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ORIGINAL PAPER

Social Perceptions of Masculinity and Sexual Esteem Are Impacted by Viagra Use, Testosterone, and Sexual Performance

Wayne R. Hawley[1] · Bryn A. Cancilla[1] · Julia L. Barnes[1] · Gregory D. Morrow[1]

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Abstract

Sexual behaviors play a role in the social construction of masculinity. Moreover, this stereotype has been capitalized upon by pharmaceutical companies, as well as those that sell products not approved by the U.S. Food and Drug Administration, for purposes of marketing sexual medicines. Stereotypical notions of masculinity, however, also emphasize the importance of self-reliance, which may cause some to look unfavorably upon the use of sexual medicine. Consistent with this notion, a male target was viewed as more masculine when his female partner consistently reached orgasm, unless he had no history of erectile dysfunction (ED), but was taking Viagra anyway (Experiment 1; $N = 522$). In addition, when his partner consistently reached orgasm, ratings of his sexual esteem were also lower if he used Viagra than if he did not, but only if he had no history of ED. In Experiment 2 ($N = 711$), although there was no effect of a male target's use of testosterone, social perception of his masculinity and sexual esteem increased as his "natural" levels of testosterone increased. In addition, exploratory analysis revealed that if the male target had low (but not normal or high) "natural" levels of testosterone, ratings of his masculinity were higher if his female partner consistently had an orgasm, which suggests that female orgasm served to "rescue" masculinity. Because expectations about drugs drive their use, it is important to address preconceived notions about the use of sexual medicines for purposes of enhancing masculinity and sexual esteem, as the social perception of their use is much more complex.

Keywords Testosterone · Erectile dysfunction · Viagra · Orgasm · Masculinity

Introduction

Stereotypes about those who use recreational drugs, which include gendered beliefs about drug use, are ubiquitous (George et al., 1995; Lang et al., 1992; Ragsdale & Elliott, 2022; Barbosa de Oliveira Silva et al., 2018; Staub et al., 2022). Deeply held stereotypes about gender ultimately influence expectations about the types of substances men and women are expected to use, which in turn, impacts substance use. Although capitalizing on gender stereotypes that link sexual behavior to masculinity appears to be a central strategy for the marketing of sexual medicines (Åsberg & Johnson, 2009), there is a paucity of research examining the social perception of those who take sexual medicines.

✉ Wayne R. Hawley
whawley@pennwest.edu

[1] Department of Psychology, Counseling, and Art Therapy, Pennsylvania Western University-Edinboro, 210 East Normal Street, Edinboro, PA 16444, USA

As noted elsewhere, the development of medical technologies like Viagra (sildenafil citrate) have transformed expectations of aging in men (Gross & Blundo, 2005). More specifically, prior to the 1970's, impotence (problematic erectile function) was viewed as psychological in nature, as was its treatment. This perspective began to change in the early 1990's and the term impotence was replaced by erectile dysfunction (ED). The approval of Viagra by the FDA in 1998 (Goldstein et al., 2019) led to the conceptualization of ED as a biological rather than psychological problem, subject to medical rather than psychological treatment, at least in the United States and other Euro-American cultures (Wentzell, 2017).

For many men, as well as their partners, medications to treat ED have beneficial effects on sexual functioning, as well as other psychological outcomes (Cayan et al., 2004; Giuliano et al., 2001). Others have posited, however, that medications for ED are tools to combat the "loss of" sexuality/masculinity brought on by aging, a concept wrought with ageism that is driven by societal expectations of masculinity and the idea of aging well (Gross & Blundo, 2005). Conceivably,

similar expectations about sexual behavior being mandatory for masculinity play a role in the increased prescription sales (Baillargeon et al., 2013; Bandari et al., 2017) and popularity of testosterone replacement therapy (TRT) (Muncey et al., 2022) despite the health risks of TRT outlined by the FDA (Garnick, 2015), and the therapy's inconsistent (Basaria et al., 2015; Brock et al., 2016; Onyeji & Clavijo, 2022) and often clinically unmeaningful effects (Onyeji & Clavijo, 2022). Because expectations about drug use can motivate their use (Leventhal & Schmitz, 2006; Peters et al., 1999), the aim of the current set of studies was to examine if the use of popular sexual medicines (i.e., Viagra and testosterone) and underlying biological functioning (i.e., ED and "natural" testosterone levels) impact social perceptions of masculinity and sexual esteem of those who take the drugs, and if those perceptions are subsequently modified by aspects of sexual performance (i.e., female partner orgasm).

Poor erectile function is associated with lower perceptions of sexual confidence (San Martín et al., 2012), and ED has been consistently shown to be associated with reductions in perceptions of masculinity (Chambers et al., 2017; Matic & McCabe, 2007; Richards et al., 2018). However, reductions in self-perceived masculinity that arise as a function of ED may be attenuated by pharmacotherapeutic treatments for ED, such as Viagra. Accordingly, aging men report using, or considering using, ED medications to bolster their sense of masculinity (Hurd Clarke & Lefkowich, 2018). Consistent with these results, some theorists argue that medications such as Viagra exist to counteract the threat to masculinity that results from ED (Loe, 2001). However, the use of drugs to enhance erectile function is not restricted to older men or those with ED. Younger men indicate they recreationally use ED medications such as Viagra to perform better sexually (Bechara et al., 2010; Korkes et al., 2008) and increase their sexual confidence (Bechara et al., 2010). The recreational use of such medications in younger men is further driven by anxiety related to their ability to perform sexually, which for some men, appears to be due to their belief that their female partners expect prolonged sex (Both, 2016). Therefore, the use of medications to enhance erectile function appears to be driven by beliefs that they will lead to enhanced sexual performance and heightened feelings of masculinity.

One factor that defines stereotypical notions of masculinity, however, is that men should be self-reliant (Mahalik et al., 2003). Therefore, when it comes to sexual activity, "real men" should not need medication (e.g., Viagra) to achieve an erection or to "perform" sexually. Accordingly, a significant portion of men with ED discontinue use of ED medications partly out of concern that use of ED medications modify their sense of masculinity (Carvalheira et al., 2012). Conceivably, the use of such medications may be considered as "cheating" to achieve masculinity by not being self-reliant, much in the same way that the use of performance enhancing drugs in athletics (Becker & Scheufele, 2016; Chantal et al., 2009, 2013; Feinberg, 2009; Raalte et al., 1993; Schwerin & Corcoran, 1992) and academics (Aikins, 2011) are also perceived negatively. Support for this notion comes from in-depth interviews with young men who take non-prescription Viagra (Both, 2016). When revealing personal feelings about using Viagra with his girlfriend, who "found it (sex with him) so amazing," one man noted, "But I was tricking her. This was not my own strength, it was artificial" (p. 500). Therefore, on one hand, use of drugs like Viagra by those with ED may heighten perceptions of their masculinity and sexual esteem. On the other hand, use of Viagra by those without ED may attenuate perceptions of their masculinity and sexual esteem.

Another traditional notion of masculinity is to be a "playboy," which is largely characterized by a desire to have sexual relations with multiple partners (Levant et al., 2020). However, it is not just the quantity of sexual interactions that dictate feelings of masculinity; the outcomes of those interactions are also an important factor. For example, imagining orgasm by a female partner increased male participants' perceptions of their own masculinity and sexual esteem (Chadwick & van Anders, 2017). In addition, an inability to satisfy one's sexual partner is associated with lower perceptions of men's sexual confidence (San Martín et al., 2012). Similarly, orgasm is often perceived as something men "give" to their partners and the ability of men to do so is seen as an indication of their sexual competency (Gilfoyle et al., 1992). Correspondingly, women report sometimes faking orgasm (Harris et al., 2019; Muehlenhard & Shippee, 2010) to avoid hurting their partner's feelings and/or to enhance their male partner's ego (Opperman et al., 2014), as well as to protect, what they perceive to be, their partner's fragile sense of masculinity (Jordan et al., 2022). Collectively, these findings suggest that for men, as well as those whose masculinity is not "on the line" (i.e., women), female orgasm is important to perceptions of men's sexual adequacy, and subsequently provides proof of their masculinity (Chadwick & van Anders, 2017).

Thus, Experiment 1 was designed to examine the role that Viagra use, ED, and partner orgasm have on perceptions of a hypothetical male. Specifically, it was predicted that female partner orgasm would increase, and ED would decrease, perceptions of the male target's masculinity and sexual esteem. However, it was expected that the effect of female orgasm would not occur when the male target was not being self-reliant, which would be when he did not have a history of ED, but was still taking Viagra.

Experiment 1

Method

Participants

Participants were obtained from Prolific, and were required to be fluent in English, citizens of the United States, and not have participated in any other studies from our laboratory, including the survey from Experiment 2. Previous research indicates that men are more likely than women to report that sexual confidence is contingent upon erectile function and the ability to satisfy their partners (San Martín et al., 2012), suggesting that gender may play an important role in the effects of sexual outcomes and sexual functioning on social perceptions of sexual esteem, and perhaps masculinity. However, because there would not have been enough participants to form groups large enough to perform meaningful statistical analyses, only participants who indicated they identified as cisgender men or women were invited to respond. There were, however, no main or interactive effects of gender, and therefore gender was removed as a variable. In Experiment 1, 606 participants submitted responses (see Fig. 1), which is within the range of the number of participants employed in earlier studies from which the design and methodology of the current study was adapted (Chadwick & van Anders, 2017; Savoury et al., 2022).

After removing ineligible participants (see procedures section and Fig. 1) the final sample consisted of 522 participants, 54% identifying as male and 46% identifying as female, with an average age of 32.2 years (range: 18–76 years). The majority (68.4%) identified as White or Caucasian (0.2% = American Indian or Alaskan Native; 11.7% = Asian; 3.8% = Black or African American; 7.5% = Hispanic/Latinx; 7.7% = Multiracial; 0.4% = Other; 2 participants did not indicate an ethnicity).

Materials

The survey for Experiment 1 was administered through LimeSurvey. Data were analyzed using the Statistical Package Software for the Social Sciences (SPSS; International Business Machines Corporation, Armonk, NY).

Vignettes and Reading Checks

Participants read one of eight different vignettes that were adapted from a previous study that investigated the impact of a hypothetical female partner achieving orgasm during sex on male participants' perceptions of their own masculinity and sexuality (Chadwick & van Anders, 2017). In the current set of experiments, however, participants were asked to evaluate the male target in the vignette, rather than imagining themselves in the sexual situation. The vignettes described a male target who had sex three times with a woman whom he liked very much, who either always had an orgasm when the pair had sex or who never had an orgasm during their three sexual encounters. In addition, the male target either had, or did not have, a history of ED, and he either was, or was not, taking Viagra. Three reading checks were used to confirm participants were attending to the information in the vignette they were randomly assigned (i.e. "Did the female in the hypothetical scenario have an orgasm with the male in the scenario every time they had sex?; Did the male in the hypothetical scenario have a history of erectile dysfunction?; Did the male in the hypothetical scenario take Viagra?).

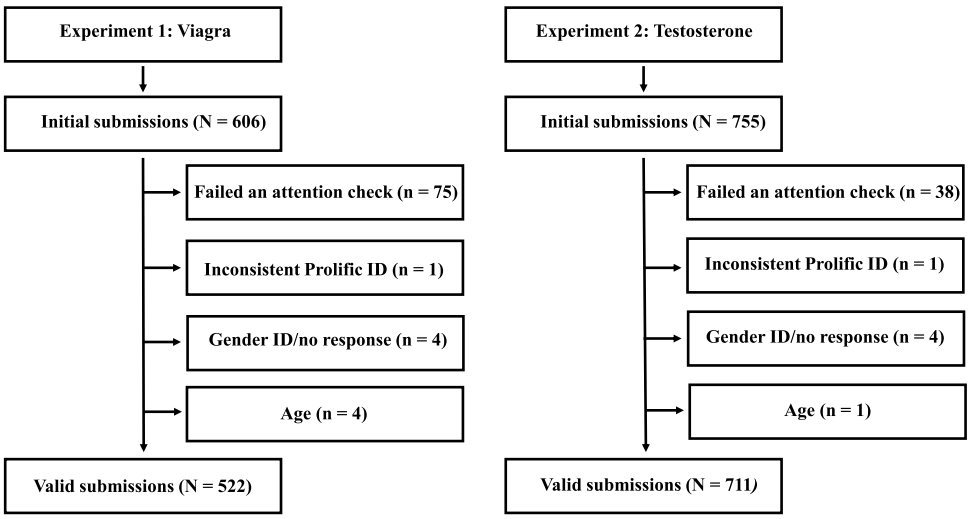

Fig. 1 The number of participants recruited from Prolific that were excluded for Experiment 1 (Viagara) and Experiment 2 (Testosterone)

Perceptions of Masculinity and Sexual Esteem/Depression

A modified version of the 36-item Affect and Arousal Scale (Heiman & Rowland, 1983) was used to measure participants' perceptions of the male target's masculinity. Participants indicated on a scale of 1 (*very slightly or not at all*) to 5 (*extremely*) the extent to which they believed the male target embodied each of the 36 characteristics after reading the following instructions: "This scale consists of a number of words that describe different feelings and emotions. Read each item and indicate to what extent you feel the male character in the hypothetical scenario that you just read embodies the following characteristics." However, in accordance with previous research (Chadwick & van Anders, 2017; Savoury et al., 2022), only one item (i.e., Masculine) was used to assess perceptions of the male target's masculinity.

A modified version of the 30-item Sexuality Scale (Snell & Papini, 1989) was used to measure participants' perceptions of the male target's sexuality. Participants indicated on a scale of 1 (*strongly disagree*) to 5 (*strongly agree*) the extent to which they agreed with each of the statements regarding the male character after reading the following instructions: "Using the scale, please indicate the extent to which you agree or disagree, with each of the following statements regarding the male character in the hypothetical situation that you just read." The scale features three separate 10-item subscales that characterize perceptions of the male target's sexual esteem, sexual depression, and sexual preoccupation, which is the degree to which individuals experience sexual cognitions at the expense of other thoughts and behaviors (Snell & Papini, 1989). Following previously published methodologies that used vignettes to examine self-perceptions of masculinity and sexual esteem as a result of female partner orgasm, the sexual preoccupation subscale was not analyzed further (Chadwick & van Anders, 2017; Savoury et al., 2022).

Design

Experiment 1 was a 2 (Female partner orgasm: always, never) × 2 (Male's history of ED: history of ED, no history of ED) × 2 (Male's Viagra use: takes Viagra, does not take Viagra) factorial design.

Procedure

After indicating consent, participants were randomly assigned one of the eight different vignettes by LimeSurvey's randomization program. Participants were first prompted to indicate their Prolific identification number and those who did not indicate a valid number were excluded from the analysis ($n = 1$; see Fig. 1). After reading their randomly assigned vignette, participants were asked to complete the three reading checks and then completed the modified versions of the Affect and Arousal Scale and Sexuality Scale, which were presented in a randomized order. Finally, prior to being routed back to Prolific's website for compensation, participants were prompted to provide basic information on demographics, as well as information that pertained to their (or their partner's) experiences with ED and use of medications to treat ED (e.g., Viagra). As indicated in Fig. 1, four participants were removed for either indicating a gender other than male or female or failing to indicate their gender. Four participants were removed for either not indicating their age ($n = 2$), that they were under 18 ($n = 1$), or over 200 ($n = 1$; see Fig. 1). Five participants did not indicate whether they or their partner ever experienced significant and/or ongoing ED. Of those who responded, 12.6% indicated that ED has been experienced by either themselves or their partner, and 6.9% of participants indicated that they or their partner had taken Viagra or similar drugs to improve sexual functioning.

Data Analysis

Higher scores on the Sexual Esteem subscale indicated higher perceptions of sexual esteem (Snell & Papini, 1989). However, as was done previously (Chadwick & van Anders, 2017), scores on the depression subscale were reverse scored relative to the original scoring procedure (Snell & Papini, 1989), such that high scores on the depression subscale indicated lower perceptions of sexual depression. Each of the 10-item subscales exhibited a high degree of reliability (see Table 1). According to guidelines for determining the strength of effect sizes (Cohen, 1969; Ferguson, 2009), there was a strong positive correlation between scores on the sexual esteem and sexual depression subscales, $r(N = 505) = 0.85$, $p < 0.001$. Therefore, the 20 items from the two subscales were combined into one variable, as was done previously (Chadwick & van Anders, 2017; Savoury et al., 2022).

Table 1 Cronbach's coefficient alphas for the three subscales (n = 10 items/subscale) of the modified version of the Sexuality Scale (Snell & Papini, 1989)

	Experiment 1 (Viagra)		Experiment 2 (Testosterone)	
	Cronbach's alpha	*N*	Cronbach's alpha	*N*
Sexual Preoccupation	0.80	510	0.83	695
Sexual Esteem	0.92	514	0.92	696
Sexual Depression	0.91	511	0.90	697
Sexual Esteem/Depression	0.95	505	0.95	688

Because the sexual esteem and sexual depression scores were significantly correlated in both experiments, a new variable (sexual esteem/depression) that featured all 10 items from each subscale was created by summing the 20 values together

Higher scores on the new subscale (sexual esteem/depression), which exhibited a high degree of reliability among the items (see Table 1), indicated high perceived sexual esteem and low perceived sexual depression (20 = *low sexual esteem/high sexual depression*, 100 = *high sexual esteem/low sexual depression*).

Analysis of normality for the two dependent variables, based on each factor, revealed that there were minor departures from normality in some instances (in both experiments). Although analysis of variance (ANOVA) is quite robust to non-normality with large sample sizes (Glass et al., 1972; Schmider et al., 2010), which was the case for the current study, data were first analyzed by conducting an ordinal regression when the dependent variable was perceptions of the male target's masculinity. When perception of the male target's sexual esteem/depression was the dependent variable, data were first analyzed by performing aligned rank transforms using ARTool software (Wobbrock et al., 2011) to conduct non-parametric factorial ANOVAs (Oliver-Rodríguez & Wang, 2015). Then, to maintain consistency between studies that have used vignettes to examine perceptions of masculinity based on female partner orgasm, and facilitate interpretation of results, data were reanalyzed by conducting factorial ANOVAs (Chadwick & van Anders, 2017; Savoury et al., 2022). The results from the factorial ANOVAs were consistent with the results from the ordinal regressions and non-parametric factorial ANOVAs, and therefore the results from the factorial ANOVAs were reported. Consistent with the suggestions for interpreting partial eta squared (η_p^2) effect sizes (Richardson, 2011) that were originally outlined by Cohen (1969), and used in previous studies (Rivera et al., 2022), small, medium, and large effects were indicated by η_p^2 values of 0.01, 0.06, and 0.14, respectively. Tukey's HSD was conducted to analyze all single-factor post-hoc tests. In accordance with previous studies (Vandello et al., 2008), when a 3-way interaction was detected, the file was split according to expected predictions (i.e., history of ED) and separate 2-way factorial ANOVAs were conducted using the other two independent variables (i.e., female partner orgasm x male's Viagra use). All multifactor contrasts were conducted by using the syntax function in SPSS to perform Fisher's Least Significant Difference post-hoc tests. Gender of the participant was removed from the analysis because it did not independently impact perceptions of either masculinity or sexual esteem/depression, nor did it modify the predicted highest order interactive effects. All significant main effects and highest order interactive effects are reported.

Results

Figure 2 (top panel) depicts the mean masculine ratings of the male target. Both female partner orgasm [$F(1, 512) = 70.70$, $p < 0.001$, $\eta_p^2 = 0.12$] and, although the effect size was small, the male target's history of ED [$F(1, 512) = 4.02$, $p = 0.046$, $\eta_p^2 = 0.01$], independently impacted perceptions of his masculinity. Specifically, the male target was perceived as more masculine if his partner always had an orgasm during sex with him or if he did not have a history of ED. As expected, there was also a significant interaction between female partner orgasm, the male target's history of ED, and his use of Viagra [$F(1, 512) = 5.47$, $p = 0.02$, $\eta_p^2 = 0.01$]. Analysis of simple effects revealed that the male target was rated as more masculine if his partner had an orgasm during sex with him relative to if she did not (all $p < 0.001$), but only when he did not have ED and was not taking Viagra, or if he had ED and either was or was not taking Viagra.

The mean sexual esteem/depression ratings participants gave the male target are illustrated in Fig. 2 (bottom panel). Female partner orgasm [$F(1, 497) = 446.34$, $p < 0.001$, $\eta_p^2 = 0.47$], history of ED [$F(1, 497) = 50.33$, $p < 0.001$, $\eta_p^2 = 0.09$], and Viagra use [$F(1, 497) = 10.86$, $p = 0.001$, $\eta_p^2 = 0.02$] all independently impacted perceptions of the male's sexual esteem/depression, such that he was rated as higher in sexual esteem (and lower in sexual depression) if his female partner always had an orgasm, if he did not have a history of ED, or if he was not taking Viagra. There was also a significant interaction between female partner orgasm, the male target's history of ED, and use of Viagra [$F(1, 497) = 23.77$, $p < 0.001$, $\eta_p^2 = 0.06$]. Analysis of simple effects revealed that if the male target had no history of ED, and his partner always had an orgasm, he was rated as lower in sexual esteem (and higher in sexual depression) if he was taking Viagra than if he was not ($p < 0.001$). However, when the male target had a history of ED, and his partner always had an orgasm, he was rated as higher in sexual esteem (and lower in sexual depression) if he was taking Viagra than if he was not ($p = 0.005$).

Discussion

Consistent with the results of Chadwick and van Anders (2017), female partner orgasm heightened perceptions of male masculinity and sexual esteem. However, perceptions of male masculinity and sexual esteem were reduced if the male had a history of ED. Importantly, the effects of Viagra on both perceptions of the male target's masculinity and sexual esteem were contingent upon whether he had a history of ED and whether his female partner had orgasms during sex with him. Consistent with our prediction, the only time

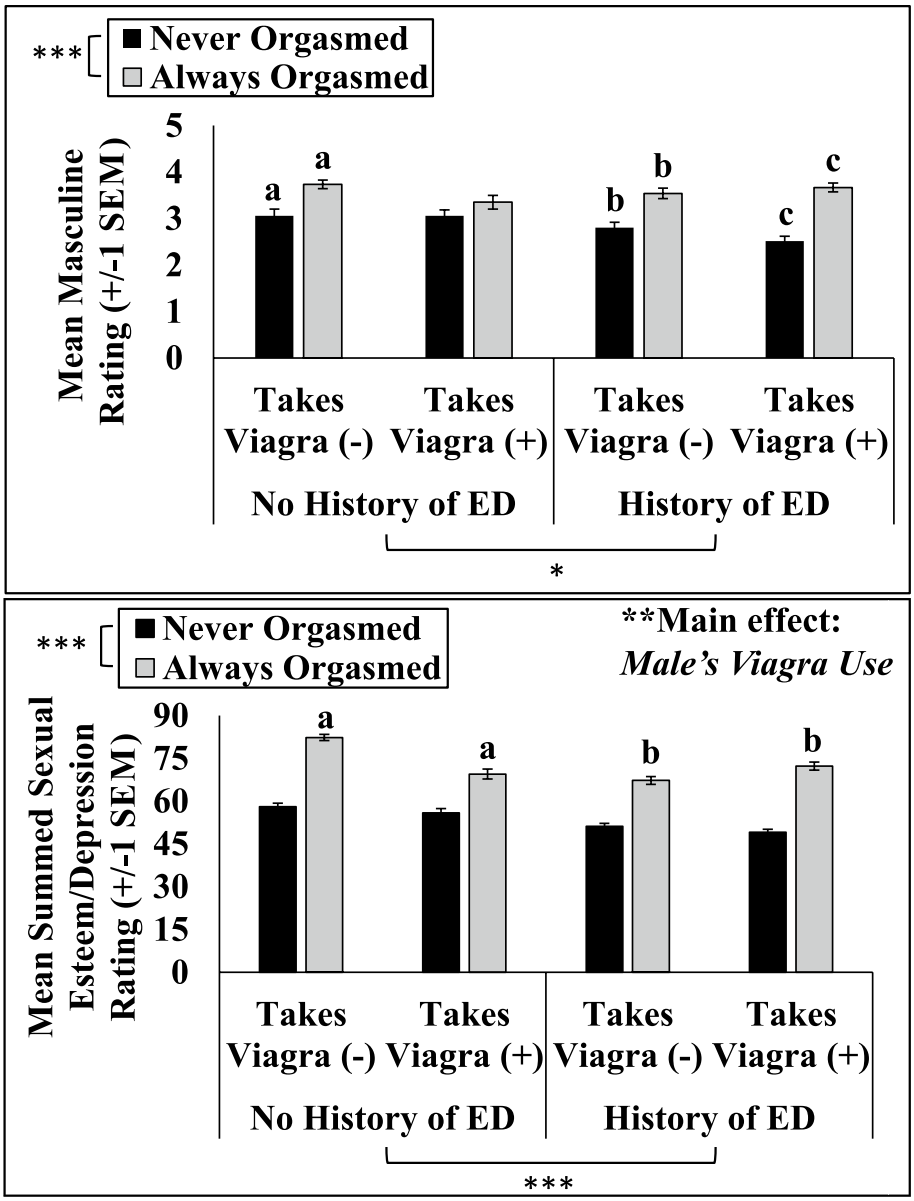

Fig. 2 It was only when the male target did not have a history of erectile dysfunction (ED), but was still taking Viagra, that his female partner having an orgasm during sex him failed to significantly enhance perceptions of his masculinity (top panel; shared letters $p = < 0.001$ for simple effects). If the male's female partner had a history of orgasm during sex with him, his use of Viagra caused him to be perceived as lower in sexual esteem if he had no history of ED, but higher in sexual esteem if he had a history of ED (bottom panel; shared letters $= p < 0.05$ for simple effects). There were also lower order main effects of the male target's history of ED and female partner orgasm on both perceptions of his masculinity (top panel) and sexual esteem (bottom panel), as well as a main effect of male's Viagra use on perceptions of his sexual esteem (bottom panel), but not his masculinity (top panel); Main effects: $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$; Takes Viagra (−) = male does not take Viagra; Takes Viagra (+) = male does take Viagra. SEM = standard error of the mean

there was no effect of female partner orgasm on heightening masculinity ratings was when the male target had no history of ED, but still used Viagra. With regard to his sexual esteem, the male target's use of Viagra reduced perceptions of his sexual esteem when he had no history of ED and his partner always had orgasms during sex with him. The male target's use of Viagra, however, increased perceptions of his sexual esteem if he had a history of ED and his partner always had an orgasm during sex with him.

The results of Experiment 1 provide support for the notion 1) that social perceptions of male masculinity (and sexual esteem) are impacted by aspects of sexual performance (i.e., female partner orgasm and ED and 2) that use of Viagra, when not justified by an underlying biological condition (i.e., ED), abrogates the impact of female orgasm on social perceptions of male masculinity. Therefore, as hypothesized, when not medically justified, use of drugs to enhance sexual performance may violate the self-reliance rule of masculinity (Mahalik et al., 2003). The results from Experiment 1 have implications for understanding how ED and the use of medications to treat ED interact with aspects of sexual behavior to shape social perceptions of masculinity and sexual esteem.

The results of Experiment 1 also suggest that in addition to the use of certain sexual medicines (i.e., Viagra), biological factors (i.e., ED) are important in the construction of masculinity. Therefore, the purpose of Experiment 2 was to extend these findings and examine if the use of testosterone, which is a hormone the lay public often believes to be a powerful driver of sexual behavior in men (Jordan-Young & Karkazis, 2019), also undermines the perceived masculinity-enhancing

effects of female orgasm when use of the steroid is not associated with an underlying biological condition (i.e., lower "natural" levels of testosterone).

Experiment 2

Equating testosterone with masculinity has undoubtedly played a role in marketing of the hormone over the internet (Balasubramanian et al., 2019; Bandari et al., 2017), as was once done by pharmaceutical companies directly to consumers (Bandari et al., 2017; Layton et al., 2017), to treat what the general public has been told is the "disease state" of low testosterone (Mintzes, 2018). Correspondingly, prescriptions sales of testosterone (Baillargeon et al., 2013; Bandari et al., 2017), as well as an overall interest in TRT (Muncey et al., 2022) and supplements not approved by the FDA that claim to "boost natural levels" of testosterone (Balasubramanian et al., 2019), have increased exponentially in recent decades. Given the safety concerns raised by the FDA that TRT may lead to cardiovascular health issues (Garnick, 2015), the medical misuse and illicit abuse of the steroid hormone by those who are not hypogonadal (Bandari et al., 2017; Corona et al., 2020; Handelsman, 2006) are of concern. Such concern is only heightened by the fact that use of TRT has recently been championed to a certain extent by celebrities, including Joe Rogan (Rogan, 2018), who hosted the most popular podcast on Spotify in both 2021 and 2022. Therefore, beliefs about testosterone and masculinity (and sexual esteem) may be particularly important to identify, as beliefs about drugs, which includes steroids like testosterone, have been shown to motivate drug use (Leventhal & Schmitz, 2006; Peters et al., 1999). Moreover, such beliefs about testosterone, sex, and masculinity may also influence prescribing practices of the steroid by physicians, many of whom have been increasingly targeted by pharmaceutical companies after the FDA issued a black box warning for TRT (Togun et al., 2022).

Testosterone heightens self-perceptions of masculinity for those who take the steroid (Schwerin & Corcoran, 1996). However, when it comes to the social image of those who use testosterone-like substances, men who used anabolic–androgenic steroids (AAS) in the competitive domains of athletic performance and body building are rated more negatively (i.e., as cheaters) (Becker & Scheufele, 2016; Chantal et al., 2009, 2013; Feinberg, 2009; Raalte et al., 1993; Schwerin & Corcoran, 1992), perhaps because they are not exhibiting self-reliance. Violation of the self-reliance masculine norm (Mahalik et al., 2003) by taking a drug (i.e., steroid) that artificially boosts levels of what many believe to be the "male hormone" to enhance performance, may explain why use of AAS is stigmatized to a greater extent than marijuana use (Griffiths et al., 2016) and cocaine use (Yu et al., 2015) by undergraduates and healthcare workers, respectively. Whether use of the steroid within the context of sexual "performance" impacts the social image of those who use it remains to be determined. As was the case for ED justifying Viagra use in Experiment 1, use of the steroid testosterone when justified by what the public has been told is the disease state of "low T" (Mintzes, 2018) may warrant its use.

Thus, in Experiment 2, it was predicted that a hypothetical male would be perceived as more masculine and higher in sexual esteem if his new female partner always had an orgasm during sex with him, an effect that was also expected to occur as his "natural" levels of testosterone increased. However, if the male target was taking testosterone, the effect of his female partner having orgasms during sex with him on heightening perceptions of his masculinity and sexual esteem would only emerge if he had low "natural" levels of testosterone, which is when taking exogenous (i.e., originating from outside an organism) testosterone would be justified (i.e., not cheating) by an underlying condition.

Experiment 2

Method

Participants

Participants were obtained from Prolific and were required to be fluent in English, citizens of the United States, and not have participated in any other studies from our laboratory, including Experiment 1. Consistent with the rationale outlined above for Experiment 1, only participants who identified as cisgender were invited to respond to the survey for Experiment 2. However, there were again no main or interactive effects of gender, so gender was removed from analysis. A total of 755 participants submitted responses for Experiment 2 (see Fig. 1).

For the final sample ($N = 711$; see Fig. 1 and procedures section), participants were 30.9 years of age on average (*range*: 18–78), 50.2% identified as male, 49.8% identified as female, and 66.7% identified as White or Caucasian (0.3% = American Indian or Alaskan Native; 10.4% = Asian; 9.1% = Black or African American; 5.9% = Hispanic/Latinx; 6.5% = Multiracial; 0.4% = Other; 5 participants did not indicate an ethnicity).

Materials

All aspects of Experiment 2, including the informed consent form, were administered through LimeSurvey. Data

were analyzed using SPSS (International Business Machines Corporation).

Vignettes and Reading Checks

Participants read one of 12 different vignettes adapted from the same study Experiment 1 was adapted from (Chadwick & van Anders, 2017). Participants were asked to evaluate the male target in a vignette who had sex three times with a woman whom he liked very much and either always had an orgasm when the pair had sex, or she never did. In the vignette used in Experiment 2, however, the male target either had "naturally" low, normal, or high levels of testosterone for someone his age, and he either had been taking the steroid testosterone, or he had never taken the steroid. Three reading checks were used to confirm participants were attending to the vignette they were assigned (i.e., "In the hypothetical scenario that you just read, did the female have an orgasm with the male in the scenario every time they had sex?; In the hypothetical scenario that you just read, did the male have naturally low, normal, or high levels of testosterone?; In the hypothetical scenario that you just read, has the male been taking the steroid testosterone?").

Perceptions of Masculinity and Sexual Esteem/Depression

The same materials used in Experiment 1 were used to measure perceptions of the male target's masculinity, sexual esteem, and sexual depression.

Design

Experiment 2 was a 2 (Female partner orgasm: always, never) × 3 (Male's "natural" testosterone levels: low, normal, high) × 2 (Male's testosterone use: takes testosterone, never taken testosterone) factorial design.

Procedure

Participants in Experiment 2 were randomly assigned to one of the 12 different vignettes by LimeSurvey's randomization program. All procedures, including removal of participants who failed to indicate a valid Prolific identification number ($n = 1$; see Fig. 1), were the same as Experiment 1. As indicated in Fig. 1, four participants were also removed for either indicating a gender other than male or female or failing to indicate their gender. One participant was removed for indicating they were under 18.

Rather than prompting participants to respond to their (or their partner's) experiences with ED and use of medications to treat ED (e.g., Viagra), participants were asked about their testosterone level and use of the steroid. Very few participants (2.3%) indicated they had ever taken testosterone or other steroids, and of those participants, improving sexual performance was most often cited (37.5%) as the primary reason for taking testosterone or other steroids. Of those participants who indicated they had their testosterone level measured (7.5%), 56.6% of them indicated their level was within the normal range, 12.5% indicated their level was low, and 21.4% indicated their level was high (4 participants did not know the results).

Data Analysis

With few exceptions, data analysis was consistent with Experiment 1. Scoring of the items on sexual esteem and sexual depression subscales again indicated a high degree of reliability (see Table 1) and there was a strong (Cohen, 1969; Ferguson, 2009) positive correlation between scores on the subscales, $r(N = 688) = 0.87$, $p < 0.001$. Therefore, the 20 items from the two subscales were again combined into one variable as was done previously (Chadwick & van Anders, 2017; Savoury et al., 2022).

Factorial ANOVAs were conducted to examine both dependent variables based on the rationale outlined in Experiment 1. However, because of the large sample size (and increased power) there was one instance where the assumption of homogeneity of variances was violated, which is indicated in the Results section. Therefore, to reduce the risk of reporting a Type 1 error, only factors with a medium to large effect (Cohen, 1969) were reported for that analysis. All post-hoc tests, including analysis of simple effects, were conducted in accordance with Experiment 1. All significant main effects and highest order interactive effects are reported.

Results

Figure 3 (top panel) depicts the mean masculine ratings of the male target as a function of his "natural" testosterone levels, his use of the steroid testosterone, and his female partner's orgasm history during sex with him. There were main effects of both female partner orgasm [$F(1, 699) = 63.84$, $p < 0.001$, $\eta_p^2 = 0.08$] and "natural" testosterone levels of the male target [$F(2, 699) = 29.16$, $p < 0.001$, $\eta_p^2 = 0.08$]. Masculinity ratings of the male target were higher when his female partner had an orgasm during sex with him compared to if she never had an orgasm during sex with him. Post-hoc tests revealed that the male target was rated as more masculine if his "natural" testosterone levels were normal compared to if they were low ($p < 0.001$), and if his "natural" testosterone levels were high compared to if they were either normal ($p < 0.001$) or low ($p < 0.001$). In addition, although the effect size was small, there was an interaction between female partner orgasm and the "natural" testosterone levels of the male target [$F(2, 699) = 3.76$, $p = 0.024$, $\eta_p^2 = 0.02$]. Analysis of simple effects

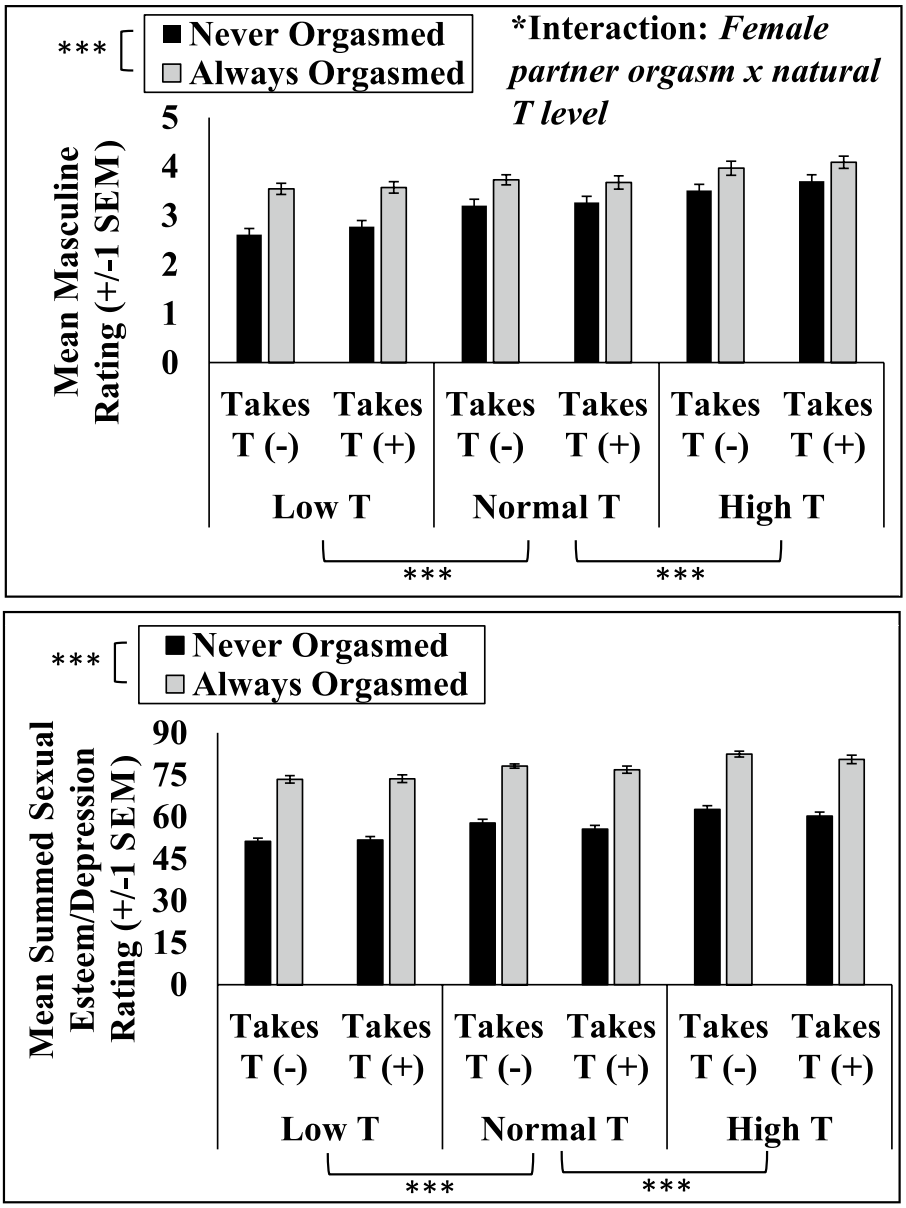

Fig. 3 When the male target's female partner did not have an orgasm during sex with him, he was perceived as significantly more masculine as his natural (i.e., endogenous) level of testosterone (T) increased (i.e., Low < Normal < High; all $p < 0.01$; top panel). However, when she did have an orgasm during sex with him, there was no difference perceptions of his masculinity when his natural level of T was low relative to when it normal. There were also lower order main effects of female partner orgasm (***$p < 0.001$) and the male's natural testosterone level (***$p < 0.001$ = post hoc comparisons) on perceptions of the male's masculinity (top panel) and sexual esteem (bottom panel). T (−) = male does not take testosterone; Takes T (+) = male does take testosterone. SEM = standard error of the mean

revealed that when the male target's female partner never had an orgasm during sex with him, he was rated as more masculine as his "natural" levels of testosterone increased (low < normal: $p < 0.001$; normal < high: $p = 0.003$). However, when the male target's female partner always had an orgasm during sex with him, he was only rated as more masculine when his "natural" testosterone levels were high relative to when they were either normal ($p = 0.013$) or low ($p < 0.001$). There were no main or interactive effects of taking the steroid testosterone on masculinity ratings.

Participants' mean sexual esteem/depression ratings of the male target are illustrated in Fig. 3 (bottom panel). Levene's test revealed that the variances among the conditions were not equal ($p = 0.021$). Therefore, to reduce the risk of reporting a Type 1 error, only effects with medium to large effect sizes are reported. There was both a main effect of female partner orgasm [$F(2, 676) = 811.78$, $p < 0.001$, $\eta_p^2 = 0.55$] and "natural" testosterone levels of the male target [$F(2, 699) = 48.66$, $p < 0.001$, $\eta_p^2 = 0.13$] on sexual esteem/depression ratings of the male target. The male target was rated as higher in sexual esteem (and lower in sexual depression) if his female partner always had an orgasm during sex with him relative to if she never did. As was the case for masculine ratings, post-hoc tests revealed that the male target was rated higher in sexual esteem (and lower in sexual depression) if his "natural" testosterone levels were normal compared to if they were low ($p < 0.001$), and if his "natural" testosterone levels were high compared to if they were either normal ($p < 0.001$) or low ($p < 0.001$). There were no main or interactive effects

of taking the steroid testosterone on the male target's sexual esteem/depression.

Discussion

Consistent with the results of previous studies that examined self-perceptions of masculinity in men as a result of their female partner having an orgasm during sex with them (Chadwick & van Anders, 2017; Savoury et al., 2022), in Experiment 2, female partner orgasm again heightened social perceptions of the male target's masculinity and sexual esteem. There was no support for the prediction that social perceptions of masculinity and sexual esteem of the male target would be lower if he was not being sexually self-reliant. Specifically, it was expected that the male target would be viewed as less masculine and lower in sexual esteem if he was taking testosterone, as opposed to if he was not, when he had normal or high endogenous (i.e., originating from within; "natural") levels of the hormone, and his female partner had an orgasm during sex with him. Perceptions of the male target's masculinity and sexual esteem also increased as his endogenous level of testosterone increased. Thus, levels of endogenous testosterone in men are perceived to be a direct indicator of their masculinity and sexual esteem, which suggests that certain biological factors play a powerful role in the social construction of masculinity and sexuality. However, female partner orgasm attenuated the reduced perceptions of masculinity that resulted from the male target having a low endogenous level of testosterone. Accordingly, there were no differences in masculinity ratings of the male if he had a low endogenous level of testosterone compared to if he had a normal endogenous level of testosterone, but this occurred only if his partner always had orgasms when they had sex. Thus, acting as a "playboy" served to partially abrogate the effects of low endogenous levels of testosterone on social perceptions of masculinity.

General Discussion

Biological Factors and Perceptions of Masculinity: Role of Female Partner Orgasm

Although the effect was small ($\eta_p^2 = 0.01$), in Experiment 1, the male target was rated lower in masculinity if he had a history of ED, which is consistent with research that suggests some men with ED report concerns over feeling less masculine (Chambers et al., 2017; Fergus et al., 2002). Erectile dysfunction, therefore, is perceived as a hurdle to achieving masculinity by being a "playboy" (Mahalik et al., 2003), likely because it violates one of the socially proscribed rules of masculinity (Potts, 2000), that men must always be ready for sex.

In Experiment 2, there was a medium effect size of the male's "natural" (i.e., endogenous) testosterone levels on perceptions of his masculinity ($\eta_p^2 = 0.08$). Thus, certain biological factors in men may be more important to social perceptions of masculinity than others (i.e., ED). Accordingly, perceptions of the male target's masculinity increased as his "natural" levels of testosterone increased, which is consistent with previous research that indicated social perceptions of masculinity are heightened for men who actually have higher levels of endogenous testosterone (Penton-Voak & Chen, 2004; Roney et al., 2006) or possess a variety of other physical characteristics (Avery & Liss, 1996; Dixson & Brooks, 2013; Neave & Shields, 2008) linked to heightened testosterone and androgen signaling (Evans et al., 2008; Kasperk et al., 1997), although this was not always the case (Neave et al., 2003). The results of the current study extend these findings, as they suggest that the mere mention of a man's endogenous testosterone level impacts social perceptions of his masculinity.

Much like the simple effect in Experiment 1 of female orgasm heightening perceptions of the male target's masculinity if he had a history of ED (regardless of Viagra use), in Experiment 2, female partner orgasm served to "rescue" social perceptions of masculinity lost to a low level of testosterone. Although it is important to keep in mind that an *a prior* prediction was not explicitly stated, the results of Experiment 2 revealed that when the male target's female partner always had an orgasm during sex with him there was no difference in his masculinity rating between when he had low levels of "natural" testosterone compared to when he had normal "natural" levels of the hormone. However, if his female partner never had an orgasm during sex with him, the male target was rated as progressively higher in masculinity as his "natural" levels of testosterone increased. These findings align well with the results from an earlier study that found some men report a greater desire to engage in sexual behavior after vasectomy, which is perhaps an effort to abrogate the self-perceived reduction in their masculinity (Williams et al., 1980). Thus, in accordance with the notion that masculinity is a precarious state (Vandello et al., 2008), and that engaging in sexual behavior (i.e., being a playboy) is a method by which men demonstrate their masculinity (Cheryan et al., 2015), the results of both experiments indicated that when faced with an underlying biological threat, ED or low testosterone, female orgasm provided proof of male masculinity.

Sexual Medicines and Perceptions of Masculinity: Role of Female Partner Orgasm

The effect of history of ED was qualified by an interaction between the male's use of Viagra and female orgasm, such that the only time the effect of female orgasm on masculinity ratings of the male target did not emerge was when he did not have a history of ED, but was still taking Viagra. In accordance with this finding, a small fraction of men report discontinuing use of ED medications out of concern that it alters masculinity (Carvalheira et al., 2012), which may be due to underlying beliefs that masculinity is contingent upon self-reliance (Mahalik et al., 2003). Consistent with this notion, participants also form negative evaluations of men who use performance enhancing drugs in athletics (Becker & Scheufele, 2016; Raalte et al., 1993; Schwerin & Corcoran, 1992), which is another domain men use to establish proof of their masculinity (DiMuccio et al., 2017). As the results of the current study suggest, it is likely the case that the use of drugs such as Viagra to "fix broken masculinity" (Loe, 2001) is justified by ED, whereas use of Viagra in the absence of ED may be perceived as breaking the self-reliance rule of masculinity, and thus "cheating" to "achieve" masculinity through sexual performance.

Given the results of Experiment 1, it was expected that if the male target was taking testosterone, his masculinity ratings would be affected by his female partner's orgasm history with him only when his "natural" testosterone levels were low. However, the predicted 3-way interaction between taking the steroid testosterone, "natural" testosterone levels, and female partner orgasm did not emerge. Thus, when considered within the context of Experiment 1, use of Viagra, but not testosterone, when not justified by an underlying condition (i.e., ED or low testosterone, respectively), attenuates social perceptions of masculinity of those who take the substances. It is also important to note that although there were no effects of the male target taking testosterone on social perception of his masculinity in the current study, in a study done with a convenience sample of male weightlifters, those who reported that they take AAS, like testosterone, reported that they feel more masculine when compared to the self-perceptions of non-AAS users (Schwerin & Corcoran, 1996). Thus, because there was no evidence that taking testosterone enhanced the perceived masculinity of the male target in the current study, self-perceptions of masculinity among those who take the steroid differs from the beliefs that others have about those who take the steroid.

Sexual Medicines, Testosterone, and Perceptions of Sexual Esteem: Role of Female Partner Orgasm

In both Experiment 1 ($\eta_p^2 = 0.47$) and Experiment 2 ($\eta_p^2 = 0.55$), there was a large effect of female orgasm on enhancing social perceptions of the male target's sexual esteem. In addition, the male's history of ED determined whether his use of Viagra heightened or attenuated social perceptions of his masculinity if his female partner had an orgasm during sex with him. As hypothesized in Experiment 1, when the male's female partner always had an orgasm when they had sex, but he did not have a history of ED, his use of Viagra lowered perceptions of his sexual esteem. The lower perceptions of sexual esteem may have been due to the target not exhibiting self-reliance, and thus "cheating" to "achieve" female orgasm. Conversely, when the male's female partner always had an orgasm when they had sex, and he did have a history of ED, his use of Viagra resulted in higher perceptions of his sexual esteem. This effect may have been due to participants making a comparison to what his sexual esteem would be like if he were unable to "perform" had he not taken the medication. Therefore, Viagra use, when medically justified, may enhance the effect of a sexual "achievement" (i.e., female orgasm) on social perceptions of sexual esteem.

However, unlike the effect of Viagra use and female partner orgasm in Experiment 1, the effect of the male target's "natural" testosterone levels in Experiment 2 on perceptions of his sexual esteem was not modified by female partner orgasm or his testosterone use. Thus, social perceptions of both masculinity and sexual esteem are modulated by an individual's use of Viagra, but not testosterone. That there was no effect of testosterone use on social perceptions of sexual esteem is consistent with a previous study that showed the social perception of testosterone use is that it does not increase sexual arousal or sexual vitality (Schwerin & Corcoran, 1992).

Although there was no effect of his use of exogenous testosterone on social perception of his sexual esteem, the male target was perceived as higher in sexual esteem (and lower in sexual depression) as his "natural" testosterone levels increased. This novel finding suggests that the endogenous level of the hormone, but not use of the steroid, serves as a powerful driver of social perceptions of sexual esteem. Despite the popular belief that more testosterone is better, in healthy men, previous research suggests there is no relationship between endogenous testosterone levels and sexual desire (Monti et al., 1977; van Anders, 2012), sexual activity (Monti et al., 1977), or self-reported sexual arousal as a result of thinking about sex (Goldey & van Anders, 2012). The actual effects of testosterone on aspects of sexual behavior are important to highlight given the potential adverse effects of the steroid (Garnick, 2015), that expectations about the effects of testosterone-like substances motivate their use (Peters et al., 1999), and the growing online marketing of supplements, not regulated by the FDA, that claim to "boost natural levels" of testosterone (Balasubramanian et al., 2019), in part to enhance sexual performance. Furthermore, the use

of such substances that claim to "naturally" boost levels of testosterone may be stigmatized by healthcare workers in the same way that use of AAS are (Yu et al., 2015), which ultimately undermines healthcare needs.

Strengths and Limitations

To our knowledge, this is the first study to experimentally examine the impact of the use of sexual medicines (i.e., Viagra and testosterone), as well as underlying biological factors (i.e., ED and "natural" testosterone levels), on social perceptions of masculinity and sexual esteem. It is also important to point out that there were no gender differences in either experiment. Therefore, in terms of generalizability of the results, women appear to be as cognizant as men of the sexual outcomes that impact masculinity (and sexual esteem) in men, which may explain why some women report faking orgasms to keep their male partners happy (Roberts et al., 1995), avoid upsetting them (Muehlenhard & Shippee, 2010), and protect their sense of masculinity (Jordan et al., 2022). In addition to their beliefs about the role of female orgasm, males and females hold similar beliefs about how the use of sexual medicines, such as Viagra and testosterone, as well associated underlying biological conditions shape masculinity and sexuality. That there were no gender differences between men and women is perhaps not surprising, given that lower levels of sexual satisfaction in women correspond with the self-reported severity of their partner's experience of ED, and that sexual satisfaction in women is heightened when their partners with ED use drugs like Viagra (Fisher et al., 2005). Thus, the shared concern among men and women regarding sexual functioning in men (Fisher et al., 2009) may explain why men and women appear to hold similar attitudes about how ED and testosterone, as well as the use of sexual medicines, impacts masculinity and sexual esteem.

The online convenience sample was rather homogeneous, such that the majority of participants in both experiments indicated their ethnicity as White or Caucasian. In addition, description of the sample was limited to only three sociodemographic variables (i.e., age, race, and gender), as well as a limited number of health variables that characterized participant's (or their partner's) experience with ED or endogenous testosterone levels, as well as their use of ED medications or testosterone. Notably, use of sexual medications is associated with a wide range of risky behaviors, both sexual and otherwise (e.g., more frequent sexual activity, unsafe sex, recent sexually transmitted infection, and a greater likelihood of smoking and alcohol use; Mitchell et al., 2015). Therefore, it may be especially important to gain an understanding of the role that perceptions of masculinity play in the use of sexual medicines for those predisposed to engaging in sexual behaviors that jeopardize well-being. Further, it is important to highlight the unique role that use of Viagra may play in the social construction of masculinity across cultures. For instance, Wentzell (2013) interviewed 254 male Mexican patients seeking treatment for prostate problems and other chronic diseases (e.g., type 2 diabetes, heart disease). Roughly 70% of those individuals reported some degree of ED. However, less than 10% of the men had ever used medication to treat ED, and of those who used the medications, the majority discontinued its use. Instead, ED was typically viewed as a natural part of the aging process, and a condition for which medical treatment was generally seen as unnecessary, which seems to stand in sharp contrast to the attitudes about ED and its treatment often held by men in the United States and United Kingdom (Perelman et al., 2005).

Consistent with previous studies that examined participants' self-perceptions of their masculinity and sexual esteem (Chadwick & van Anders, 2017; Savoury et al., 2022), social perceptions of the male target in the current study were assessed by analyzing one item (i.e., Masculine) from the Affect and Arousal Scale, as well as the sexual esteem and sexual depression subscales of the Sexuality Scale (Snell & Papini, 1989). Although the Sexuality Scale is reliable and valid (Snell et al., 1992), and other items of the AAS scale likely served to mask the true intention of the scale, future studies may consider the use of measures that characterize a variety of dimensions of masculinity. This may be especially important to consider when examining cross cultural constructions of masculinity.

Conclusions and Future Directions

The novel results from the current set of experiments suggests that female partner orgasm significantly influences social perceptions of male masculinity and sexual esteem, and that these perceptions are modified by a man's Viagra use, his erectile function, and his endogenous (i.e., "natural") level of testosterone. These findings have important implications for understanding cultural constructions of masculinity and sexuality, which seem to underlie the marketing and sales of sexual medicines (Åsberg & Johnson, 2009). Notably, ED is more common in men who report precarious beliefs about their masculinity (Walther et al., 2023). Further, hypermasculine advertisements were more likely to be viewed as masculinity enhancing for men who experienced an experimental threat to their masculinity and strongly believed it is important to win, have power over women, and present themselves as heterosexual (Parent & Cooper, 2020). However, other research suggests that greater endorsement of feminine identification is associated with a greater likelihood of the use of prescription ED medication (Silva & Fetner, 2023). Thus, future studies may find it useful to examine how aspects of gender (e.g., norms) interact with threats to masculinity, such as ED or low testosterone, to impact perceptions of sexual medicines, as well as the desire to use the medications, which

may ultimately serve to shape prevention efforts aimed at curbing their misuse.

Author's Contribution All authors made substantial contribution to work and have approved the version to be published.

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Data Availability Made available upon request.

Code Availability SPSS was used to code the data.

Declarations

Conflict of interest Not applicable.

Ethical Approval All procedures in Experiment 1 were approved by the Institutional Review Board associated with the authors' university (protocol #PSYC2020-017 and #PSYC2020-016).

Informed Consent All participants consented to the experimental procedures.

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