



Relationship Status Rather than Sociosexuality or Sexual Orientation Predicts Male Sexual Functioning

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Received: 19 May 2023 / Revised: 4 September 2024 / Accepted: 5 September 2024 / Published online: 4 November 2024
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Abstract

Male sexual functioning is a prerequisite for conception and consequently for reproduction and is thus a crucial mechanism from an evolutionary and social perspective. Previous studies reported better sexual functioning in coupled compared to single individuals. However, it is not clear whether sexual functioning increases or decreases with a short-term casual sexual strategy, which is another possibility, along with a long-term strategy. Furthermore, sexual orientation may represent yet another mating strategy that may influence sexual functioning. Here, we aimed to test the possible associations between male sexual functioning and sexual strategies, as measured through sociosexuality, relationship status, and sexual orientation. We hypothesize that due to its relationship with the evolved motivation of mate acquisition and mate retention, both stable relationships and sociosexuality would be positively associated with male sexual functioning. We did not expect significant differences in sexual functioning among men with different sexual orientations. We sampled 427 healthy men of different sexual orientations (203 heterosexuals, 77 bisexuals, and 147 gay men) who completed the Male Sexual Function Index (MSFI) and its subscales of desire, arousal, erection, orgasm, and satisfaction; the Sociosexual Orientation Inventory-Revised; and sociodemographic questions. A multivariate general linear model showed that, compared to single individuals, partnered individuals reported greater MSFI-arousal, MSFI-erection, MSFI-orgasm, and MSFI-satisfaction. Sociosexuality and sexual orientation only weakly predicted MSFI domains. Male sexual functioning thus seems to be moderately associated with a long-term mating strategy and can thus serve for relationship maintenance rather than for acquiring new partners.

Keywords Male Sexual Function Index · Sexual function · Gay · Bisexual · Sociosexuality · Sexual orientation

Introduction

From an evolutionary perspective, successful male sexual functioning before and during intercourse is a prerequisite for conception and reproduction (Apostolou, 2015). However, sexual functioning has been understudied by evolutionary scholars compared to other topics related to mating strategies, such as mate preferences, jealousy, extrapair relationships,

ovulation, sexual disgust, and masturbation (Buss & Schmitt, 2019; Mogilski & Shackelford, 2023; Moreno & McKerral, 2015; Sevi et al., 2018; Timmermans et al., 2018; Walter et al., 2020). We can expect strong evolutionary pressures on the mechanisms that regulate sexual motivation and functioning (Apostolou, 2015), which is defined as a set of successive stages that involve the passage through desire, arousal, and orgasm (American Psychiatric Association, 2022). More recently, the male sexual response has been described as comprising five phases: sexual desire, arousal, erection, ejaculation, orgasm, and refractory period (Moghalu et al., 2020; Thunder & Serefoglu, 2018).

Sexual desire and motivation are among the basic drives that can be traced back to the origin of sexual reproduction itself. In humans, sexual relations and reproduction can be achieved by different mating strategies associated with mate acquisition and mate retention motivational systems, the former related to the pursuit of new sexual partners and the latter related to the maintenance of long-term relationships

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(Barbaro et al., 2021; Buss & Schmitt, 2019; Kenrick et al., 2010). In both cases, sexual functioning is necessary to meet the distal evolutionary goal of reproduction. Moreover, throughout evolution, sexuality in humans and other non-human species has acquired many other functions that are not directly related to reproduction, leading to other personal and social goals such as pleasure, status, resources, love and pair bonding, and self-esteem (Delval et al., 2023; Meston & Buss, 2007). Thus, from the social and evolutionary perspective, it is not surprising that the disruption of sexual functioning negatively affects individual and relationship satisfaction, self-esteem, and overall quality of life (Stephenson et al., 2013; Tayebi et al., 2021; Thunder & Serefoglu, 2018). It is thus of the utmost importance to better understand the factors influencing individual differences in sexual functioning that may be related to different mating strategies.

Despite their personal, social, and evolutionary importance, there are significant individual and contextual differences in sexual functioning. Sexual functioning is related to a variety of factors, such as overall health condition, age, and individual cognitive-emotional dimensions, which encompass the interplay among biological and environmental processes, including individual sociocultural attitudes (Morrisette, 2002; Peixoto & Nobre, 2020; Rowland et al., 1993). However, the association between sexual functioning and sexual strategies has been underexplored. Sex drive is positively correlated with sociosexuality, lifetime number of sex partners, and lower masculinity in men (Ostovich & Sabini, 2004); similarly, sociosexuality is associated with greater male femininity in both heterosexual and homosexual men (Bártová et al., 2020). Here, we aimed to explore the possible associations between male sexual functioning and sexual strategies, measured by sociosexuality and relationship status.

Evolutionary theory suggests that individuals may employ different mating strategies based on their reproductive goals and environmental contexts. Sociosexuality measures the tendency toward casual sex without commitment, which serves as a proxy for short-term versus long-term mating strategies. Less restricted sociosexuality is defined by a tendency for a greater variety of sexual partners, thus increasing the quantity of sexual encounters (Nascimento et al., 2018). Despite its possible costs, such as sexually transmitted diseases or aggression from other males, in most mammalian males, a greater number of sexual partners increases reproductive success (Janicke et al., 2016). Higher sexual functioning can thus motivate a less restricted sexual strategy. Alternatively, sociosexually less restricted individuals may present greater sexual functioning through practice due to their involvement with more sexual partners. As shown in previous studies, male sexual functioning, such as erectile functioning and sexual intercourse satisfaction, is

indeed greater among more sexually experienced individuals (O’Sullivan et al., 2014).

Relationship status is another proxy for an adopted mating strategy. Single men show more interest in casual sex and are less restricted than men in relationships (Edelstein et al., 2011; Sánchez et al., 2009), and single men had more casual partners during the COVID-19 pandemic (Silva Júnior et al., 2022). Although it might seem counterintuitive given the less restricted sexual strategy, men in stable relationships report greater sexual functioning (O’Sullivan et al., 2014). Individuals oriented toward long-term relationships, such as developing stable romantic relationships (mate retention), show greater levels of subjective well-being and lower levels of anxiety and depression (Ko et al., 2020; Pick et al., 2022). By reducing the number of potential offspring, especially for men, a long-term sexual strategy can bring evolutionary advantages in terms of higher paternity certainty, greater offspring survival, and long-term social alliances with other people. Since mate retention is an evolved motivation found cross-culturally, we can expect that this motivation is maintained by mechanisms of better sexual functioning with long-term partners.

Indeed, partnered individuals report greater sexual satisfaction than single individuals, although the factors that predict their sexual satisfaction are similar (Park & MacDonald, 2022). Both short-term casual mating and long-term committed relationship strategies can thus be associated with greater sexual functioning because both can bring evolutionary and social advantages. Moreover, humans have evolved multiple motivational systems through which reproduction can be achieved, granting possibilities to pursue both mate acquisition and mate retention goals, which can sometimes be enacted simultaneously (Valentova, de Moraes et al., 2020). Importantly, both strategies require good sexual functioning.

Furthermore, non-heterosexual men exhibit different mating strategies than heterosexual men. Gay men display, on average, greater sex drive and casual sex tendencies than heterosexual men (Bailey et al., 1994). Across different populations, Schmitt (2007) found that, compared to heterosexual men, gay and bisexual men scored higher on sociosexuality. Supposedly, gay and bisexual men report greater sociosexuality because they are less limited by their male partners, who also desire less restricted casual relations, while heterosexual men’s sociosexuality is restricted by women who are less inclined to have casual sex, possibly due to their greater parental investments (Schmitt, 2007). If this is the case, then gay men should display greater sociosexual behavior than heterosexual men but not sociosexual desire or attitudes. Sexual strategies can thus be influenced by the sex of the preferred partner (e.g., Howard & Perilloux, 2017; Valentova et al., 2022a, 2022b). Furthermore, non-heterosexual men also show differences in partner

preferences, such as preferences for partners of the same height or slightly taller than themselves (Valentova et al., 2016; for review see Valentova et al., 2023), and differences in relationship maintenance mechanisms, such as jealousy (Valentova et al., 2022a, 2022b). Studying sexual behavior within different groups of the population can thus enrich our understanding of the social and evolutionary underpinnings of human sexuality.

It has been suggested that gay men's mating psychology is "male-typical," meaning that gay men seek sexual diversity and are more prone to casual sex with strangers (Bailey et al., 1994; Schmitt, 2007). Studies on sociosexuality consistently support this hypothesis (see Schmitt, 2007; Silva Júnior et al., 2022). Even in stable relationships, gay and bisexual men are more open to consensual non-monogamy than heterosexuals (Cohen & Wilson, 2017; Costa & Ribeiro-Gonçalves, 2020). Despite this, different sexual orientations may have different reproductive costs, operationalized as the number of offspring, where exclusively gay men have the lowest mean number of children, thus the highest direct reproductive cost, while heterosexuals have the highest number of children, thus the lowest direct reproductive cost (Apostolou, 2022). Additionally, bisexual individuals tend to fall between gay men and heterosexuals across many domains, such as sexual desire, mating strategies, occupational preferences, gender typicality, and number of children (Jabbour et al., 2020; Lippa, 2020; Valentova et al., 2022a, 2022b). If gay and bisexual men exhibit this male-typical mating psychology, they may be less likely to differ from heterosexuals in fundamental dimensions of mating, such as sexual functioning (see Silva Júnior et al., 2023), while varying in other, more contextual dimensions.

Some may argue that same-sex sexual orientation is not adaptive from an evolutionary perspective, as this orientation reduces reproductive success. However, many other groups of individuals, such as post-menopausal women, do not reproduce, and they can convey evolutionary advantages. Furthermore, sexuality has gained many other functions throughout evolution and can serve purposes other than direct reproduction, such as pair bonding or play (Delval et al., 2023). Finally, plausible evolutionary hypotheses have been suggested and have received some empirical support, showing that non-heterosexuality may be maintained in the population through kin selection or can bring social advantages, such as increasing cooperation and reducing aggression (for review, see Bailey et al., 2016; Barron & Hare, 2020; Valentova & Varella, 2016). Some authors further suggest that indiscriminate sexuality is the evolutionary ancestral condition, thus questioning the seeming evolutionary puzzle of non-heterosexual orientation (Monk et al., 2019).

From both proximal and distal perspectives, studying how sexual behavior manifests in individuals with varying sexual preferences can shed light on whether and how

certain aspects of sexuality, including sexual functioning, are universal or vary across sexual orientations. For example, if gay men are more prone to casual sex than heterosexual men are, then one may assume that their sexual functioning might exhibit different patterns. Furthermore, Sánchez et al. (2009) reported that single gay men were more interested in casual sex. In many countries, homosexuality and bisexuality are treated as socially unacceptable or taboos, leading individuals to conceal their sexual orientation and seek relationships in nightclubs and dating apps, which may favor casual sex over the formation of lasting relationships (Sevi et al., 2018; Valentova et al., 2020a, 2020b; Wu & Ward, 2018). Thus, there may be more single gay men in the population than heterosexual men. However, studies rarely investigate potential differences in sexual function among men of different sexual orientations, and when they do, gay and bisexual individuals are often studied as a single group (e.g., Bártoová et al., 2021), or they represent a very small portion of the sample, making comparisons with heterosexuals difficult or impossible (e.g., Bártoová et al., 2021; Calzo, 2013; Kalmbach et al., 2015).

Here, we aimed to test the possible associations between male sexual functioning and sexual strategies, as measured through sociosexuality, relationship status, and sexual orientation. We hypothesize that due to its relationship with the evolved motivation for mate acquisition, sociosexuality is positively associated with male sexual functioning, as measured by the Male Sexual Function Index and its domains (desire, arousal, erection, orgasm, and satisfaction). Additionally, being in a relationship versus being single is associated with higher levels of sexual functioning due to its relationship with the evolved motivation of mate retention. We do not expect significant differences in sexual functioning among men with different sexual orientations.

Method

Participants

A total of 567 Brazilian men (all biological males) over 18 years of age participated in the study. One part of the project aimed to validate and adapt the Male Sexual Function Index for the Brazilian population (Silva Júnior et al., 2023). We excluded 114 individuals who were receiving psychiatric treatment (e.g., anxiety, depression) or who had conditions such as urinary incontinence, diabetes, HIV-positive serology, or neurological treatment, as these conditions are associated with impaired sexual functioning (Lewis et al., 2010). In 26 cases, it was not possible to determine the medical condition of the participants due to conflicting answers, which led to their exclusion. The final sample consisted of 427 men from

capitals and cities in the interior of Brazil, representing 18 different states across the five regions of the country.

The participants were, on average, 28.83 years old ($SD = 9.53$), ranging from 18 to 65 years. They reported an average family income of approximately USD 2,200 ($SD = 1,900$), with incomes ranging from \$200 to \$15,700. In terms of education level, the highest percentages were for incomplete undergraduate education (36.1%) and complete graduate education (28.1%). The majority were identified as white (49.6%) or mixed-race (37%), with 10.3% identified as black. Indigenous people, Asians, and others made up 3.1% of the participants.

Measures

Sociodemographic information included age, family income, current city (at the time of the study), relationship status, and health-related questions, such as history of penile and anal surgeries, psychiatric medication use, and HIV serology. The relationship status categories were as follows: dating ($N = 140$), married ($N = 76$), single ($N = 189$), divorced ($N = 5$), widower ($N = 2$), and "other" (15). For analysis purposes, we categorized participants as "partnered" ($N = 216$) if they selected "dating" or "married," and as "single" ($N = 194$) if they selected "single" or "divorced." Widowers and those in the "other" category were excluded from the analyses ($n = 17$) due to ambiguity regarding their relationship status.

The Klein Sexual Orientation Grid (Klein, 2014) was utilized to assess, among other factors, how participants self-identify their sexual orientation on a seven-point scale ranging from 1 (exclusively heterosexual) to 7 (exclusively gay). We specifically focused on the "Self-Identification" dimension in the present study. Those who scored from 1 to 2 were considered heterosexual ($N = 203$), those who scored from 3 to 5 were considered bisexual ($N = 77$), and those who scored from 6 to 7 were considered gay ($N = 147$). Table 1 displays the frequencies and percentages of single and partnered men divided by sexual orientation. As predicted, we found a greater frequency of partnered heterosexuals than of gay and bisexual men.

Table 1 Frequencies and chi-square tests for relationship status divided by sexual orientation

Sexual orientation	Partnered		Single		$X^2(2)$
	<i>n</i>	%	<i>n</i>	%	
Gay	59	41.3	84	58.7	20.52*
Bisexual	32	43.8	41	56.2	
Heterosexual	125	64.4	69	35.6	

* $p < .001$

The Male Sexual Function Index (MSFI) was translated and adapted from the original version by Kalmbach et al. (2014) for use in the study (Silva Júnior et al., 2023). It comprises 16 items designed to assess male sexual functioning across several domains: MSFI-desire, MSFI-erection, MSFI-arousal, MSFI-orgasm, and MSFI-satisfaction (including sexual, emotional closeness with partner, and sexual life as whole). The items measure the frequency, degree of confidence, extent of evaluation, or difficulty experienced by men in terms of sexual desire, arousal, maintaining an erection, achieving orgasm, and experiencing sexual and emotional satisfaction. The MSFI-desire consists of two items, while the MSFI-arousal and MSFI-erection each consist of four items. Responses are recorded on a 5-point Likert scale ranging from 1 (almost never or never) to 5 (almost always or always). The scores for each domain are computed by summing the responses within that domain. In the Brazilian adaptation, the internal consistency indices ranged from 0.82 to 0.98, indicating good reliability.

In addition to the MSFI, other instruments used to assess male sexual function, including the Sexual Inhibition/Sexual Excitation Scale (SIS/SES) and the International Index of Erectile Function (IIEF) (Neijenhuijs et al., 2019; Panzeri et al., 2021). However, the MSFI comprehensively evaluates various aspects of sexual functioning, including subjective elements, such as desire and satisfaction (Kalmbach et al., 2015). This comprehensive approach makes it a valuable tool for assessing male sexual function. Moreover, the Brazilian Portuguese version of the MSFI has demonstrated configural, metric, and scalar invariance across all sexual orientations examined in this study. This means that the psychometric properties of the instrument remain consistent and equivalent across heterosexual, gay, and bisexual individuals. Therefore, any observed mean differences in sexual functioning among these groups cannot be attributed to the instrument's suitability solely for heterosexual populations (Silva Júnior et al., 2023).

Sociosexual Orientation Inventory-Revised (SOI-R-Brazil; Nascimento et al., 2018). The instrument consists of nine items grouped into three domains: SOI-behavior, SOI-attitude, and SOI-desire. The behavior domain items are related to the frequency of sexual behaviors and are measured on an ordinal scale with nine options (0 to 20 or more sexual partners). The SOI-attitude assesses how much emotional closeness a person needs before engaging in sexual intercourse. The SOI-desire evaluates the level of sexual arousal and fantasies associated with casual sex. The items from the attitude and desire domains are measured on a nine-point Likert scale of agreement, ranging from 1 (*Strongly Disagree*) to 9 (*Strongly Agree*). Scores in the different domains were calculated by averaging the responses given in each domain. Internal consistency indices using Cronbach's alpha

were calculated for each domain: behavior ($\alpha = 0.88$), attitude ($\alpha = 0.82$), and desire ($\alpha = 0.86$).

Procedure

Data collection for this study utilized Google Forms, a widely accessible online platform that allows participants to respond conveniently via mobile phones or computers without requiring them to log in. Sampling was conducted using a convenience method, with the research link distributed across various internet sites and social media platforms aimed at diverse audiences. These included Facebook groups, WhatsApp community groups, and Instagram posts. Advertisements explicitly invited male individuals of all sexual orientations over 18 years old to participate in a research study on sexual behavior. Participants were informed that they would complete online questionnaires covering socioeconomic data, past and present sexual behavior, sexual orientation, and recent sexual experiences. Informed consent was obtained from all participants by having them click on the “I agree” button on the first page of the survey.

Statistical Analysis

Descriptive statistics and correlational analyses were conducted to summarize and examine the relationships among the study variables (Tables 2 and 3). A MGLM was performed. A MGLM is an advanced extension of the general linear model (GLM) that facilitates the simultaneous analysis of multiple dependent variables. This model is especially valuable when the dependent variables are correlated or when the goal is to understand the combined effects of the independent variables on multiple outcomes. MGLM allows for joint hypothesis testing across all dependent variables, providing a more comprehensive understanding of how the independent variables influence the entire set of outcomes. These tests are instrumental in assessing whether the independent variables significantly impact the combination of dependent variables. By analyzing multiple dependent variables together, MGLM is more efficient than conducting separate GLMs for each outcome. The joint analysis increases the power of the tests, particularly when the dependent variables are correlated. Additionally, performing a single multivariate

Table 2 Correlations for age and the SOI and MSFI domains

Variable	1	2	3	4	5	6	7	8
1. SOI-Behavior	-							
2. SOI-Attitude	.45***	-						
3. SOI-Desire	.29**	.40***	-					
4. MSFI-Desire	.10*	.18**	.35***	-				
5. MSFI-Arousal	-.05	.05	.004	.37***	-			
6. MSFI-Erection	-.08	.06	-.04	.13*	.53***	-		
7. MSFI-Orgasm	-.07	.02	-.12*	.07	.41***	.41***	-	
8. MSFI-Satisfaction	-.14*	-.09	-.25***	.08	.50***	.35***	.43***	-

* $p < .05$. ** $p < .01$. *** $p < .001$

Table 3 Means and standard deviations for MSFI domains by sexual orientation and relationship status

		Heterosexual			Bisexual			Gay		
		Single	Partnered	Total	Single	Partnered	Total	Single	Partnered	Total
		(N = 42)	(N = 114)	(N = 156)	(N = 23)	(N = 30)	(N = 53)	(N = 49)	(N = 52)	(N = 101)
MSFI-desire	<i>M</i>	7.74	8.04	7.96	8.00	8.10	8.06	8.08	7.94	8.01
	<i>SD</i>	2.01	1.56	1.69	1.59	1.45	1.50	1.89	1.79	1.83
MSFI-arousal	<i>M</i>	16.95	17.87	17.62	15.09	17.57	16.50	17.18	17.79	17.5
	<i>SD</i>	2.55	2.02	2.21	3.48	2.80	3.32	2.40	2.19	2.30
MSFI-erection	<i>M</i>	18.24	19.29	19.01	17.57	19.57	18.70	18.76	18.81	18.78
	<i>SD</i>	2.66	1.68	2.03	3.37	1.07	2.54	2.26	2.33	2.29
MSFI-orgasm	<i>M</i>	12.55	13.74	13.42	12.26	13.27	12.83	12.80	13.81	13.32
	<i>SD</i>	2.72	1.63	2.04	2.70	1.89	2.31	2.57	2.23	2.44
MSFI-satisfaction	<i>M</i>	11.31	12.95	12.51	11.00	13.43	12.38	11.37	12.56	11.98
	<i>SD</i>	2.99	2.30	2.60	2.37	2.54	2.73	2.47	2.60	2.60

test instead of multiple univariate tests reduces the risk of Type I error, or false positives (Tabachnick & Fidell, 2019).

Specifically, in our study all MSFI dimensions included simultaneously as dependent variables. The SOI dimensions were entered as continuous predictors, while sexual orientation and relationship status were included as categorical predictors. In the event of a significant interaction between the categorical variables, separate MGLMs were used for specific comparisons. All the statistical tests were adjusted using Bonferroni correction for multiple comparisons, and effect sizes were reported using partial η^2 . The significance level was set at 0.05.

To ensure that our study has sufficient statistical power to detect effects of interest, we conducted a sensitivity analysis using G*Power software (version 3.1.9.7). Specifically, we performed the analysis for a MANOVA model, considering the predictors, a power of 0.8, an alpha level of 0.05, our sample size, and five response variables (the MSFI domains). The sensitivity analysis indicated that the study has sufficient power to detect a minimum effect size of $f^2(V) = 0.011$. This value is indicative of a small effect, according to Cohen's (1988) benchmarks. Therefore, our study is adequately powered to detect interactions between the analyzed factors, even if they are small.

Results

We conducted correlations between the main variables of the study (Table 2). As expected, the SOI domains were positively correlated with each other, and the MSFI domains were positively correlated with each other. The MSFI-desire was positively correlated with all SOI domains but was more strongly correlated with the SOI-desire. MSFI-arousal and MSFI-erection did not correlate with any of the SOI domains. The MSFI-orgasm was negatively correlated with the SOI-desire. MSFI-satisfaction was negatively correlated with SOI-behavior and SOI-desire.

We present the means, standard deviations, and sample sizes of the MSFI domains stratified by sexual orientation and relationship status in Table 3.

Effects of Sociosexuality, Relationship Status, and Sexual Orientation on Male Sexual Function Index

The test of between-subject effects showed no significant effect of SOI-behavior on any of the MSFI dimensions (all p 's > 0.32). SOI-attitude positively predicted MSFI-erection, $B = 0.174$, 95% CI: [0.04, 0.31], $F(1, 310) = 6.55$, $p = 0.011$, partial $\eta^2 = 0.021$, while no other effect was significant (all p 's > 0.09). SOI-desire positively predicted MSFI-desire,

$B = 0.239$, 95% CI [0.15, 0.33], $F(1, 310) = 25.64$, $p < 0.001$, partial $\eta^2 = 0.079$) and negatively predicted MSFI-satisfaction, $B = -0.260$, 95% CI [-0.40, -0.12], $F(1, 310) = 13.26$, $p < 0.001$, partial $\eta^2 = 0.042$), with no other significant effect (all p 's > 0.27).

Relationship status had small to medium effects on all MSFI dimensions, except for the MSFI-desire dimension ($p = 0.065$). Estimated marginal means with Bonferroni correction showed that compared to single individuals, individuals in relationships reported greater MSFI-arousal, $F(1, 310) = 17.89$, $p < 0.001$, partial $\eta^2 = 0.056$; MSFI-erection, $F(1, 310) = 12.18$, $p < 0.001$, partial $\eta^2 = 0.039$; MSFI-orgasm, $F(1, 310) = 11.37$, $p < 0.001$, partial $\eta^2 = 0.036$; and MSFI-satisfaction, $F(1, 310) = 19.34$, $p < 0.001$, partial $\eta^2 = 0.060$. Table 3 shows the means and standard deviations.

Sexual orientation had a weak significant effect on MSFI-arousal, $F(2, 310) = 4.84$, $p = 0.009$, partial $\eta^2 = 0.031$. The estimated marginal means showed that bisexual men reported lower MSFI-arousal than both gay men (mean difference = 1.17, $p = 0.014$) and straight men (mean difference = 1.12, $p = 0.015$), and there was no difference between gay and straight men (mean difference = 0.048, $p = 1.0$). There was no other effect of sexual orientation on MSFI (all p 's > 0.35).

There was only one significant but weak interaction effect between relationship status and sexual orientation on MSFI-erection, $F(2, 310) = 4.14$, $p = 0.017$, partial $\eta^2 = 0.027$. An additional MGLM with MSFI-erection as a dependent variable and sexual orientation and relationship status as predictors was conducted. The only significant difference appeared between heterosexual partnered men who scored higher on the MSFI-erection than single bisexual men ($p = 0.008$), with no other difference among the groups.

Given that many studies have shown significant differences between gay, bisexual, and heterosexual men in terms of sociosexuality, we additionally investigated the interaction effect of sexual orientation and relationship status. Gay men were less restricted than the other groups, while single men scored significantly higher than the partnered men in the SOI-desire. An interaction effect showed that partnered heterosexual men reported lower SOI-attitude scores than both single and coupled gay men (for all additional analyses, please see the Supplementary Material).

Discussion

In this study, we investigated the associations between sociosexuality, relationship status, and sexual orientation with male sexual function in a non-clinical population of men who did not exhibit clinical sexual dysfunctions. Our results revealed several significant but rather weak associations.

Specifically, SOI-attitude positively predicted MSFI-erection, indicating that men with a more liberal attitude toward casual sex might experience better erectile function. Additionally, the SOI-desire positively predicted MSFI-desire but negatively predicted MSFI-satisfaction. A greater desire for a variety of sexual partners may thus be linked to lower satisfaction with sexual function. Furthermore, SOI-behavior did not predict any MSFI domain, highlighting that actual sexual behavior may not significantly impact sexual function outcomes. Additionally, being in a relationship weakly or moderately predicted higher MSFI-arousal, MSFI-erection, MSFI-orgasm, and MSFI-satisfaction, underscoring the positive impact of a stable relationship on sexual function. Finally, sexual orientation was not, or only weakly, associated with MSFI.

Sociosexuality and Male Sexual Function

Our findings regarding the relationship between sociosexuality and male sexual function partially align with previous research. For instance, Carvalho and Nobre (2011) reported that more restricted sexual attitudes and negative sexual emotions were associated with lower erectile function. This finding aligns with our finding that SOI-attitude positively predicts MSFI-erection, suggesting that individuals with a short-term mating strategy may have greater sexual performance, possibly increasing reproductive success. Additionally, it is not surprising that there is a positive association between the desire to have casual sex (SOI-desire) and the frequency and level of sexual interest (MSFI-desire), as both are closely related constructs of sexual desire and motivation.

The negative association between SOI-desire and MSFI-satisfaction in our study contrasts with some research that suggests a positive relationship between sexual desire and overall sexual satisfaction (Štulhofer et al., 2014). This discrepancy may be due to differences in how sexual desire is defined and measured across studies. Here, we specifically measured sociosexual desire, which reflects the desire for a variety of different sexual partners rather than a general desire for sex (either with a stable or a casual partner). Moreover, MSFI-satisfaction is a composite measure of satisfaction with one's sexual relationship, emotional closeness with one's partner, and one's overall sexual life. Thus, the desire for casual partners may be connected to reduced sexual satisfaction with a stable partner.

The lack of significant association between male sexual function and SOI-behavior may be surprising. We hypothesized that men with greater sociosexuality, including sociosexual behavior, would exhibit greater levels of sexual functioning. However, the associations between SOI-desire and SOI-attitude were weak and nonexistent in the case of SOI-behavior. The SOI-behavior domain is the

best predictor of the SOI composite and is associated with other psychological outcomes related to sexual short-term orientation, such as antisocial personality traits, mate value, and earlier sexual initiation (Nascimento et al., 2018; Silva Júnior et al., 2022). The behavior domain addresses how many different people the individual had sex with without a committed relationship. Accordingly, one might speculate that individuals who had more sexual partners in the past would show better sexual functioning due to experience with different partners. However, our results contradict this assumption. It is possible that having more sexual experience with stable partners may be more connected to sexual functioning than having a variety of sexual experiences with different partners. Thus, while sociosexual attitudes and desires play a marginal role in sexual functioning, actual behavior might be less influential, possibly due to the complex interplay of psychological and relational factors.

Relationship Status and Male Sexual Function

In line with this reasoning, relationship status was a stronger predictor of sexual function than was sociosexuality. The positive association between being in a relationship and various domains of the MSFI found in our study is consistent with a substantial body of literature highlighting the benefits of relational context on sexual health. Men in committed relationships report greater levels of sexual satisfaction and sexual function than do singles (Park & MacDonald, 2022). Thus, relationship stability and emotional intimacy significantly contribute to better sexual function and satisfaction among men.

Sexuality is an integral part of most romantic relationships and is commonly perceived as both the closest and most intimate relationship that an individual has (Rocha & Fensterseifer, 2019). Sexuality is thus defined not only by a variety of sexual behaviors but also by subjective and emotional aspects, such as sexual desire, intimacy, communication, and beliefs (Sprecher et al., 2006). It is therefore understandable to find higher rates of sexual functioning in partnered men. People in relationships can better know their partners' preferences, and relationships can create an environment of greater familiarity and intimacy sought in long-term relationships.

From an evolutionary perspective, we hypothesized that sexual functioning would be maintained in long-term relationships since mate retention is an evolved motivation found cross-culturally. A stable relationship may enhance male sexual function, as it aligns with a long-term mating strategy that promotes pair bonding and parental investment, both of which are crucial for reproductive success in a species with highly altricial offspring (Barbaro et al., 2021; Buss & Schmitt, 2019; Kenrick et al., 2010; Ko et al., 2019). Humans have psychological mechanisms that promote stable

relationships, which align with findings that adolescent men in stable relationships report lower levels of sexual dysfunction using IIEF, possibly because relationships reduce concerns about sexual problems (O’Sullivan et al., 2014). Additionally, those pursuing long-term relationships show lower levels of anxiety and depression but greater levels of subjective well-being. In addition to the distal evolutionary perspective, the higher levels of MSFI-arousal, MSFI-erection, MSFI-orgasm, and MSFI-satisfaction observed in partnered individuals highlight the critical role of relationship quality and stability in promoting sexual health.

Sexual Orientation and Male Sexual Function

Sexual orientation did not predict male sexual functioning domains. Sexual orientation weakly negatively predicted MSFI-arousal only, with bisexual men scoring significantly lower than both gay and heterosexual men. Similarly, in a Czech sample, Bártoř et al. (2021) found no differences between heterosexual and non-heterosexual men in arousal and sexual inhibition measured by SIS/SES.

If gay and bisexual men are more likely to be single and suffer from minority stress and marginalization, leading to greater anxiety, we might expect lower sexual functioning among these groups compared to heterosexual men. Bisexual men may experience a lower frequency of arousal for various reasons, such as worsened mental health, including depression. Additionally, the marginalization of minority groups can contribute to this issue (Wittgens et al., 2022). However, individuals diagnosed with depression were excluded from our final sample (see Method). Nevertheless, the negative association between sexual orientation and sexual functioning was very weak, and its real effect is possibly nonexistent.

Systematic reviews tend to report a greater prevalence of erectile dysfunction in gay men or men who have sex with men than in heterosexual men (Barbonetti et al., 2019; Cheng, 2022; Fernandez-Crespo & Cordon-Galiano, 2021; Grabski & Kasperek, 2017). However, after adjusting for factors such as being in a relationship or publication bias, the difference did not reach significance (Fernandez-Crespo & Cordon-Galiano, 2021) or may remain significant (Barbonetti et al., 2019). Some researchers are skeptical about the claim that sexual dysfunctions occur more frequently in non-heterosexual individuals, as the samples used in these studies may not be representative of the broader population and often derive from non-probabilistic sampling methods (Grabski & Kasperek, 2017). In line with this, our study indicates that sexual orientation was not a strong predictor of sexual functioning.

Differences in the sexual psychology of gay, bisexual, and heterosexual men have been reported before. In the study of Schmitt (2007), gay and bisexual men demonstrated less

restricted behavior than heterosexual men. In contrast, a different study found that bisexual men exhibited the highest levels of sociosexuality, while heterosexual men did not differ significantly from gay men (Lippa, 2020). However, in both Schmitt (2007) and Lippa (2020), the effect sizes were generally small to moderate, as they were in our study. Another crucial point is that neither Schmitt (2007) nor Lippa (2020) controlled for the relationship status of the participants, which could influence sociosexuality levels. Individuals in relationships tend to be more restricted (Edelstein et al., 2011; Sánchez et al., 2009); thus, neglecting relationship status can lead to the erroneous conclusion that the differences found are due to sexual orientation, when in fact they could be artifacts of their relationship status.

Following this reasoning, we observed a greater proportion of heterosexual men in relationships than of gay and bisexual men. By including relationship status in our analyses, we demonstrated that there was no interaction between sexual orientation and relationship status for the domains of SOI-behavior and desire, although there was a weak interaction for the domain of sociosexual attitude (see Supplementary Material). This indicates that relationship status does not significantly influence the differences among sexual orientation groups in terms of sociosexuality. In line with our findings, Silva Júnior et al. (2022) also reported no interaction between sexual orientation and relationship status when studying sociosexuality among men during the 2020 coronavirus pandemic. Their study similarly showed that heterosexual men were more likely to be in a relationship than non-heterosexual men were.

In our survey, we did not differentiate bisexual men based on their reported sociosexuality with women versus men. It is possible that bisexual men exhibit varying levels of sociosexuality depending on their partner’s gender. Additionally, gay men may demonstrate greater sociosexual behavior due to the greater availability of less restricted male partners (Schmitt, 2007). However, the availability of partners alone does not explain their higher levels of desire and attitudes. Other factors could explain the less restricted sexual behavior observed among gay men, such as their use of dating apps designed for casual encounters or meeting new partners in nightclubs—environments conducive to casual sex without commitment (Wu & Ward, 2018). Future research could explore whether sociosexuality differs between gay app users, nightclub attendees, and nonusers, examining whether exposure to these contexts significantly influences the sociosexual differences observed between gay and heterosexual men.

While extensive research has utilized the Female Sexual Function Index, this study represents the first endeavor, to our knowledge, to apply the MSFI in exploring its relationships with psychological constructs such as sociosexuality, sexual orientation, and relationship status. This underscores

the significance of examining individual differences in male sexual functioning. As previously noted, the MSFI uniquely incorporates subjective domains such as desire and satisfaction, which are not fully captured by other instruments such as the SIS/SES and the IIEF. Its comprehensive nature makes the MSFI particularly valuable for investigating sexual function across men with diverse sexual orientations, given the psychological differences between gay and bisexual men compared to heterosexual men.

The demonstrated invariance of the MSFI supports its utility in research involving different sexual orientations, allowing for meaningful comparisons across these groups. Future research should consider employing the MSFI more frequently to deepen our understanding of male sexual function, particularly in relation to various psychological and relational factors. This approach can offer insights into how sexual functioning varies across different demographic and sexual orientation groups.

Evolutionary studies should focus more on the similarities and differences between sexual orientations, as these variations can elucidate the interplay between biological sex and environmental factors in shaping sexual behavior (Bailey et al., 1994). Our study provides evidence that while sociosexuality varies across sexual orientations, sexual function does not. Evolutionary theory can provide insights into the study of sex differences among gay, bisexual, and heterosexual individuals. While individuals of different sexual orientations differ in the “target” of their sexual desires, as well as in some other dimensions (e.g., physical attractiveness preferences), they may share a common mating psychology. This is particularly true for men, who tend to be more similar to each other across various psychological measures (Bailey et al., 1994).

Even when differences are observed between gay and heterosexual men, such as in the level of sociosexuality-related behavior (Schmitt, 2007; Silva Júnior et al., 2023), these differences may not reflect distinct underlying mating psychologies. Instead, they could result from varying opportunities for engaging in uncommitted sex, as suggested by Bailey et al. (1994) and Symons (1979). According to evolutionary theory, mating psychology has likely been shaped by natural selection due to its reproductive advantages in ancestral environments. In these contexts, traits that promoted reproductive success—such as efficient sexual functioning—would have been favored, leading to a relatively uniform mating psychology across different sexual orientations.

Given that sexual functioning is a prerequisite for reproduction, it is likely to vary very little among heterosexual, bisexual, and gay men. This universality underscores its critical importance not only for reproduction but also for sustaining long-term relationships across different sexual orientations. This consistency in sexual

functioning across sexual orientations highlights its role in maintaining relationship satisfaction and stability, whether in monogamous or consensually non-monogamous partnerships. Thus, while differences in sociosexual behaviors might arise due to external factors, the foundational role of sexual functioning remains a unifying aspect of male mating psychology.

If this hypothesis holds true, we might expect that gay and bisexual men would differ more from heterosexual men in contextual factors, such as the availability of potential sexual partners, rather than in mechanisms of sexual behavior per se, such as sexual functioning. Since our study was not designed to test this specific hypothesis, we suggest that future studies address this question. Overall, sexual functioning can be considered a universal aspect of male sexuality across different sexual orientations.

Despite expanding our current understanding of sexual functioning in men, our study has some limitations. The sample predominantly comprised young, white individuals with relatively high family incomes and educational levels, which contrasts with the broader demographics of the Brazilian population. This restricts the generalizability of our findings.

In addition, the relatively large sample size in our study enabled the detection of very small effects, which could result in statistically significant findings that may not have practical significance. To address this, we included measures of effect size in our main analyses to evaluate the magnitude of the effects and determine their practical relevance. Indeed, most of our results indicate small effects, underscoring the need for cautious interpretation.

Furthermore, the cross-sectional design limits the ability to draw causal inferences. For example, we cannot determine whether sexual functioning improves with stable relationships or whether individuals with better sexual functioning are more likely to enter stable relationships. Finally, reliance on self-reported measures may introduce biases related to social desirability or recall accuracy.

In summary, this was the first study to explore associations between sociosexuality and male sexual functioning in a sample of non-clinical men with diverse sexual orientations. Our findings show that relationship status positively predicts male sexual function, while the relationships between sociosexuality, sexual orientation, and sexual functioning are weak or nonexistent. This suggests that sexual functioning may be more closely tied to long-term mating strategies, a mechanism observed across men regardless of sexual orientation. Exploring the impact of relationship quality and dynamics on sexual function could also yield valuable information for interventions aimed at improving sexual health.

Supplementary Information The online version contains supplementary material available at <https://doi.org/10.1007/s10508-024-03006-0>.

Acknowledgements The authors thank all the participants for the time they dedicated to taking part in the research. We also thank three anonymous reviewers for their valuable contributions, which have substantially improved the quality of our manuscript.

Author contribution Mauro Dias Silva Júnior was responsible for the study conception and design. Material preparation, data collection, and analysis were performed by Maria Luiza Rodrigues Sampaio de Souza, Adna Janaína Silva, Jaroslava Varella Valentová, and Mauro Dias Silva Júnior. The first draft of the manuscript was written by Maria Luiza Rodrigues Sampaio de Souza and Mauro Dias Silva Júnior, and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

Funding Funding was provided by Coordenação de Aperfeiçoamento de Pessoal de Nível Superior—Brazil (CAPES)/Brazilian Agency for the Improvement of Higher Education Personnel by the means of a master degree scholarship to the first author; and by the Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq)—Brazil/National Council for Scientific and Technological Development by the means of a master degree scholarship to the second author.

Data Availability Data are available through direct request to the corresponding author.

Code availability Code is available through direct request to the corresponding author.

Declarations

Conflict of interest The authors declare no conflict of interest.

Informed Consent Informed consent was obtained from all individual participants included in the study.

Ethical Approval All procedures were conducted in accordance with the Helsinki Declaration. The study was approved by the Ethical Committee for Research in Human and Social Sciences of University of Brasília under report number 82638118.0.0000.5540.

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