Title

Testosterone Use and Sexual Function among Transgender Men and Gender Diverse People Assigned Female at Birth

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1 **Testosterone Use and Sexual Function among Transgender Men and Gender Diverse**

2 **People Assigned Female at Birth**

3

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34   **Word Count:** 377 words in abstract, 3,034 words in manuscript, 5 tables/figures, 39 references

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36   **Tweetable Statement:** In a study of 1219 transgender men, testosterone use among transgender

37   men is associated with positive sexual function and vulvovaginal pain during sex.

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39   **Short Title:** Testosterone and Sexual Function

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41   **AJOG at a Glance:**

42   •   **Why was this study conducted?** The study aimed to improve our understanding of the

43   impact of testosterone on the sexual health of transgender men and gender diverse people

44   assigned female at birth.

45   •   **Key findings.** In our cross-sectional analysis of 1,219 adult transgender participants, 65%

46   reported any genital pain/discomfort during sexual activity in the past 30 days. Current

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47   testosterone use was associated with a higher interest in sexual activity and ability to

48   orgasm as well as vulvovaginal pain during sexual activity.

49   • **What does this add to what is known?** Although data from the extant literature are

50   scare, available evidence demonstrates that >60% of transgender men experience

51   vulvovaginal pain during sexual activity. Given this high burden, there is an urgent need

52   to identify effective and acceptable interventions for this population.

ABSTRACT

Background: Testosterone use among transgender people likely impacts their experience of
sexual function and vulvovaginal pain via several complex pathways. Testosterone use is
associated with decreased estrogen in the vagina and atrophic vaginal tissue, which may be
associated with decreased vaginal lubrication and/or discomfort during sexual activity. At the
same time, increased gender affirmation through testosterone use may be associated with
improved sexual function. However, data on pelvic and vulvovaginal pain among transgender
men and nonbinary people assigned female at birth is scarce.

Objective: To assess the association between testosterone and sexual function, with a focus on
symptoms that are commonly associated with vaginal atrophy.

Study Design: We conducted a cross-sectional analysis of 1,219 participants ages 18-72 years
old using 2019-2021 data from an online, prospective, longitudinal, cohort study of sexual and/or
gender minority people in the US (The PRIDE Study). Our analysis included adult transgender
men and gender diverse participants assigned female at birth who were categorized as never,
current, and former testosterone users. Sexual function was measured across eight Patient-
Reported Outcomes Measurement Information System (PROMIS) Sexual Function and
Satisfaction (SexFS) domains.

Results: Overall, 516 (42.3%) had never used testosterone and 602 (49.4%) currently used
testosterone. Median duration of use was 37.7 months (range 7 days to >27 years). Most
participants (64.6%) reported genital pain/discomfort during sexual activity in the past 30 days,
most commonly in the vagina/frontal genital opening (52.2%), followed by the clitoris (29.1%)
and labia (24.5%). Current testosterone use was associated with higher interest in sexual activity
(β=6.32, 95% CI: 4.91-7.74) and more vaginal pain/discomfort during sexual activity (β=1.80,

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76 95% CI: 0.61-3.00). No associations were observed between current testosterone use and

77 satisfaction with sex life, lubrication, labial pain/discomfort, or orgasm pleasure.

78 **Conclusions:** Testosterone use among transgender men and gender diverse people was

79 associated with a higher interest in sexual activity and ability to orgasm as well as vaginal

80 pain/discomfort during sexual activity. Notably, the available evidence demonstrates that >60%

81 of transgender men experience vulvovaginal pain during sexual activity. The causes of pelvic

82 and vulvovaginal pain are poorly understood but are likely multifactorial and include

83 physiological (*e.g.,* testosterone-associated vaginal atrophy) and psychological factors (*e.g.,*

84 gender affirmation). Given this high burden, there is an urgent need to identify effective and

85 acceptable interventions for this population.

86

87 **KEYWORDS:** Dyspareunia, Sexual Function, Testosterone, Transgender, Vulvovaginal Pain

INTRODUCTION

At least 1.6 million transgender adults and adolescents live in the United States,[1] among whom an estimated 70% of transgender men have ever used testosterone as gender-affirming hormone therapy (GAHT).[2] Vaginectomy is rare (<3%) in this population, and the majority of transgender men and gender diverse people retain their vagina.[2] Testosterone GAHT likely impacts sexual function via several complex pathways: Testosterone GAHT is associated with vaginal atrophy, which may be associated with decreased lubrication and/or discomfort during sexual activity.[3–5] At the same time, increased gender affirmation through testosterone use may be associated with improved sexual function.

There is limited research on the sexual function of transgender men and gender diverse people assigned female at birth (AFAB). What does exist suggests that, although testosterone GAHT is associated with increased desire and arousal,[6] a high proportion of transgender men also reported dyspareunia (painful sex), a common symptom of vaginal atrophy. The prevalence of dyspareunia may be as high as 60-62% among transgender men,[7,8] markedly higher than the prevalence reported among cisgender women (3-48%).[9] Several studies also suggest that transgender men using testosterone may experience chronic genital pain and discomfort, with one study reporting that 10-16% of transgender men had been diagnosed with vulvodynia (defined as chronic burning, stinging, or irritating vulvovaginal pain for three consecutive months or longer).[7,8] Only one prior small study directly assessed the impact of testosterone GAHT on genital pain during sexual activity. Although 30% of transgender men reported that testosterone had caused genital dryness and 14% experienced genital tearing since initiating testosterone, they did not observe an association between testosterone use and vulvodynia or dyspareunia symptoms.[10]

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111   The present study aimed to improve our understanding of the impact of testosterone on

112   the sexual health of transgender people, with a focus on symptoms that are commonly associated

113   with vaginal atrophy, including decreased lubrication, and pain during sexual activity. Using data

114   from a large national online sample of sexual and/or gender minority adults in the US, we

115   examined the association between current testosterone use and self-reported measures of sexual

116   function and satisfaction experienced by transgender men and gender diverse people.

117

118   **MATERIALS AND METHODS**

119   This analysis used data from The Population Research in Identity and Disparities for

120   Equality (PRIDE) Study, an online, prospective, longitudinal cohort study of sexual and/or

121   gender minority people in the US. We conducted a cross-sectional analysis using 2019-2021 data

122   from a questionnaire administered annually to study participants among adult transgender men

123   and gender diverse participants AFAB. We included participants who self-reported currently

124   having a vagina or frontal genital opening (FGO) and who completed the Patient-Reported

125   Outcomes Measurement Information System (PROMIS) Sexual Function and Satisfaction

126   (SexFS) items.[11] We excluded participants who did not self-report having a vagina/FGO or who

127   reported having a phalloplasty or vaginectomy.

128   **Measures**

129   *Demographic Characteristics.* Participants self-reported data on race and ethnicity,

130   current gender identity, current sexual orientation, and sex assigned at birth. Participants could

131   select multiple response options for race, ethnicity, gender, and sexual orientation. Participants

132   self-reported the gender(s) of people they had any sexual activity within the past year.

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133   ***Testosterone Use.*** We categorized participants as never, current, and former testosterone

134 users. Current testosterone use was assessed on the 2019-2021 annual questionnaires and

135 included participants who, at the time, indicated they were currently taking testosterone (of any

136 type in any formulation such as gel, injection or patch), testosterone cypionate, testosterone

137 enanthate, or testosterone undecanoate for gender affirmation. To differentiate participants who

138 had never used testosterone from participants who formerly used testosterone, we also

139 incorporated participants' responses to a baseline survey that assessed participants' lifetime

140 testosterone use. Duration of testosterone use was calculated based on participant's self-reported

141 month and year of initiating testosterone and the date of survey completion. We did not collect

142 information regarding the dose of testosterone.

143   ***Sexual Function.*** The PROMIS SexFS assesses self-reported sexual function and

144 satisfaction over the past 30 days. This instrument was originally developed for cancer

145 populations and was subsequently validated among a broad group of sexually active adults in the

146 US who were not cancer survivors.[11] Although sexual minority (*e.g.,* bisexual, gay, and lesbian)

147 individuals were involved in the development of the PROMIS SexFS, transgender people were

148 not. The PRIDE Study implemented a modified version of the PROMIS SexFS that allowed

149 participants to select their preferred anatomical language (*i.e.*, "vagina" or "frontal genital

150 opening").[12,13] In completing the survey, each participant's selection for their preferred

151 terminology was propagated throughout subsequent survey items.

152   Our analysis included eight PROMIS SexFS domains: interest in sexual activity,

153 satisfaction with sex life, vaginal/FGO lubrication, ability to orgasm, orgasm pleasure, as well as

154 vaginal/FGO, labial, or clitoral pain/discomfort during sexual activity. Interest in sexual activity

155 was assessed for all participants while all other domains were only assessed for participants who

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156 reported any sexual activity in the past 30 days (which was broadly defined and included

157 masturbation). For each domain, we calculated each participant's raw score and T-scores. A T-

158 score of 50 represents the mean for the US population and has a standard deviation of 10. Higher

159 T-scores indicate more of the construct measured by the domain; for example, more interest in

160 sexual activity, increased vaginal/FGO lubrication, and more pain/discomfort relative to lower

161 scores.

162 *Covariates.* We considered covariates that are associated with sexual function and pelvic

163 pain based on prior literature. These included standardized clinical assessment tools and self-

164 reported lifetime diagnoses. We broadly considered five categories of covariates that have been

165 previously associated with sexual function among cisgender women and transgender men:

166 structural changes to the pelvis, inflammatory conditions in the pelvis, hormonal influences,

167 mental health, and substance use.[17–30]

168 Structural changes to the pelvis included prior pregnancies, hysterectomy, and uterine

169 fibroids. Inflammatory conditions in the pelvis included pelvic inflammatory disease,

170 inflammatory bowel disease (including Crohn's disease and ulcerative colitis), irritable bowel

171 syndrome, and bacterial sexually transmitted infections (STI; defined as chlamydia, gonorrhea,

172 or syphilis diagnosis in the past year). Hormonal influences include oophorectomy, polycystic

173 ovary syndrome, current hormonal contraceptive use (including oral contraceptives, transdermal

174 patch, vaginal rings, medroxyprogesterone acetate injections, and etonogestrel implants), and

175 intrauterine device use.

176 Mental health measures included lifetime diagnoses of depression and post-traumatic

177 stress disorder (PTSD) as well as lifetime experiences of sexual abuse, rape, and sexual assault.

178 Depressive symptoms in the past two weeks were assessed using the Patient Health

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179   Questionnaire-9 (PHQ-9; score range 0-27 with higher scores indicating more depressive

180   symptoms)[14] and PTSD symptoms in the last month were assessed with the brief 6-item version

181   of the PTSD Check List (PCL-6; score range 6-30).[15] Substance use variables included current

182   smoking and current alcohol consumption behaviors; the latter was assessed using the Alcohol

183   Use Disorders Identification Test (AUDIT; score range 0-40 with higher scores indicating more

184   disordered alcohol use).[16]

185   **Statistical Analysis**

186   We assessed cross-sectional associations between current testosterone use and sexual

187   function. For participants who completed more than one annual questionnaire, we restricted our

188   analysis to only include their first year of responses. We calculated descriptive statistics stratified

189   by testosterone use and conducted Chi-squared tests. We conducted one sample t-tests to test if

190   the SexFS domain T-scores differed from the population mean of 50 and calculated the Pearson

191   correlation coefficient to estimate the strength and direction of the relationship between PROMIS

192   SexFS domains.

193   We then used multivariable linear regression to estimate the association between current

194   testosterone use (relative to never testosterone use) and the T-scores for each sexual function

195   domain. We used causal diagrams to select covariates to include in our model (Supplemental

196   Figure 1). We estimated three models: an unadjusted model, a minimally adjusted model, and a

197   robustly adjusted model. We chose our primary analysis to be a minimally adjusted model that

198   included confounding variables (*i.e.,* covariates that were associated with both the exposure

199   [testosterone use] and outcomes [sexual function] in our sample). The minimally adjusted model

200   included age, current depression symptoms (PHQ-9 scores), current PTSD symptoms (PCL-6

201   scores), alcohol use (AUDIT score), current smoker, hysterectomy, oophorectomy, and hormonal

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202   contraception use. We conducted secondary analyses with a robustly adjusted model that

203   included all covariates that are associated with sexual function and dyspareunia in prior

204   literature, but were not associated with testosterone use in our sample, including history of sexual

205   assault, prior pregnancy, inflammatory bowel disease, irritable bowel syndrome, uterine fibroids,

206   pelvic inflammatory disease, polycystic ovary syndrome, and intrauterine devices.[17–30]

207   Our primary analysis considers current *versus* never testosterone users. Results

208   comparing former to current users are provided in the Supplementary Materials. We

209   hypothesized that asexual identity may be a potential effect modifier, as asexual participants may

210   differ from non-asexual participants with respect to interest in sexual activity. Therefore, we

211   conducted sensitivity analyses stratified by self-reported asexual sexual orientation. All analyses

212   were conducted in R version 4.2.1. This study received ethical approval from University of

213   California, San Francisco, Stanford University School of Medicine, and WCG Institutional

214   Review Boards.

215

216   **RESULTS**

217   Our analysis included 1,219 participants ages 18-72 years old (median age 27.1; Table 1).

218   Most participants (61.1%) endorsed more than one gender identity: most commonly non-binary

219   (54.2%), transgender man (46.0%), genderqueer (33.6%), and man (21.5%). Participants were

220   diverse in sexual orientation, although most identified as queer (65.1%). The majority (80.6%) of

221   participants only reported White race and/or ethnicity and 12.0% of participants selected more

222   than one racial and/or ethnicity.

223   There were 516 (42.3%) participants who had never used testosterone, 602 (49.4%) who

224   currently used testosterone, and 76 (6.2%) former testosterone users. Twenty-five participants

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225 were missing information about GAHT use. The median duration of GAHT with testosterone use

226 was 37.7 months (range 7 days to >27 years). Current testosterone users were significantly more

227 likely to identify as a man or transgender man, and less likely to identify as agender,

228 genderqueer, nonbinary, or questioning (Supplemental Table 1). There were no differences in

229 testosterone use by age, race, or ethnicity.

230 Most participants reported having sex with another person in the past year (68.9%), were

231 in a relationship (59.4%), and reported any sexual activity (including masturbation) in the past 30

232 days (89.5%; Table 2). Among participants who reported having sex with another person in the

233 past year, 88.5% reported any receptive oral sex or receptive vaginal/FGO sex. Participants

234 currently using testosterone were more likely to be sexually active in the past year (73.3% v.

235 63.4%, p=0.001) and in the past 30 days (93.9% v. 84.7%, p<0.001).

236 Table 2 reports participants' pelvic health histories. Current testosterone users were more

237 likely to have a hysterectomy (17.9% v. 5.4%, p<0.001) and oophorectomy (14.5% v. 3.3%,

238 p<0.001), and less likely to currently use hormonal contraceptives (5.8% v. 17.8%, p<0.001)

239 compared to participants who never used testosterone. Current testosterone users were also more

240 likely to have a past year bacterial STI diagnosis (3.0% v. 1.6%, p=0.001). Testosterone use was

241 not associated with pelvic inflammatory disease, polycystic ovary syndrome, uterine fibroids,

242 inflammatory bowel disease, irritable bowel syndrome, pregnancy history, or intrauterine device

243 use.

244 Participants reported very high levels of lifetime experiences of sexual abuse, sexual

245 assault, and ever having received a depression and PTSD diagnoses (Table 2). Testosterone use

246 was associated with lower scores (*i.e.,* better mental health) for current depressive and PTSD

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247   symptoms. Testosterone use was also associated was substance use, including current smoking

248   (7.5% v. 4.3%, p=0.033) and higher AUDIT scores.

249   Among the 1,091 sexually active participants, most (n=693, 64.6%) reported genital pain/

250   discomfort during sexual activity in the past 30 days, most commonly in the vagina/FGO

251   (52.2%), followed by the clitoris (29.1%) and labia (24.5%; Table 3). There were 103 (9.6%)

252   participants who reported pain at all three genital sites. T-scores for pain/discomfort were higher

253   than the population mean (p-values<0.001) while T-scores for orgasm pleasure (mean T-score

254   45.0, p-value<0.001) and satisfaction with sex life (mean T-score 45.6, p-value<0.001) were

255   lower than the population mean. Figure 1 shows the correlation between each sexual function T-

256   score among participants. Interest in sexual activity, satisfaction, lubrication, orgasm ability and

257   pleasure were positively correlated. Measures of pain/discomfort were negatively correlated with

258   all other domains.

259   Compared to participants who never used testosterone, current testosterone users were

260   less likely to report difficulty with lubrication (58.5% v. 66.7%, p=0.01), more like to report any

261   vaginal pain/discomfort (56.0% v. 49.2%, p=0.04), and more likely to achieve orgasm (p=0.003;

262   Table 3). In the minimally adjusted regression models (Table 4), current testosterone use was

263   associated with higher interest in sexual activity (β=6.32, 95% CI: 4.91-7.74), higher ability to

264   orgasm (β=1.50, 95%CI: 0.19-2.81), pain/discomfort during sexual activity in the vaginal/FGO

265   (β=1.80, 95% CI: 0.61-3.00) and in the clitoris (β=1.20, 95%CI: 0.10-2.30). The association

266   between testosterone use, ability to orgasm, and clitoral pain/discomfort were not statistically

267   significant in the robustly adjusted model. No associations were observed between current

268   testosterone use and satisfaction with sex life, lubrication, labial pain/discomfort, or orgasm

269   pleasure.

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270   Duration of testosterone use was associated with increased interested in sexual activity,

271 but not with any other outcomes (Supplemental Table 4). In sensitivity analyses, we did not

272 observe any evidence of effect modification by asexual sexual orientation (Supplemental Figure

273 2), although asexual identity was independently associated with most sexual function domains.

274

275 **COMMENT**

276   In our study, testosterone use among transgender men and gender diverse people AFAB

277 was associated with some domains of positive sexual function (such as a higher interest in sexual

278 activity and ability to orgasm) as well as pain/discomfort during sexual activity. Specifically, we

279 observed a strong, consistent association between current testosterone use and higher interest in

280 sex as well as vaginal/FGO pain during sexual activity.

281   Our findings are consistent with prior studies which found that testosterone use is

282 associated with increased desire and interest in sex.[6] GAHT is associated with significant

283 improvements in overall mental health, quality of life, and body image,[31–33] which in turn likely

284 have positive impacts on other areas of wellbeing, including sexual function. For example, other

285 studies have found that access to gender-affirming chest reconstruction surgery is associated with

286 higher sexual function scores, while experiencing barriers to accessing gender-affirming care is

287 associated with lower sexual function scores.[25] Although prior studies have not observed an

288 association between testosterone use and orgasm,[6] testosterone use was associated with a higher

289 ability to orgasm in our study.

290   Notably, we observed that a majority of transgender and gender diverse people AFAB

291 using testosterone (67%) experienced vulvovaginal pain during sexual activity. This prevalence

292 is consistent with prior studies, which have reported that 60-62% of transgender men experience

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293   dyspareunia.[7,8] Although testosterone was associated with vaginal/FGO pain in all regression

294   analyses, the prevalence of any genital pain among individuals who were testosterone naïve was

295   also quite high (63%). The causes of genital pain during sex (including dyspareunia, vulvodynia,

296   and vaginismus) are multifactorial.[24] Although physiological factors (such as vaginal atrophy,

297   endometriosis, and pelvic floor injury) are associated with genital pain during sex,[5] there are

298   complex associations with psychological and social factors, including co-occurrence with other

299   pain disorders, mental health, substance use, and sexual trauma.[22,23] Our sample reported an

300   alarmingly high level of sexual abuse (78%), sexual assault (50%), depression (81%) and PTSD

301   diagnoses (40%)—factors that are correlated with chronic pelvic pain among presumably

302   cisgender women.[17–21] This may partially account for the high prevalence of pain in our study.

303   Genital pain, including dyspareunia and chronic vulvodynia, can have a significant

304   impact on people's well-being and quality of life.[34,35] Although one prior study reports that 1 in 5

305   transgender men reported that pain during sexual activity was causing significant problems in

306   their life or relationship,[7] there has been limited investigation into how this may impact the well-

307   being and quality of life of transgender people.

308   Intravaginal estrogen (delivered via cream, tablets, or a ring) is recommended for

309   transgender men experiencing testosterone-associated dyspareunia, vaginitis, and cervicitis.[36]

310   Locally administered estrogen therapy has been demonstrated to be a safe and effective therapy

311   in post-menopausal cisgender women, who also experience vaginal atrophy associated with

312   estrogen deficiency.[37–39] However, few existing reports likewise suggest that a minority of

313   transgender men (<5%) have ever used intravaginal estrogen.[8] Therefore, there may be barriers

314   to the uptake of this intervention among transgender populations, including acceptability,

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315 provider awareness, participant/patient knowledge, insurance coverage, and other structural

316 barriers, in addition to the limited evidence base to inform clinical use.

317 **Strengths and Limitations**

318   To our knowledge, this is the first study to report PROMIS SexFS outcomes for

319 transgender men, and one of few studies to examine the association between testosterone use and

320 vulvovaginal pain. This study has several strengths, including a large, national sample of

321 transgender participants who were diverse with respect to their age, gender identity, and sexual

322 orientations.

323   Our results should be interpreted considering several limitations. The PRIDE Study is a

324 convenience sample of majority White participants that relies on self-reported health outcomes

325 and diagnoses and therefore may be subject to sampling, recall, and social desirability biases.

326 Although our study demonstrates the feasibility of using the PROMIS SexFS with transgender

327 men, the PROMIS SexFS has not been validated in transgender populations. This is notable,

328 given that the item calibration and scoring is stratified by sex assigned at birth. Although scoring

329 for interest in sexual activity, orgasm ability, and orgasm pleasure are identical for male and

330 female populations, the items specific to vaginal/FGO anatomy were calibrated to a sample

331 primarily composed of (presumably) cisgender women.[11] Therefore, there remain opportunities

332 to develop and validate sexual function measures for transgender and gender diverse people.

333   In addition, our survey did not collect data on several important variables. Although most

334 participants reported any receptive oral or receptive vaginal/FGO sex, we did not assess other

335 types of vaginal/FGO sexual activity (e.g., penetration with fingers or sex toys) and acknowledge

336 that some transmasculine people do not use their vagina/FGO at all during sex. We also lacked

337 detailed information of hormone doses and were unable to distinguish between low- and high-

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338 dose testosterone. We did not collect data on several factors that also influence genital pain,

339 including intravaginal estrogen use or the use of other medications used to manage symptoms of

340 vaginal atrophy and painful sex (*e.g.,* topical lidocaine).

341   Lastly, although duration of testosterone use was associated with few outcomes in our

342 study, this may in part be a limitation of our cross-sectional design. Future prospective

343 longitudinal research is important for identifying changes to sexual function over time,

344 accounting for cyclical variability in vaginal symptoms, variation in testosterone access and

345 dosing, as well as for understanding how long-term testosterone use may impact sexual function

346 and vulvovaginal pain.

347 **Conclusions**

348   Using data from a large national sample of transgender men and gender diverse people

349 AFAB, we observed that testosterone use was both associated with positive sexual function and

350 dyspareunia. The relationship between receipt of testosterone GAHT and sexual function is

351 complex, and likely includes both physiological (*e.g.,* vaginal atrophy) and psychological factors

352 (*e.g.,* affirmation). However, given the high burden (>60%) of dyspareunia observed among

353 transgender people AFAB, there is a need to assess its impact on the overall quality of life,

354 identify effective and acceptable interventions, and reduce barriers to accessing treatment for

355 transgender people experiencing dyspareunia.

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REFERENCES

1. Herman JL, Flores AR, O'neill KK. *How Many Adults and Youth Identify as Transgender in the United States?* The Williams Institute, UCLA School of Law; 2022. Accessed June 23, 2022. https://williamsinstitute.law.ucla.edu/publications/trans-adults-united-states/

2. James SE, Herman JL, Rankin S, Keisling M, Mottet L, Anafi M. *The Report of the 2015 U.S. Transgender Survey*. National Center for Transgender Equality; 2016.

3. Krakowsky Y, Potter E, Hallarn J, et al. The Effect of Gender-Affirming Medical Care on the Vaginal and Neovaginal Microbiomes of Transgender and Gender-Diverse People. *Front Cell Infect Microbiol*. 2022;11. doi:10.3389/FCIMB.2021.769950

4. Baldassarre M, Giannone FA, Foschini MP, et al. Effects of long-term high dose testosterone administration on vaginal epithelium structure and estrogen receptor-α and -β expression of young women. *Int J Impot Res*. 2013;25(5):172-177. doi:10.1038/ijir.2013.9

5. Kingsberg S, Kellogg S, Krychman M. Treating dyspareunia caused by vaginal atrophy: a review of treatment options using vaginal estrogen therapy. *Int J Womens Health*. 2010;1:105-111.

6. Mattawanon N, Charoenkwan K, Tangpricha V. Sexual Dysfunction in Transgender People: A Systematic Review. *Urol Clin North Am*. 2021;48(4):437-460. doi:10.1016/j.ucl.2021.06.004

7. Abern L, Maguire K, Cook J, Carugno J. Prevalence of Vulvar Pain and Dyspareunia in Trans Masculine Individuals. *LGBT Health*. Published online February 3, 2022. doi:10.1089/LGBT.2020.0357

8. Zwickl S, Burchill L, Wong AFQ, et al. Pelvic Pain in Transgender People Using Testosterone Therapy. *LGBT Health*. Published online January 4, 2023. doi:10.1089/lgbt.2022.0187

9. Weijmar Schultz W, Basson R, Binik Y, Eschenbach D, Wesselmann U, Van Lankveld J. Women's sexual pain and its management. *J Sex Med*. 2005;2(3):301-316. doi:10.1111/j.1743-6109.2005.20347.x

10. Dadasovich R, Auerswald C, Minnis AM, Raymond HF, McFarland W, Wilson EC. Testosterone and sexual risk among transmen: a mixed methods exploratory study. *Cult Health Sex*. 2017;19(2):256-266. doi:10.1080/13691058.2016.1216605

11. Weinfurt KP, Lin L, Bruner DW, et al. Development and Initial Validation of the PROMIS® Sexual Function and Satisfaction Measures Version 2.0. *J Sex Med*. 2015;12(9):1961-1974. doi:10.1111/jsm.12966

12. Moseson H, Lunn MR, Katz A, et al. Development of an affirming and customizable electronic survey of sexual and reproductive health experiences for transgender and gender

19

nonbinary people. *PLOS ONE*. 2020;15(5):e0232154.
doi:10.1371/JOURNAL.PONE.0232154

13. Klein A, Golub SA. Enhancing Gender-Affirming Provider Communication to Increase
Health Care Access and Utilization Among Transgender Men and Trans-Masculine Non-
Binary Individuals. *LGBT Health*. 2020;7(6):292-304. doi:10.1089/lgbt.2019.0294

14. Levis B, Benedetti A, Thombs BD. Accuracy of Patient Health Questionnaire-9 (PHQ-9) for
screening to detect major depression: individual participant data meta-analysis. *BMJ*.
2019;365. doi:10.1136/BMJ.L1476

15. Han B, Wong EC, Mao Z, Meredith LS, Cassells A, Tobin JN. Validation of a brief PTSD
screener for underserved patients in federally qualified health centers. *Gen Hosp Psychiatry*.
2016;38:84-88. doi:10.1016/j.genhosppsych.2015.07.009

16. Bohn MJ, Babor TF, Kranzler HR. The Alcohol Use Disorders Identification Test (AUDIT):
validation of a screening instrument for use in medical settings. *J Stud Alcohol*.
1995;56(4):423-432. doi:10.15288/jsa.1995.56.423

17. Reed BD, Legocki LJ, Plegue MA, Sen A, Haefner HK, Harlow SD. Factors associated with
vulvodynia incidence. *Obstet Gynecol*. 2014;123(2 Pt 1):225-231.
doi:10.1097/AOG.0000000000000066

18. Chisari C, Monajemi MB, Scott W, Moss-Morris R, McCracken LM. Psychosocial factors
associated with pain and sexual function in women with Vulvodynia: A systematic review.
Eur J Pain. 2021;25(1):39-50. doi:10.1002/ejp.1668

19. Siqueira-Campos VME, Da Luz RA, de Deus JM, Martinez EZ, Conde DM. Anxiety and
depression in women with and without chronic pelvic pain: prevalence and associated
factors. *J Pain Res*. 2019;12:1223-1233. doi:10.2147/JPR.S195317

20. Meltzer-Brody S, Leserman J, Zolnoun D, Steege J, Green E, Teich A. Trauma and
posttraumatic stress disorder in women with chronic pelvic pain. *Obstet Gynecol*.
2007;109(4):902-908. doi:10.1097/01.AOG.0000258296.35538.88

21. Fishbain DA, Pulikal A, Lewis JE, Gao J. Chronic Pain Types Differ in Their Reported
Prevalence of Post -Traumatic Stress Disorder (PTSD) and There Is Consistent Evidence
That Chronic Pain Is Associated with PTSD: An Evidence-Based Structured Systematic
Review. *Pain Med Malden Mass*. 2017;18(4):711-735. doi:10.1093/pm/pnw065

22. Bornstein J, Goldstein AT, Stockdale CK, et al. 2015 ISSVD, ISSWSH and IPPS Consensus
Terminology and Classification of Persistent Vulvar Pain and Vulvodynia. *Obstet Gynecol*.
2016;127(4):745-751. doi:10.1097/AOG.0000000000001359

23. Lamvu G, Carrillo J, Ouyang C, Rapkin A. Chronic Pelvic Pain in Women: A Review.
JAMA. 2021;325(23):2381-2391. doi:10.1001/JAMA.2021.2631

448   24.   Alimi Y, Iwanaga J, Oskouian RJ, Loukas M, Tubbs RS. The clinical anatomy of
449   dyspareunia: A review. *Clin Anat N Y N*. 2018;31(7):1013-1017. doi:10.1002/ca.23250

450   25.   Reisner SL, Pletta DR, Potter J, Deutsch MB. Initial Psychometric Evaluation of a Brief
451   Sexual Functioning Screening Tool for Transmasculine Adults: Transmasculine Sexual
452   Functioning Index. *Sex Med*. 2020;8(3):350-360. doi:10.1016/j.esxm.2020.05.006

453   26.   McCool-Myers M, Theurich M, Zuelke A, Knuettel H, Apfelbacher C. Predictors of female
454   sexual dysfunction: a systematic review and qualitative analysis through gender inequality
455   paradigms. *BMC Womens Health*. 2018;18:108. doi:10.1186/s12905-018-0602-4

456   27.   Eftekhar T, Sohrabvand F, Zabandan N, Shariat M, Haghollahi F, Ghahghaei-Nezamabadi
457   A. Sexual dysfunction in patients with polycystic ovary syndrome and its affected domains.
458   *Iran J Reprod Med*. 2014;12(8):539-546.

459   28.   O'Connor A, Gracie DJ, Hamlin PJ, Ford AC. Predictors of Dyspareunia Among Female
460   Patients With Inflammatory Bowel Disease. *Clin Gastroenterol Hepatol Off Clin Pract J
461   Am Gastroenterol Assoc*. 2020;18(4):1000-1001. doi:10.1016/j.cgh.2019.07.065

462   29.   Sakinci M, Ercan CM, Olgan S, Coksuer H, Karasahin KE, Kuru O. Comparative analysis
463   of copper intrauterine device impact on female sexual dysfunction subtypes. *Taiwan J
464   Obstet Gynecol*. 2016;55(1):30-34. doi:10.1016/j.tjog.2014.12.011

465   30.   Rosen NO, Dawson SJ, Binik YM, et al. Trajectories of Dyspareunia From Pregnancy to 24
466   Months Postpartum. *Obstet Gynecol*. 2022;139(3):391-399.
467   doi:10.1097/AOG.0000000000004662

468   31.   Nguyen HB, Chavez AM, Lipner E, et al. Gender-Affirming Hormone Use in Transgender
469   Individuals: Impact on Behavioral Health and Cognition. *Curr Psychiatry Rep*.
470   2018;20(12):110. doi:10.1007/s11920-018-0973-0

471   32.   Foster Skewis L, Bretherton I, Leemaqz SY, Zajac JD, Cheung AS. Short-Term Effects of
472   Gender-Affirming Hormone Therapy on Dysphoria and Quality of Life in Transgender
473   Individuals: A Prospective Controlled Study. *Front Endocrinol*. 2021;12:717766.
474   doi:10.3389/fendo.2021.717766

475   33.   Owen-Smith AA, Gerth J, Sineath RC, et al. Association Between Gender Confirmation
476   Treatments and Perceived Gender Congruence, Body Image Satisfaction, and Mental Health
477   in a Cohort of Transgender Individuals. *J Sex Med*. 2018;15(4):591-600.
478   doi:10.1016/j.jsxm.2018.01.017

479   34.   Xie Y, Shi L, Xiong X, Wu E, Veasley C, Dade C. Economic burden and quality of life of
480   vulvodynia in the United States. *Curr Med Res Opin*. 2012;28(4):601-608.
481   doi:10.1185/03007995.2012.666963

482   35.   Schneider MP, Vitonis AF, Fadayomi AB, Charlton BM, Missmer SA, DiVasta AD. Quality
483   of Life in Adolescent and Young Adult Women With Dyspareunia and Endometriosis. *J

484 *Adolesc Health Off Publ Soc Adolesc Med*. 2020;67(4):557-561.
485 doi:10.1016/j.jadohealth.2020.02.024

486 36. Obedin-Maliver J. Pelvic pain and persistent menses in transgender men. UCSF
487 Transgender Care & Treatment Guidelines. Published 2016. Accessed December 7, 2022.
488 https://transcare.ucsf.edu/guidelines/pain-transmen

489 37. Krause M, Wheeler TL, Snyder TE, Richter HE. Local Effects of Vaginally Administered
490 Estrogen Therapy: A Review. *J Pelvic Med Surg*. 2009;15(3):105.
491 doi:10.1097/SPV.0B013E3181AB4804

492 38. Krause M, Wheeler TL, Richter HE, Snyder TE. Systemic Effects of Vaginally
493 Administered Estrogen Therapy: A Review. *Female Pelvic Med Reconstr Surg*.
494 2010;16(3):188. doi:10.1097/SPV.0B013E3181D7E86E

495 39. Weber MA, Kleijn MH, Langendam M, Limpens J, Heineman MJ, Roovers JP. Local
496 Oestrogen for Pelvic Floor Disorders: A Systematic Review. *PloS One*. 2015;10(9).
497 doi:10.1371/JOURNAL.PONE.0136265

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500 **Tables and Figures**

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Table 1. Participant Characteristics

N	1219
Age, years (median, IQR)	27.1 (22.6-33.0)
Gender Identity[1] (n, %)	
Agender	166 (13.6)
Genderqueer	410 (33.6)
Man	262 (21.5)
Non-binary	661 (54.2)
Transgender man	561 (46.0)
Two-spirit	14 (1.1)
Questioning	39 (3.2)
Another gender identity	166 (13.6)
Sexual Orientation[1] (n, %)	
Asexual	262 (21.5)
Bisexual	406 (33.3)
Gay	227 (18.6)
Lesbian	85 (7.0)
Pansexual	245 (20.1)
Queer	793 (65.1)
Same-gender loving	60 (4.9)
Straight/heterosexual	49 (4.0)
Two-spirit	5 (0.4)
Questioning	58 (4.8)
Another sexual orientation	84 (6.9)
Race and Ethnicity[1] (n, %)	
American Indian or Alaskan Native	39 (3.2)
Asian	59 (4.8)
Black, African American or African	49 (4.0)
Hispanic, Latinx, or Spanish	82 (6.7)
Middle Eastern or North African	15 (1.2)
Native Hawaiian or Pacific Islander	5 (0.4)
White	1120 (91.9)
Another race/ethnicity	16 (1.3)
Missing	10 (0.8)

[1]Participants were able to select more than one response, therefore, proportions may sum to greater than 100%. 61.1% selected more than one gender identity, 53.2% selected more than one sexual orientation, and 12.0% selected more than one race and/or ethnicity.

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Table 2. Sexual Behavior and Medical History of Participants, Stratified by Never or Current Testosterone Use

	Overall	Never Testosterone Use	Current Testosterone Use	p-value
N	1219	516	602	
Sex in the past year (n, %)	750 (68.9)	291 (63.4)	400 (73.3)	**0.001**
Receptive oral sex[1]	598 (79.8)	218 (74.9)	333 (83.5)	**0.008**
Receptive vaginal/FGO sex[1]	400 (53.9)	174 (59.8)	193 (49.1)	**0.007**
Interest in sexual activity, past 30 days[2] (mean, sd)	46.6 (11.1)	44.2 (11.3)	49.0 (10.5)	**<0.001**
Any sexual activity, past 30 days[3] (n, %)	1091 (89.5)	437 (84.7)	565 (93.9)	**<0.001**
In a relationship (n, %)	701 (59.4)	291 (58.3)	355 (60.5)	0.509
Gender(s) of past year sex partners (n, %)				
Cisgender men	354 (29.0)	147 (28.5)	182 (30.2)	0.567
Cisgender women	286 (23.5)	107 (20.7)	160 (26.6)	**0.027**
Genderqueer, non-binary, or gender non-conforming people AFAB	183 (15.0)	75 (14.5)	92 (15.3)	0.791
Genderqueer, non-binary, or gender non-conforming people AMAB	125 (10.3)	52 (10.1)	60 (10.0)	>0.999
Transgender Men	112 (9.2)	25 (4.8)	81 (13.5)	**<0.001**
Transgender Women	103 (8.4)	37 (7.2)	57 (9.5)	0.203
Pelvic Health History (n, %)				
Pelvic inflammatory disease	27 (2.2)	13 (2.5)	11 (1.8)	0.556
Polycystic ovary syndrome	120 (9.8)	51 (9.9)	55 (9.1)	0.747
Uterine Fibroids	50 (4.1)	24 (4.7)	22 (3.7)	0.493
Inflammatory bowel disease[4]	24 (2.0)	11 (2.1)	12 (2.0)	>0.999
Irritable bowel syndrome	218 (17.9)	86 (16.7)	112 (18.6)	0.443
Bacterial STI diagnosis[5]	19 (1.6)	1 (0.2)	18 (3.0)	**0.001**
Ever pregnant	130 (10.7)	60 (11.6)	56 (9.3)	0.241
Hysterectomy	142 (11.6)	28 (5.4)	108 (17.9)	**<0.001**
Oophorectomy	108 (8.9)	17 (3.3)	87 (14.5)	**<0.001**
Current hormonal contraceptive use[6]	138 (11.3)	92 (17.8)	35 (5.8)	**<0.001**
Current hormonal intrauterine device use[7]	91 (8.4)	49 (10.0)	32 (6.5)	0.056
Current non-hormonal intrauterine device use[7]	29 (2.7)	11 (2.3)	16 (3.2)	0.454
Mental Health and Substance Use (n, %)				
History of sexual abuse	686 (78.0)	289 (76.3)	340 (78.3)	0.532
Ever experienced rape or sexual assault	437 (49.9)	196 (51.9)	206 (47.7)	0.266
Ever diagnosed with depression	988 (81.1)	399 (77.3)	503 (83.6)	**0.011**
PHQ-9 score for depression[8] (mean, sd)	10.2 (6.4)	10.7 (6.4)	9.6 (6.2)	**0.005**
Ever diagnosed with PTSD	484 (39.7)	198 (38.4)	238 (39.5)	0.737
PCL-6 score for PTSD[9] (mean, sd)	15.6 (5.3)	16.1 (5.2)	15.0 (5.2)	**0.001**
Current smoker	74 (6.1)	22 (4.3)	45 (7.5)	**0.033**
AUDIT score for alcohol use[10] (mean, sd)	3.6 (4.3)	3.2 (3.8)	3.9 (4.6)	**0.005**
Language Preferences (n, %)				

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Vagina	891 (73.1)	428 (82.9)	386 (64.1)	**<0.001**
Frontal genital opening	315 (25.8)	86 (16.7)	207 (34.4)	

AFAB, assigned female at birth; AMAB, assigned male at birth; AUDIT, alcohol use identification test; PHQ-9, 9-item patient health questionnaire; PTSD, post-traumatic stress disorder; sd, standard deviation

[1]Among participants who reported having sex in the past year

[2]T-scores of 50 represents the population average for the US population, and 10 points represents one standard deviation from the population average

[3]Including masturbation as well as sexual activity with a partner

[4]Including Crohn's disease, ulcerative colitis, etc

[5]Diagnosis with chlamydia, gonorrhea, or syphilis in the past year

[6]Including oral contraceptives, transdermal patch, vaginal rings, medroxyprogesterone acetate injections, and etonogestrel implants

[7]Excluding participants who had a hysterectomy

[8]The PHQ-9 measures depressive symptoms in the past two weeks, where scores of 10 or higher are suggestive of moderate to severe depression

[9]The PCL-6 measures PTSD symptoms in the past month, where scores of 17 or higher are associated with probable PTSD

[10]The AUDIT measures current alcohol consumptions behaviors, where scores of 15 or higher are suggestive of alcohol use disorder

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Table 3. Sexual Function Stratified by Never and Current Testosterone Use

	Overall	Never Testosterone Use	Current Testosterone Use	p-value
Participants who were NOT sexually active in the past 30 days, N	**128**	**79**	**37**	
Reasons for No Sexual Activity (n, %)				
Not interested	93 (72.7)	67 (84.8)	17 (45.9)	**<0.001**
No partners	43 (33.6)	26 (32.9)	14 (37.8)	0.756
Don't enjoy sexual activity	32 (25.0)	23 (29.1)	4 (10.8)	0.053
Partner(s) away, not interested in sex, or health condition	20 (15.6)	10 (12.7)	7 (18.9)	0.544
Difficulties with orgasm/climax	15 (11.7)	10 (12.7)	5 (13.5)	>0.999
Dryness or pain in or around my vaginal/FGO	11 (8.6)	4 (5.1)	5 (13.5)	0.225
Health condition	9 (7.0)	5 (6.3)	2 (5.4)	>0.999
Another reason	18 (14.1)	12 (15.2)	6 (16.2)	>0.999
Participants who WERE sexually active in the past 30 days, N	**1091**	**437**	**565**	
Lubrication				
Any difficulty achieving or maintaining lubrication (n, %)	670 (62.2)	289 (66.7)	326 (58.5)	**0.010**
T-score[1] (mean, sd)	50.7 (8.5)	50.2 (8.4)	51.2 (8.4)	**0.045**
Any genital pain/discomfort (n, %)	693 (64.6)	274 (63.3)	368 (66.5)	0.317
Pain/discomfort inside vagina/FGO				
Any pain or discomfort (n, %)	561 (52.2)	213 (49.2)	310 (56.0)	**0.040**
T-score[2] (mean, sd)	51.6 (9.1)	50.9 (8.9)	52.3 (9.2)	**0.013**
Pain/discomfort in the labia				
Any pain or discomfort (n, %)	263 (24.5)	118 (27.3)	126 (22.8)	0.124
T-score[2] (mean, sd)	51.2 (7.5)	51.6 (7.7)	51.0 (7.4)	0.168
Pain/discomfort in the clitoris				
Any pain or discomfort (n, %)	312 (29.1)	117 (27.1)	167 (30.2)	0.317
T-score[2] (mean, sd)	53.1 (8.3)	52.6 (7.7)	53.4 (8.5)	0.136
Orgasm				
Did not have an orgasm (n, %)	61 (5.6)	34 (7.8)	19 (3.4)	**0.003**
Any difficulty achieving orgasm (n, %)	559 (52.8)	216 (51.2)	289 (52.2)	0.811
T-score for achieving orgasm[1] (mean, sd)	49.2 (9.8)	48.4 (10.8)	50.1 (9.0)	**0.010**
T-score for orgasm pleasure[1] (mean, sd)	45.0 (8.4)	45.1 (8.3)	45.2 (8.3)	0.918
Satisfaction with sex life				
T-score[1] (mean, sd)	45.6 (7.7)	45.7 (7.9)	45.9 (7.6)	0.670

FGO, frontal genital opening

T-scores of 50 represents the population average for the US population, and 10 points represents one standard deviation from the population average

[1]High scores indicate more lubrication, ability to achieve orgasm, pleasure from orgasms, and satisfaction with sex life

[2]Higher scores indicate more pain/discomfort

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	Interest in sexual activity	Satistfaction with sex life	Lubrication	Pain/discomfort inside vagina/FGO	Pain/discomfort in the labia	Pain/discomfort in the clitoris	Orgasm ability	Orgasm pleasure
Interest in sexual activity	1.00							
Satistfaction with sex life	0.36	1.00						
Lubrication	0.27	0.21	1.00					
Pain/discomfort inside vagina/FGO	0.02	-0.07	-0.28	1.00				
Pain/discomfort in the labia	0.01	-0.10	-0.22	0.38	1.00			
Pain/discomfort in the clitoris	-0.04	-0.05	-0.16	0.26	0.31	1.00		
Orgasm ability	0.14	0.20	0.25	-0.16	-0.13	-0.17	1.00	
Orgasm pleasure	0.43	0.54	0.25	-0.11	-0.13	-0.17	0.42	1.00

Figure 1. Correlation between sexual function T-scores.
The correlation coefficient measures the strength and directional of the linear association between two variables. It ranges from -1 to 1, with zero indicating no correlation. Blue indicates that variables are positive correlated with one another, and orange indicates variables are negatively correlated. FGO, frontal genital opening.

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Table 4. Association between Current Testosterone Use and Sexual Function

| Outcomes[1] | Current Testosterone Use vs Never Testosterone Use | | | | | |
| | Unadjusted | | Minimally Adjusted[2] | | Fully Adjusted[3] | |
	β (95% CI)	p-value	β (95% CI)	p-value	β (95% CI)	p-value
Interest in sexual activity	**6.44 (5.10, 7.78)**	**<0.001**	**6.32 (4.91, 7.74)**	**<0.001**	**6.02 (4.35, 7.69)**	**<0.001**
Satisfaction with sex life	0.21 (-0.75, 1.17)	0.669	0.16 (-0.85, 1.16)	0.762	0.42 (-0.75, 1.58)	0.486
Lubrication	**1.08 (0.01, 2.15)**	**0.048**	0.61 (-0.52, 1.75)	0.289	1.15 (-0.14, 2.44)	0.081
Pain/discomfort inside vagina/FGO	**1.45 (0.31, 2.59)**	**0.013**	**1.80 (0.61, 3.00)**	**0.003**	**1.95 (0.53, 3.36)**	**0.007**
Pain/discomfort in the labia	-0.67 (-1.61, 0.28)	0.168	-0.38 (-1.38, 0.62)	0.455	-0.75 (-1.93, 0.44)	0.218
Pain/discomfort in the clitoris	0.78 (-0.25, 1.82)	0.139	**1.20 (0.10, 2.30)**	**0.033**	1.21 (-0.09, 2.51)	0.068
Orgasm ability	**1.62 (0.39, 2.86)**	**0.010**	**1.50 (0.19, 2.81)**	**0.025**	0.36 (-1.14, 1.86)	0.636
Orgasm pleasure	0.06 (-1.02, 1.13)	0.919	-0.04 (-1.15, 1.08)	0.951	0.46 (-0.81, 1.73)	0.475

CI, confidence interval; FGO, frontal genital opening

[1]T-scores of 50 represents the population average for the US population, and 10 points represents one standard deviation from the population average

[2]Adjusted for age, current depression symptoms (PHQ-9 scores), current post-traumatic stress symptoms (PCL-6 scores), alcohol use (AUDIT score), current smoker, hysterectomy, oophorectomy, and hormonal contraception use

[3]Adjusted for age, current depression symptoms (PHQ-9 scores), current post-traumatic stress symptoms (PCL-6 scores), alcohol use (AUDIT score), current smoker, hysterectomy, oophorectomy, intrauterine devices use, hormonal contraception use history of sexual assault, inflammatory bowel disease, irritable bowel syndrome, uterine fibroids, pelvic inflammatory disease, polycystic ovary syndrome, prior pregnancy, and intrauterine devices use

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Supplemental Materials

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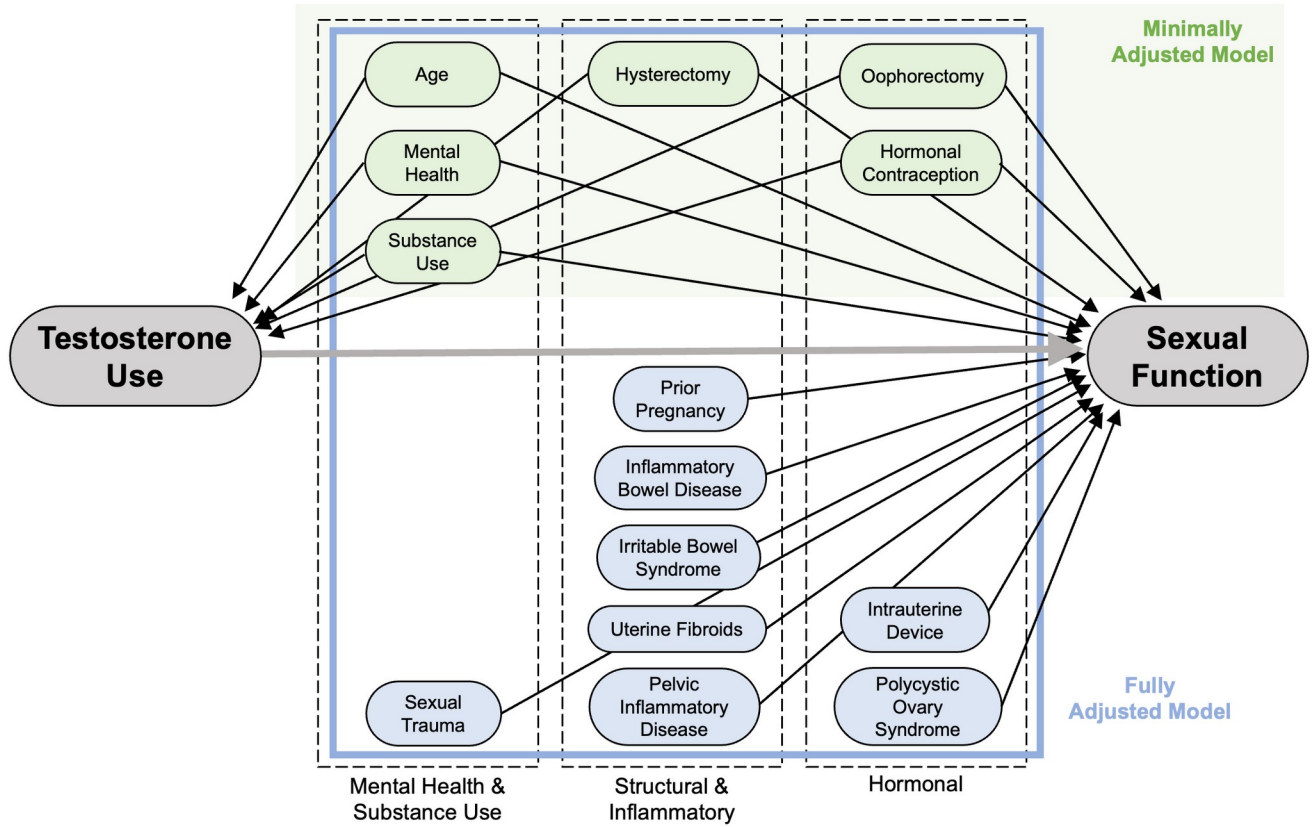
Supplemental Figure 1. Directed acyclic graph (DAG) illustrating covariates included in regression models

Supplemental Table 1. Participant Characteristics Stratified by Never, Current, and Former Testosterone Use

	Never Testosterone Use	Current Testosterone Use	p-value (Never v· Current)	Former Testosterone Use	p-value (Current v· Former)
N	516	602		76	
Age, years (mean, range)	28·3 (8·7)	29·9 (9·6)	**0·003**	30·7 (9·9)	0·505
Gender Identity[1] (n, %)					
Agender	99 (19·2)	50 (8·3)	**<0·001**	15 (19·7)	**0·003**
Genderqueer	234 (45·3)	135 (22·4)	**<0·001**	30 (39·5)	**0·002**
Man	21 (4·1)	231 (38·4)	**<0·001**	8 (10·5)	**<0·001**
Non-binary	379 (73·4)	209 (34·7)	**<0·001**	54 (71·1)	**<0·001**
Transgender man	67 (13·0)	458 (76·1)	**<0·001**	31 (40·8)	**<0·001**
Two-spirit	8 (1·6)	5 (0·8)	0·401	1 (1·3)	1·000
Questioning	27 (5·2)	10 (1·7)	**0·002**	1 (1·3)	1·000
Another gender identity	86 (16·7)	59 (9·8)	**0·001**	16 (21·1)	**0·006**
Sexual Orientation[1] (n, %)					
Asexual	145 (28·1)	95 (15·8)	**<0·001**	17 (22·4)	0·196
Bisexual	173 (33·5)	203 (33·7)	0·996	21 (27·6)	0·350
Gay	56 (10·9)	154 (25·6)	**<0·001**	16 (21·1)	0·473
Lesbian	59 (11·4)	14 (2·3)	**<0·001**	7 (9·2)	**0·004**
Pansexual	115 (22·3)	108 (17·9)	**0·082**	14 (18·4)	1·000
Queer	336 (65·1)	384 (63·8)	0·689	58 (76·3)	**0·042**
Same-gender loving	17 (3·3)	39 (6·5)	**0·022**	3 (3·9)	0·542
Straight/heterosexual	6 (1·2)	42 (7·0)	**<0·001**	1 (1·3)	0·097
Two-spirit	2 (0·4)	2 (0·3)	1·000	1 (1·3)	0·764
Questioning	18 (3·5)	34 (5·6)	0·117	4 (5·3)	1·000
Another sexual orientation	39 (7·6)	34 (5·6)	0·243	9 (11·8)	0·066
Race and Ethnicity[1] (n, %)					
American Indian or Alaskan Native	23 (4·5)	15 (2·5)	0·100	1 (1·3)	0·814
Asian	25 (4·8)	28 (4·7)	0·991	6 (7·9)	0·346
Black, African American or African	19 (3·7)	29 (4·8)	0·432	1 (1·3)	0·270
Hispanic, Latinx, or Spanish	36 (7·0)	39 (6·5)	0·832	6 (7·9)	0·824
Middle Eastern or North African	6 (1·2)	7 (1·2)	1·000	2 (2·6)	0·601
Native Hawaiian or Pacific Islander	1 (0·2)	3 (0·5)	0·728	0 (0·0)	1·000
White	480 (93·0)	551 (91·5)	0·413	72 (94·7)	0·458
Another race/ethnicity	8 (1·6)	7 (1·2)	0·764	1 (1·3)	1·000
Missing	0 (0·0)	2 (0·3)	0·548	0 (0·0)	1·000

[1]Participants were able to select more than one response, therefore, proportions may sum to greater than 1

Supplemental Table 2. Sexual Behavior and Medical History of Participants, Stratified by Current and Former Testosterone Use

	Current Testosterone Use	Former Testosterone Use	p-value
N	602	76	
Sex in the past year (n, %)	400 (73·3)	50 (75·8)	0·774
Interest in sexual activity, past 30 days[1] (mean, sd)	48·96 (10·54)	41·99 (9·93)	**<0·001**
Any sexual activity, past 30 days[2] (n, %)	565 (93·9)	64 (84·2)	**0·005**
In a relationship (n, %)	355 (60·5)	45 (61·6)	0·948
Gender(s) of past year sex partners (n, %)			
Cisgender men	182 (30·2)	18 (23·7)	0·296
Cisgender women	160 (26·6)	16 (21·1)	0·370
Genderqueer, non-binary, or gender non-conforming people AFAB	92 (15·3)	14 (18·4)	0·588
Genderqueer, non-binary, or gender non-conforming people AMAB	60 (10·0)	13 (17·1)	0·090
Transgender Men	81 (13·5)	6 (7·9)	0·237
Transgender Women	57 (9·5)	8 (10·5)	0·930
Pelvic Health History (n, %)			
Pelvic inflammatory disease	11 (1·8)	3 (3·9)	0·426
Polycystic ovary syndrome	55 (9·1)	9 (11·8)	0·581
Uterine Fibroids	22 (3·7)	4 (5·3)	0·711
Inflammatory bowel disease[3]	12 (2·0)	1 (1·3)	1·000
Irritable bowel syndrome	112 (18·6)	15 (19·7)	0·934
Bacterial STI diagnosis[4]	18 (3·0)	0 (0·0)	0·250
Ever pregnant	56 (100·0)	12 (100·0)	0·116
Hysterectomy	108 (100·0)	6 (100·0)	**0·041**
Oophorectomy	87 (14·5)	4 (5·3)	**0·042**
Current hormonal contraceptive use[5]	35 (5·8)	8 (10·5)	0·181
Current hormonal intrauterine device use[6]	32 (6·5)	8 (11·4)	0·207
Current non-hormonal intrauterine device use[6]	16 (3·2)	2 (2·9)	1·000
Mental Health and Substance Use (n, %)			
History of sexual abuse	340 (78·3)	46 (88·5)	0·127
Ever experienced rape or sexual assault	206 (47·7)	29 (55·8)	0·340
Ever diagnosed with depression	503 (83·6)	70 (92·1)	0·076
PHQ-9 score for depression[7] (mean, sd)	9·6 (6·2)	11·08 (7·12)	0·053
Ever diagnosed with PTSD	238 (39·5)	42 (55·3)	**0·012**
PCL-6 score for PTSD[8] (mean, sd)	15·1 (5·2)	16·8 (5·8)	**0·007**
Current smoker	45 (7·5)	6 (7·9)	1·000
AUDIT score for alcohol use[9] (mean, sd)	3·9 (4·6)	4·0 (4·7)	0·886
Language Preferences (n, %)			
Vagina	386 (64·1)	54 (71·1)	0·309
Front genital opening	207 (34·4)	20 (26·3)	

AFAB, assigned female at birth; AMAB, assigned male at birth; AUDIT, alcohol use identification test; PHQ-9, 9-item patient health questionnaire; PTSD, post-traumatic stress disorder

[1]T-scores of 50 represents the population average for the US population, and 10 points represents one standard deviation from the population average

[2]Including masturbation as well as sexual activity with a partner

[3]Including Crohn's disease, ulcerative colitis, etc

[4]Diagnosis with chlamydia, gonorrhea, or syphilis in the past year

[5]Including oral contraceptives, transdermal patch, vaginal rings, medroxyprogesterone acetate injections, and etonogestrel implants

[6]Excluding participants who had a hysterectomy

[7]The PHQ-9 measures depressive symptoms in the past two weeks, where scores of 10 or higher are suggestive of moderate to severe depression

[8]The PCL-6 measures PTSD symptoms in the past month, where scores of 17 or higher are associated with probable PTSD·

[9]The AUDIT measures current alcohol consumptions behaviors, where scores of 15 or higher are suggestive of alcohol use disorder

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Supplemental Table 3. Sexual Function Stratified by Current and Former Testosterone Use

	Current Testosterone Use	Former Testosterone Use	p-value
Participants who were NOT sexually active in the past 30 days, N	**37**	**12**	
Reasons for No Sexual Activity (n, %)			
Not interested	17 (45·9)	9 (75·0)	0·156
Dryness or pain in or around my vaginal/FGO	5 (13·5)	2 (16·7)	1·000
Difficulties with orgasm/climax	5 (13·5)	0 (0·0)	0·427
Don't enjoy sexual activity	4 (10·8)	5 (41·7)	**0·049**
Health condition	2 (5·4)	2 (16·7)	0·528
No partners	14 (37·8)	3 (25·0)	0·643
Partner(s) away, not interested, or health condition	7 (18·9)	3 (25·0)	0·966
Another reason	6 (16·2)	0 (0·0)	0·326
Participants who WERE sexually active in the past 30 days, N	**565**	**64**	
Lubrication			
Any difficulty achieving or maintaining lubrication (n, %)	326 (58·5)	41 (66·1)	0·308
T-score[1] (mean, sd)	51·2 (8·4)	48·6 (10·2)	**0·020**
Pain/discomfort inside vagina/FGO			
Any pain or discomfort (n, %)	310 (56·0)	27 (43·5)	0·084
T-score[2] (mean, sd)	52·3 (9·2)	50·7 (9·6)	0·182
Pain/discomfort in the labia			
Any pain or discomfort (n, %)	126 (22·8)	15 (24·2)	0·928
T-score[2] (mean, sd)	51·0 (7·4)	51·4 (7·9)	0·664
Pain/discomfort in the clitoris			
Any pain or discomfort (n, %)	167 (30·2)	21 (34·4)	0·594
T-score[2] (mean, sd)	53·4 (8·5)	54·3 (9·3)	0·419
Orgasm			
Did not have an orgasm (n, %)	19 (3·4)	6 (9·4)	**0·047**
Any difficulty achieving orgasm (n, %)	289 (52·2)	41 (67·2)	**0·036**
T-score for achieving orgasm[1] (mean, sd)	50·1 (9·0)	46·1 (10·7)	**0·001**
T-score for orgasm pleasure[1] (mean, sd)	45·2 (8·3)	42·3 (9·0)	**0·013**
Satisfaction with sex life			
T-score[1] (mean, sd)	45·9 (7·6)	42·9 (7·0)	**0·003**

FGO, frontal genital opening

T-scores of 50 represents the population average for the US population, and 10 point represents one standard deviation from the population average

[1]High scores indicate more lubrication, ability to achieve orgasm, pleasure from orgasms, and satisfaction with sex life

[2]Higher scores indicate more pain/discomfort

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Supplemental Table 4. Association between Duration of Testosterone Use (Years) and Sexual Function

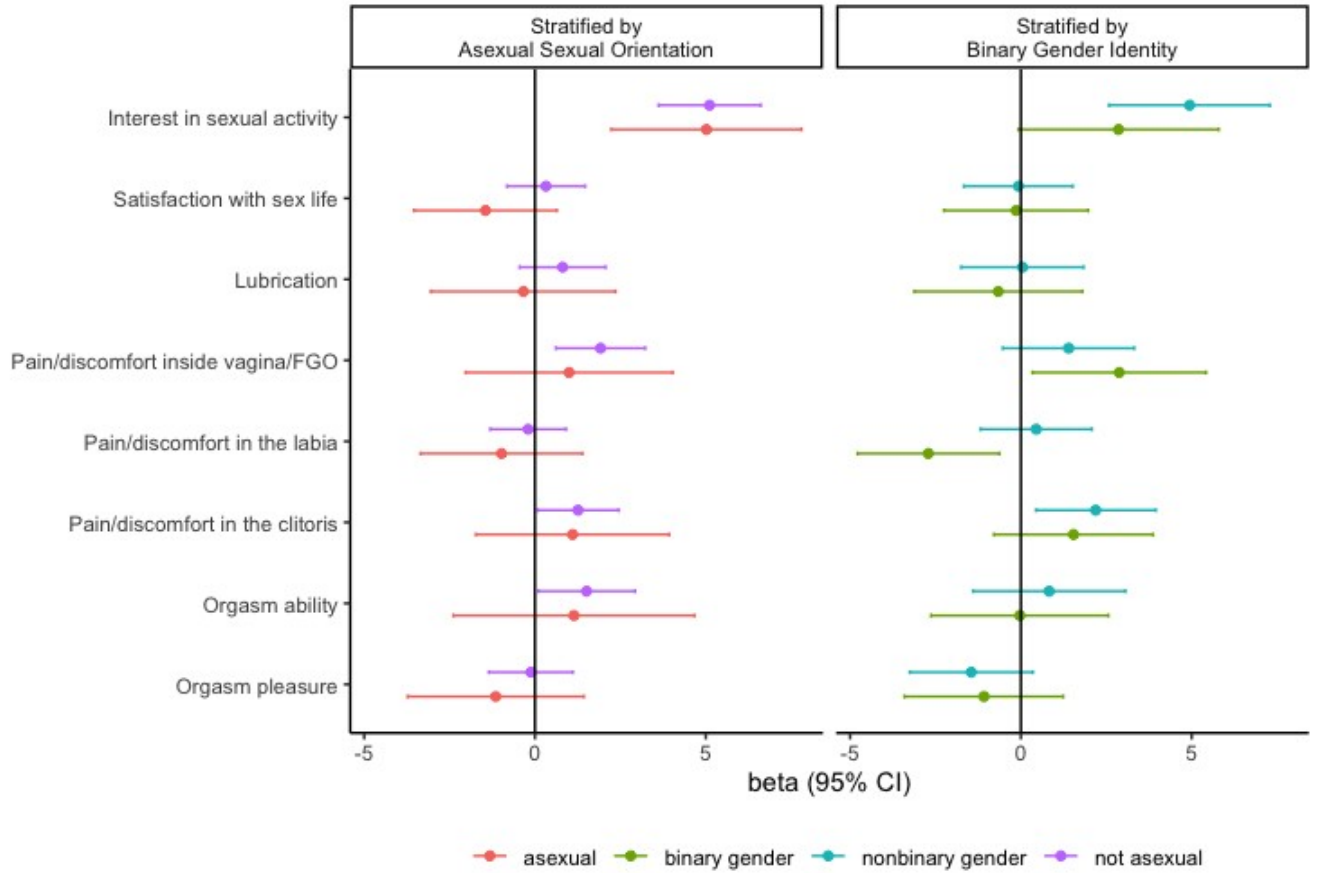| Outcomes[1]	Unadjusted		Minimally Adjusted[2]		Fully Adjusted[3]	
	beta (95% CI)	p-value	beta (95% CI)	p-value	beta (95% CI)	p-value
Interest in sexual activity	**0·38 (0·20, 0·56)**	**<0·001**	**0·39 (0·18, 0·59)**	**<0·001**	**0·35 (0·11, 0·60)**	**0·005**
Satisfaction with sex life	-0·01 (-0·13, 0·12)	0·917	0·00 (-0·14, 0·14)	0·969	0·01 (-0·16, 0·17)	0·949
Lubrication	0·10 (-0·04, 0·23)	0·165	0·11 (-0·04, 0·27)	0·161	0·17 (-0·01, 0·35)	0·062
Pain/discomfort inside vagina/FGO	0·01 (-0·14, 0·15)	0·945	0·06 (-0·11, 0·23)	0·500	0·05 (-0·14, 0·25)	0·599
Pain/discomfort in the labia	-0·10 (-0·22, 0·02)	0·099	-0·07 (-0·21, 0·07)	0·325	-0·08 (-0·24, 0·09)	0·367
Pain/discomfort in the clitoris	-0·17 (-0·3, -0·04)	0·012	-0·05 (-0·2, 0·11)	0·557	-0·06 (-0·24, 0·12)	0·521
Orgasm ability	0·20 (0·04, 0·35)	0·012	0·16 (-0·02, 0·34)	0·078	0·03 (-0·17, 0·24)	0·753
Orgasm pleasure	0·06 (-0·07, 0·2)	0·335	0·03 (-0·12, 0·18)	0·655	0·08 (-0·09, 0·25)	0·358

CI, confidence interval; FGO, frontal genital opening

[1]T-scores of 50 represents the population average for the US population, and 10 points represents one standard deviation from the population average

[2]Adjusted for age, current depression symptoms (PHQ-9 scores), current post-traumatic stress symptoms (PCL-6 scores), alcohol use (AUDIT score), current smoker, hysterectomy, oophorectomy, and hormonal contraception use

[3]Adjusted for age, current depression symptoms (PHQ-9 scores), current post-traumatic stress symptoms (PCL-6 scores), alcohol use (AUDIT score), current smoker, hysterectomy, oophorectomy, intrauterine devices use, hormonal contraception use, history of sexual assault, inflammatory bowel disease, irritable bowel syndrome, uterine fibroids, pelvic inflammatory disease, polycystic ovary syndrome, prior pregnancy, and intrauterine devices use

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Supplemental Figure 2. Minimally Adjusted Regression Results Stratified by Binary *versus* Nonbinary Gender Identity. Adjusted for age, current depression symptoms (PHQ-9 scores), current post-traumatic stress symptoms (PCL-6 scores), alcohol use (AUDIT score), current smoker, hysterectomy, oophorectomy, and hormonal contraception use.