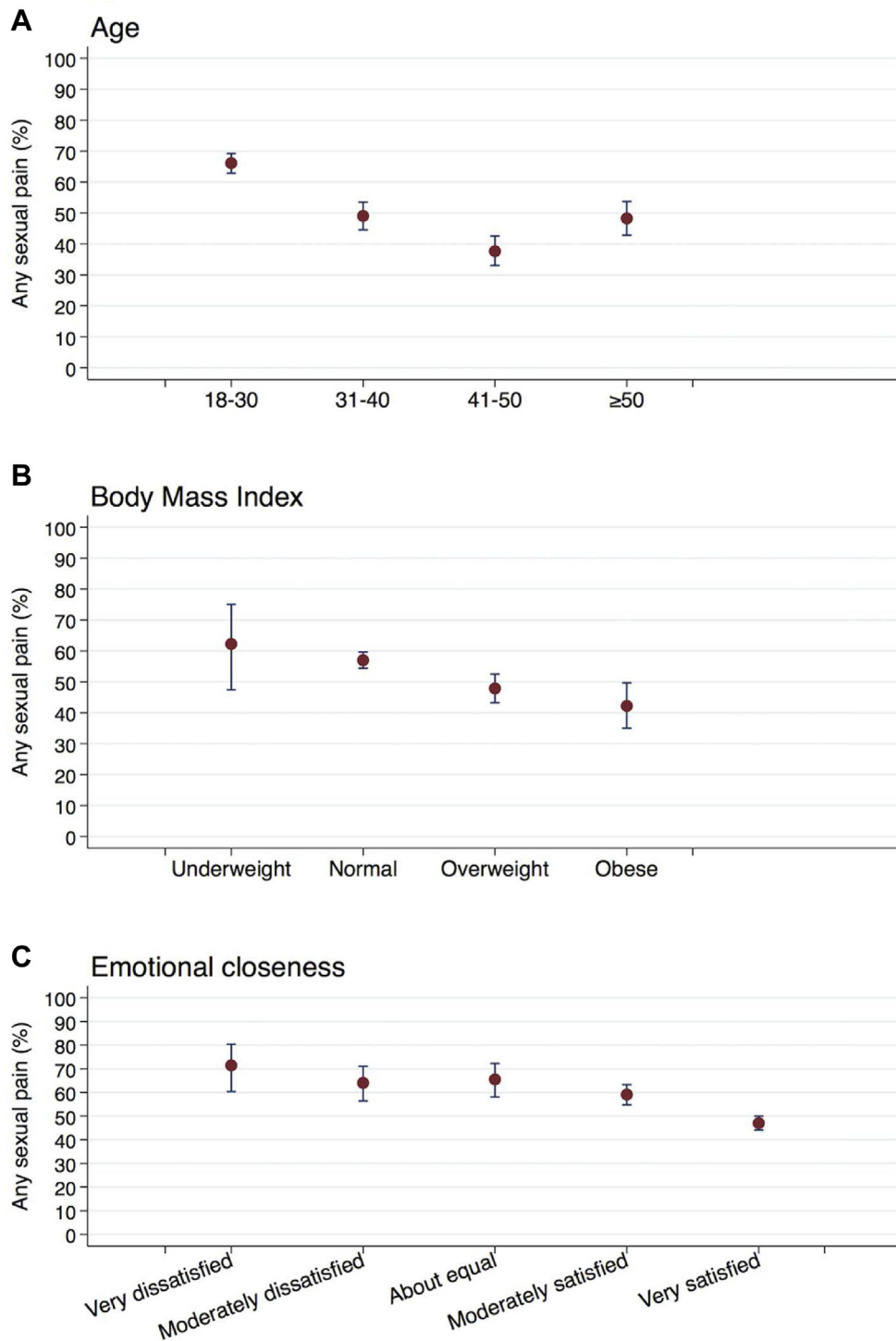


Figure 2. Prevalence of sexual pain among physically active women according to age, BMI, and emotional closeness. (A) Age group proportions of any sexual pain with 95% CI. (B) BMI category proportions of any sexual pain with 95% CI. (C) Question 14 of FSFI response proportion of any sexual pain with 95% CI. Question 14 states, “Over the past 4 weeks, how satisfied have you been with the amount of emotional closeness during sexual activity between you and your partner?” BMI = body mass index; FSFI = Female Sexual Function Inventory.

between increasing BMI and the FSFI arousal, lubrication, orgasm, and satisfaction domains, but found no association between BMI and sexual pain or desire in a sample of Italian women.²⁹ However, these studies had fewer underweight BMI-category individuals, and future research is indicated in this

population. One possible explanation is that a smaller sub-population of women with low BMI has functional hypothalamic amenorrhea as a result of intense exercise. One study investigated this hypothesis and showed an association between functional hypothalamic amenorrhea and sexual dysfunction.³⁰

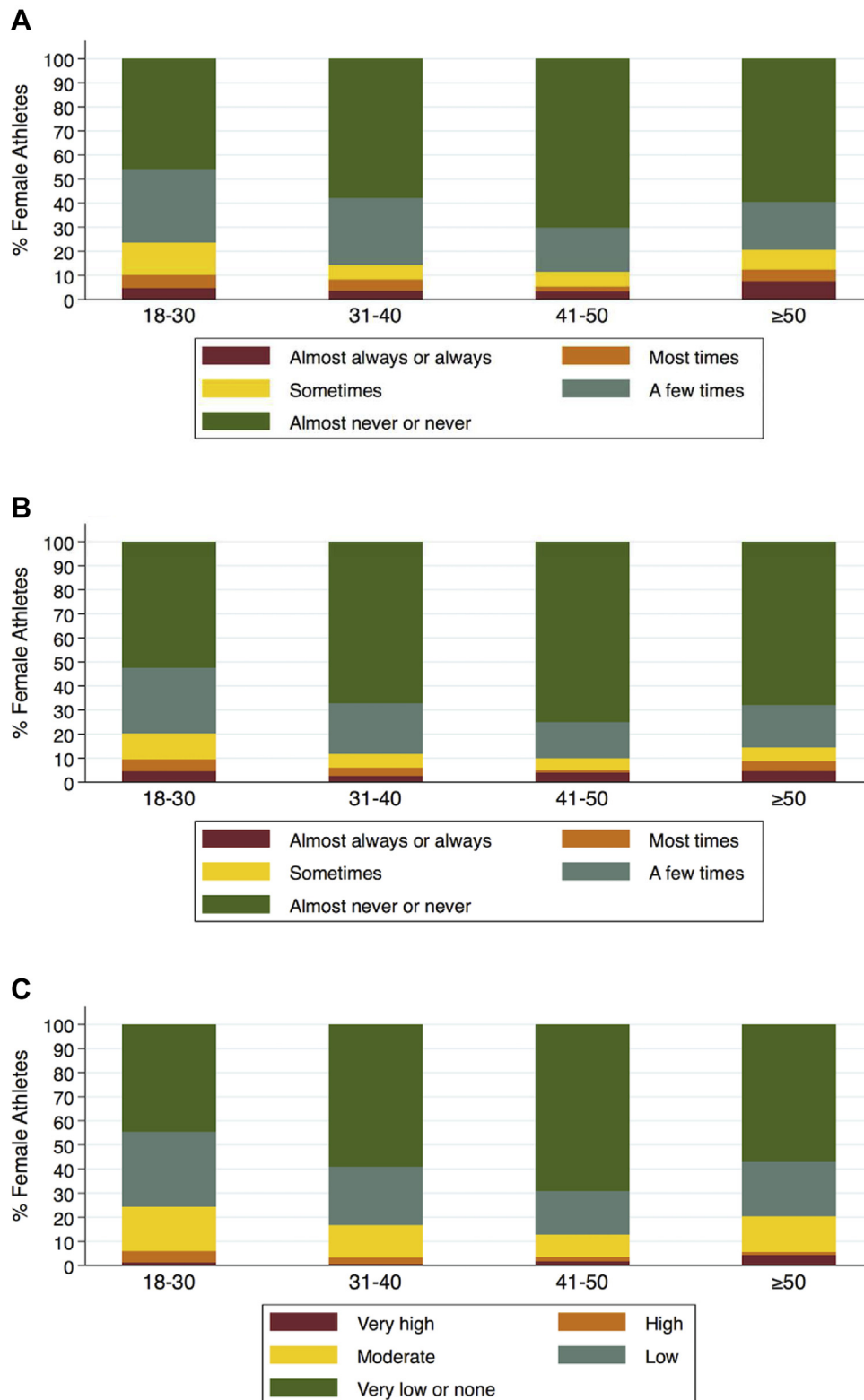


Figure 3. Distribution of responses to pain questions (questions 17–19) in the female sexual function index according to age categories. (A) Question 17: Over the past 4 weeks, how often did you experience discomfort or pain during vaginal penetration? (B) Question 18: Over the past 4 weeks, how often did you experience discomfort or pain following vaginal penetration? (C) Question 19: Over the past 4 weeks, how would you rate your level (degree) of discomfort or pain during or following vaginal penetration?

Table 2. Multivariable analysis of female sexual pain (n = 2,039)

| | Any sexual pain* | | Frequent sexual pain* | | Severe sexual pain* | |
|--------------------------------------|------------------|-------|-----------------------|-------|---------------------|-------|
| | OR (95% CI) | P | OR (95% CI) | P | OR (95% CI) | P |
| Age [†] | 0.88 (0.84–0.92) | <.001 | 0.98 (0.93–1.05) | .593 | 0.93 (0.87–0.99) | .022 |
| Body mass index (kg/m ²) | 0.96 (0.94–0.98) | .001 | 0.96 (0.93–0.99) | .006 | 0.97 (0.94–1.00) | .090 |
| Hypertension | 0.90 (0.54–1.51) | .687 | 0.85 (0.41–1.80) | .680 | 0.93 (0.46–1.89) | .838 |
| Emotional closeness | | | | | | |
| Very dissatisfied | (ref) | | (ref) | | (ref) | |
| Moderately dissatisfied | 0.62 (0.34–1.14) | .123 | 0.58 (0.32–1.08) | .084 | 0.66 (0.35–1.22) | .185 |
| About equally satisfied/dissatisfied | 0.67 (0.37–1.23) | .199 | 0.74 (0.41–1.34) | .321 | 0.85 (0.46–1.56) | .591 |
| Moderately satisfied | 0.53 (0.31–0.91) | .022 | 0.49 (0.29–0.84) | .009 | 0.66 (0.38–1.15) | .142 |
| Very satisfied | 0.33 (0.19–0.56) | <.001 | 0.32 (0.19–0.53) | <.001 | 0.39 (0.23–0.66) | <.001 |
| Marital status | | | | | | |
| Single | (ref) | | (ref) | | (ref) | |
| Married | 1.11 (0.87–1.42) | .393 | 0.98 (0.72–1.34) | .917 | 1.15 (0.84–1.55) | .396 |
| Partnered | 1.08 (0.83–1.40) | .578 | 1.01 (0.73–1.42) | .931 | 1.01 (0.73–1.41) | .944 |
| Divorced/separated | 0.82 (0.55–1.23) | .347 | 0.40 (0.20–0.79) | .008 | 0.70 (0.38–1.28) | .245 |
| Widowed | 1.96 (0.66–5.87) | .228 | 0.76 (0.16–3.73) | .739 | 3.44 (1.05–11.31) | .042 |
| Genital numbness [‡] | 1.42 (1.15–1.75) | .001 | 1.78 (1.37–2.32) | <.001 | 1.67 (1.29–2.16) | <.001 |
| Genital nodules [‡] | 1.55 (1.27–1.90) | <.001 | 1.57 (1.23–2.01) | <.001 | 1.66 (1.30–2.12) | <.001 |
| Cycling | 0.73 (0.59–0.90) | .004 | 0.58 (0.45–0.77) | <.001 | 0.66 (0.51–0.86) | .002 |

FSFI = Female Sexual Function Inventory; OR = odds ratio.

*Any sexual pain: FSFI pain score <6; frequent sexual pain: pain >50% of the time; severe sexual pain: moderate, high, or very high sexual pain.

[†]Age measured in 5-y increments.

[‡]Asked all participants, with particular interest in cyclists.

Another sub-population worth investigating is women with eating disorders and low BMI. Numerous studies have demonstrated that women with anorexia nervosa have decreased libido, as well as increased sexual anxiety and sexual dysfunction.^{31,32}

The role of emotional closeness with a sexual partner has a prominent association with sexual pain in this study. Women reporting higher satisfaction with emotional closeness to their sexual partner had reduced odds of reporting any sexual pain. This finding adds to the growing body of literature suggesting dyadic sexual communication and relationship intimacy and wellness are associated with sexual pain status.^{17–20} For instance, prior research regarding women in relationships that have pre-existing vulvovaginal pain with sex suggests that higher levels of intimacy and sexual communication were associated with greater sexual satisfaction and pain self-efficacy.¹⁷ Future research is necessary to identify a causal direction for the association between emotional intimacy and sexual pain, as our study is limited by a one-item predictor and cannot rule out reverse causation due to its cross-sectional design. Indeed, one study found that male partners of women with provoked vulvar pain symptoms reported worse sexual communication and satisfaction than controls with pain-free female partners.³³ While marital status was found to be associated with sexual pain in our univariate analysis, adjustment for other variables indicated that marital status was not independently associated with the outcome. This is likely due to the role of emotional closeness as a confounder.

This finding will aid in interpreting associations between marital status and sexual pain in future research.

The insufficient available research on women's sexual pain may also affect how this condition is treated in clinic. Elements of women's sexual function may be overlooked, such as satisfaction, sexual orientation, and pleasure.³⁴ Emotional closeness, uncovered in this study, may also be omitted in a sexual history. Other barriers to assessing women's sexual function in the clinic include perceived lack of effective therapeutic options, time constraints, and size of the patient panel.³⁵ Given the various pharmacologic and surgical options available to men, this conceivably leads physicians to feel more equipped to treat male sexual dysfunction. One study found that women with vulvodynia visited an average of 5 doctors regarding their symptoms before finally arriving at a diagnosis.³⁶ Moreover, prior research suggests physicians express discomfort in taking a sexual history for patients of the opposite gender or at younger or older age extremes.³⁷ As a first step to overcoming these barriers to taking a sexual history, risk factors uncovered in the present study may help physicians to target populations for screening based on the evidence, such as younger patients or those with a lower BMI. Women reporting any emotional or intimacy issues with their intimate partners may be worth screening for sexual pain as well.

The study population is healthy, young, and physically active, which limits generalizability to less healthy populations of women. The FSFI assesses pain during and after vaginal penetration, which

prevents the instrument from capturing pain that occurs during non-vaginal penetrative sexual activities. Given these limitations, our survey likely under-captured pain in sexually active women who do not engage in vaginal penetration or do so infrequently. We also limited our study population to women undergoing penetrative sex in the 4 weeks prior to survey completion; women with more severe pain may avoid sexual intercourse altogether. Biases introduced herein would serve to underestimate sexual pain in our results. We do not indicate temporal associations between exposure and outcome or causal relationships due to the cross-sectional design. This is a volunteer sample, which selects for respondents over non-respondents. The likelihood of selection bias is low, however, because participants were unaware of the study outcomes of interest, reducing the chance of selection on the joint basis of exposure and outcome status. Residual confounding is possible, as our survey did not ask about psychopathology (ie, depression, anxiety etc),⁷ gravidity and parity, pelvic floor physical therapy, endometriosis diagnosis, presence of acute yeast infection, hormone therapy, or surgical history. In addition, since all participants filled out the same survey online in the same way, any measurement bias would likely be non-differential misclassification of exposure status, which if present would bias results toward the null hypothesis.

CONCLUSIONS

We found a high prevalence of any sexual pain and an average prevalence of severe sexual pain in a large sample of physically active women. Cycling was protective against sexual pain in our study; however, genital numbness during cycling was associated with sexual pain. Physicians should pay particular attention to patients reporting genital numbness, as well as the youngest and possibly oldest age extremes. Importantly, emotional closeness and intimacy remains an essential component of sexual wellness among women in this exploratory analysis. Future research should explore the role of the dyadic relationship in sexual function as well as the possible mechanism for sexual pain and physical activity.

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SUPPLEMENTARY DATA

Supplementary data related to this article can be found at <https://doi.org/10.1016/j.esxm.2020.03.007>.