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SPECIALTY SECTION
This article was submitted to
Public Mental Health,
a section of the journal
Frontiers in Psychiatry

RECEIVED 24 March 2022
ACCEPTED 29 June 2022
PUBLISHED 22 July 2022

CITATION
Cervilla O and Sierra JC (2022)
Masturbation parameters related to
orgasm satisfaction in sexual
relationships: Differences between
men and women.
Front. Psychiatry 13:903361.
doi: 10.3389/fpsy.2022.903361

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Masturbation parameters related to orgasm satisfaction in sexual relationships: Differences between men and women

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Objective: Masturbation is a behavior that can enhance sexual functioning. This study aims to analyze differences between men and women in different masturbation parameters, and to examine their relation with orgasm satisfaction in sexual relationships.

Method: One thousand three hundred and thirty-fifth men and women from the Spanish population aged 18–83 years ($M = 36.91$; $SD = 11.86$) participated in an online survey. A questionnaire was used to collect socio-demographic. Sexual history data, negative attitude toward masturbation, solitary sexual desire and orgasm subjective experience upon masturbation were assessed. Given the differences between men and women, independent regression models are proposed to explain orgasm satisfaction in the sexual relationships context.

Findings: Men, compared to women, masturbated at a younger age ($p < 0.001$), and reported higher current masturbation frequency ($p < 0.001$) and more solitary sexual desire ($p < 0.001$). Women reported greater intensity in the subjective orgasm experience on its Affective ($p < 0.001$), Sensory ($p < 0.001$) and Intimacy ($p < 0.001$) dimensions. Regarding regression models, the Affective dimension of orgasm was a common parameter in men ($\beta = 0.36$; $p < 0.001$) and women ($\beta = 0.24$) to explain orgasm satisfaction during sexual relationships. In men, solitary masturbation frequency ($\beta = -0.10$; $p = 0.027$) acquired a significant role. In women, the model also included age ($\beta = 0.09$; $p = 0.038$), negative attitude toward masturbation ($\beta = -0.12$; $p = 0.005$) and solitary sexual desire ($\beta = -0.19$; $p = 0.001$).

Conclusion: When dealing with men and women's orgasm difficulties in the sexual relationships context, it is important to consider the role of masturbation. In men and women, the Affective dimension of the orgasm experience explain the orgasm satisfaction in sexual relationship. Also, in men, the solitary masturbation frequency is negatively related with orgasm satisfaction in sexual relationship, supporting the compensatory hypothesis of masturbation. In women, in addition to the Affective dimension, the orgasm satisfaction in sexual relationship is explained, negatively, by the negative

attitude toward masturbation, and positively, by the solitary sexual desire, which could be associated with more sexual self-knowledge. The relevance of masturbation in understanding sexual functioning is highlighted.

KEYWORDS

orgasm satisfaction, partnered sex, masturbation, subjective orgasm experience, attitude toward masturbation, sex differences

Introduction

Masturbation is a relatively frequent behavior that is positively associated with sexual health (1–5). More importance has been attached to study it in recent decades, and its capacity to promote sexual self-knowledge and to elicit positive sexual responses has been underlined (6, 7). Among these good points, its usefulness in sexual therapy to improve sexual functioning has been stressed (8).

Very little evidence exists for the relation between masturbation and sexual relationships (9). The association between both sexual behaviors has been described by two models: compensatory vs. complementary. The former proposes practicing masturbation to replace desired sexual relationships that do not take place (10, 11). The fact that higher masturbation frequency is related to lower sexual satisfaction, and has been found for women, favors this model (12), while higher masturbation frequency for those who less enjoy their sexual relationships has been described for men (13). The complementary model hypothesizes that a direct positive relation exists between both these sexual activities, and increasing the practice of one would be associated with an increase in the other (14).

Some works suggest that masturbation does not offer a clear advantage for sexual relationships (15–17). Nonetheless, it has been found that women who masturbate are more likely to have an orgasm during sexual relationships (18), and those who masturbate more frequently describe better sexual experiences in couples and less sexual inhibition (2, 3). Techniques like Directed Masturbation can boost pleasurable stimulation from knowing pleasure points, which improves women's orgasm facility while couples practice sex (19). Therefore, learning to have orgasms by masturbation allows women to adjust and generalize this orgasm response in sexual relationships in couples (20). These results sustain the usefulness of masturbation as the first line of treatment for the Female Orgasmic Disorder (20, 21).

Despite some findings that favor practicing masturbation to improve orgasm capacity, very little evidence exists for the role that the different parameters related to this behavior play in orgasms in the sexual relationships context. Of these parameters, attitude toward masturbation, solitary sexual desire

and intensity of the subjective orgasm experience obtained by masturbation stand out. Taking a negative attitude toward masturbation has been associated with feeling guilty and ashamed (22, 23), and also with negative sexual experiences (24). Moreover, lower masturbation frequency, more difficulty to have an orgasm and lower orgasm satisfaction have been observed in those with a more negative attitude toward masturbation (25). Solitary sexual desire (i.e., interest in solitary sexual activity) has been associated with high sexual satisfaction and self-esteem levels in women (2, 4), and has been related to both sexual satisfaction and unsatisfactory sexual functioning in men (26–28). In light of all this, a positive relation between solitary sexual desire and the intensity of the subjective orgasm experience in the solitary masturbation context has been found in a sample made up of men and women (29). Subjective orgasm experience in masturbation has been shown to be capable of distinguishing people with and without difficulties in having an orgasm during sexual relationships (29). Sierra et al. (30) recently observed that masturbation frequency, negative attitude toward masturbation and the subjective orgasmic experience in masturbation are associated with orgasm satisfaction in sexual relationships in people aged over 50 years.

Bearing in mind the relevance of masturbation for sexual health, and its usefulness in the therapeutic context to improve sexual functioning, this study aims to: analyze differences between men and women in different masturbation parameters (i.e., first masturbation experience, current solitary masturbation frequency, negative attitude toward masturbation, solitary sexual desire and subjective orgasm experience); examine their relation, along with age, to orgasm satisfaction in the sexual relationships context. To do so, the following hypotheses are proposed: (1) differences are expected in masturbation parameters between men and women; (2) orgasm satisfaction in sexual relationships is expected to be linked with masturbation parameters (30).

Methods

Participants

The sample comprised 1,335 Spanish adults (738 men, 597 women) aged 18–83 years ($M = 36.91$; $SD = 11.86$). The

TABLE 1 Sociodemographic characteristics of the participants.

Variables	Total N = 1,335	Men n = 738	Women n = 597
Age <i>M</i> (<i>SD</i>)	36.91 (11.86)	37.62 (12.43)	36.04 (11.07)
Level of education <i>n</i> (%)			
Primary education	53 (4.0)	26 (3.5)	27 (4.5)
Secondary education	390 (29.2)	231 (31.3)	159 (26.6)
University degree (ongoing or completed)	892 (66.8)	481 (65.2)	411 (68.9)
Currently have a partner <i>n</i> (%)			
Yes	988 (74.0)	524 (71.0)	464 (77.7)
No	347 (26.0)	214 (29.0)	133 (22.3)
Praying frequency <i>n</i> (%)			
Never	989 (74.1)	523 (70.90)	466 (78.1)
Less than once a month	123 (9.2)	67 (9.1)	56 (9.4)
Once a month	7 (0.5)	6 (0.8)	1 (0.2)
A few times a month	54 (4.0)	32 (4.3)	22 (3.7)
Once a week	8 (0.6)	3 (0.4)	5 (0.8)
A few times a week	57 (4.3)	34 (4.6)	23 (3.9)
Once a day	60 (4.5)	41 (5.6)	19 (3.2)
More than once a day	37 (2.8)	32 (4.3)	5 (0.8)

inclusion criteria were: (a) having Spanish nationality; (b) being heterosexual; (c) currently engaging in sexual relationships; (d) having solitary masturbation experience. Table 1 shows the samples' socio-demographic characteristics.

Measures

Background questionnaire. This instrument collects data about sex, age, level of education, nationality, sexual orientation, partner relationship, frequency of prayer, age when the first masturbation experience occurred and masturbation frequency.

The Spanish version of the Negative Attitudes Toward Masturbation Inventory (NATMI) (25, 31). It evaluates negative attitudes toward masturbation with 10 items (e.g., "I feel guilty about masturbating") answered on a 5-point Likert-type scale: 1 (Not at all true for me) to 5 (Extremely true for me). Higher scores indicate a more negative attitude toward masturbation. It has a high internal consistency (alpha ordinal) of 0.95, and presents suitable evidence for construct and discriminant validity with other psychosexual variables and sexual functioning. In this sample, the ordinal alpha coefficient was 0.91.

The Solitary Sexual Desire subscale from the Spanish version of the Sexual Desire Inventory (SDI) (28, 32). It consists of four items (e.g., "How strong is your desire to engage in sexual behavior by yourself?") and measures interest in solitary sexual

activity using different Likert response scales depending on the item (e.g., from 0 = No desire to 8 = Strong desire). Higher scores show more solitary desire. It presents good internal consistency (Cronbach's α higher than 0.90) and evidence for external validity. Cronbach's alpha in the present study was 0.91.

The Spanish version of the Orgasm Rating Scale (ORS) (33) adapted to the solitary masturbation context by Cervilla et al. (29). It assesses the subjective orgasm experience in the solitary masturbation context (during any sexual activity performed alone) with 25 adjectives distributed on four dimensions: Affective, Sensory, Intimacy, and Rewards. Items are answered on a 6-point Likert-type scale: 0 (Does not describe it at all) to 5 (Describes it perfectly). Higher scores indicate more intensity in the subjective orgasm experience. Its internal consistency reliability is good and ranges from 0.71 to 0.95. It adequately evidences validity, provided by its measures. In our study, the ordinal alphas for the different subscales were: 0.93 for Affective, 0.94 for Sensory, 0.72 for Intimacy and 0.89 for Rewards.

The Spanish version of the Arizona Sexual Experience Scale (ASEX) (34) of Sánchez-Fuentes et al. (35). It consists of five items that assess general sexual functioning (sexual desire, arousal, erection for men/lubrication for women, orgasm, and orgasm satisfaction) in the last 7 days in the sexual relationship context. It uses a Likert-type scale from 1 (hypofunction) to 6 (hyperfunction). It presents good internal consistency (Cronbach's alpha of 0.81 in men, 0.79 in women) and evidences validity. The orgasm-related item referring to orgasm satisfaction was taken into account. Its score was inverted, so higher scores evidenced more orgasm satisfaction.

Procedure

Data collection was conducted by distributing a survey using LimeSurvey, which was promoted by paying to Facebook (900€) from 23 December 2019 to 15 March 2020 by adults from Spain. In order to improve the representativeness of the sample, the promotion targeted both men and women from different age groups. Online assessments are normally used to evaluate sexual behaviors (1, 36, 37). Previous studies have confirmed that there are no differences between online and paper-and-pen methods (38, 39). To avoid automatic or fraudulent responses, IP was controlled and a CAPTCHA was used. In addition, responses were carefully examined to rule out non conclusive or abnormal cases. Participation was voluntary, and both anonymity and confidentiality of responses were guaranteed. There was no compensation for taking part in the study. All the participants received informed consent with the study aim before responding. This research was approved by the Ethics Committee of Human Research of the University of Granada.

TABLE 2 Effects of sex on masturbation-related indicators.

Variables <i>M (DT)</i>	Males <i>n = 738</i>	Females <i>n = 597</i>	<i>F</i> (1, 1,329)	<i>p</i>	<i>Cohen's d</i>
First masturbation experience	12.60 (2.03)	15.13 (5.92)	140.51	<0.001	0.60
Current frequency of solitary masturbation	3.17 (0.94)	2.50 (0.96)	185.11	<0.001	0.70
Negative attitude toward masturbation	13.03 (3.09)	13.13 (2.32)	1.91	0.167	-
Solitary sexual desire	21.59 (5.59)	19.75 (6.28)	31.96	<0.001	0.31
Subjective orgasm experience-Affective	25.66 (4.84)	27.05 (3.85)	31.69	<0.001	0.31
Subjective orgasm experience-Sensory	33.65 (15.74)	39.17 (15.15)	47.75	<0.001	0.36
Subjective orgasm experience-Intimacy	7.62 (3.64)	8.19 (3.71)	12.48	<0.001	0.15
Subjective orgasm experience-Rewards	11.34 (3.36)	11.56 (3.59)	1.82	0.177	-

Statistical analysis

A cross-sectional correlational study is proposed. First, missing values were imputed using a random forest algorithm by considering the associated variables. To examine differences in the masturbation parameters between men and women, a MANCOVA was applied for first masturbation experience (age), current solitary masturbation frequency (“Never,” “Less than once a month,” “Once a month,” “A few times a month,” “Once a week,” “A few times a week,” “Once a day” and “More than once a day”), negative attitude toward masturbation, solitary sexual desire and subjective orgasm experience caused by masturbation, and by taking into account these covariates: age, level of education (“Primary Education,” “Secondary Education” and “University degree—ongoing or completed-”), having a partner (yes or no) and frequency of prayer (similar to the masturbation frequency). Considering the differences found by sex, the subsequent analyses were presented separately for men and women. The capacity of the masturbation parameters to explain orgasm satisfaction was examined by multiple linear regression using the enter method.

The R[®] environment was employed (version 3.6.3) (40) with its RStudio[®] interface (version 1.2.5042) (41). For missing value imputations, the missForest package was used (version 1.4) (42). For the ordinal alpha, the Psych package was applied (version 1.9.12.31) (43). The other statistical analyses were performed with SPSS v.22.

Results

Sex differences in the masturbation parameters

The significant multivariate covariates were age [Wilk's lambda = 0.87; $F_{(8, 1,322)} = 24.49, p < 0.001; \eta^2 = 0.129$], having a partner [Wilk's lambda = 0.94; $F_{(8, 1,322)} = 10.91, p < 0.001; \eta^2 = 0.062$] and frequency of prayer [Wilk's lambda = 0.96; $F_{(8, 1,322)} = 7.42, p < 0.001; \eta^2 = 0.04$]. Sex had a main effect on

the masturbation parameters [Wilk's lambda = 0.77; $F_{(8, 1,322)} = 48.91, p < 0.001; \eta^2 = 0.23$]. The intersubject effect on these indicators is shown in Table 2.

Regression models

For men, a significant model was obtained that explained orgasm satisfaction in sexual relationships [$F_{(9, 728)} = 13.01; p < 0.001$]. Current solitary masturbation frequency ($\beta = -0.10$) and the Affective dimension of orgasm ($\beta = 0.36$) explained 13% of variance (See Table 3). The model was also significant for women [$F_{(9, 587)} = 8.88; p < 0.001$] and explained 11% of orgasm satisfaction from age ($\beta = 0.09$), negative attitude toward masturbation ($\beta = -0.12$), solitary sexual desire ($\beta = 0.19$) and the Affective dimension of orgasm ($\beta = 0.24$) (See Table 4).

Discussion

Masturbation is a sexual behavior that is contemplated to deal with sexual dysfunctions, especially orgasm difficulties (44–46). Justifying the use of masturbation in sexual therapy lies in the relation between this behavior and orgasm in sexual relationships. This is why the present study analyzes the relation between different masturbation parameters in men and women (i.e., first masturbation experience, current solitary masturbation frequency, negative attitude toward masturbation, solitary sexual desire and subjective orgasm experience) with orgasm satisfaction in sexual relationships. The results show differences between men and women in the masturbation parameters, and also in the role that these parameters play in explaining orgasm satisfaction in the sexual relationships context.

The first hypothesis is backed by significant differences between men and women in the different masturbation parameters. We observe that men's first masturbation experience took place at an earlier age than it did in women, whose finding coincides with previous studies (1, 2, 25, 30, 47).

TABLE 3 Multiple regression models for orgasmic satisfaction in men.

Predictors	B	SE	β	95% CI	t	p	R ²	VIF
Orgasmic satisfaction							0.13	
Age	0.00	0.00	0.01	-0.00, 0.01	0.03	0.974		1.23
First masturbation experience	-0.01	0.02	-0.03	-0.05, 0.02	-0.88	0.379		1.08
Current frequency of solitary masturbation	-0.10	0.04	-0.10	-0.19, -0.01	-2.22	0.027		1.79
Negative attitude toward masturbation	-0.01	0.01	-0.05	-0.04, 0.01	-1.31	0.191		1.15
Solitary sexual desire	0.01	0.01	0.08	-0.00, 0.03	1.77	0.076		1.92
Subjective orgasm experience-Affective	0.07	0.01	0.36	0.05, 0.08	7.70	<0.001		1.85
Subjective orgasm experience-Sensory	-0.00	0.00	-0.05	-0.01, 0.00	-1.09	0.275		1.93
Subjective orgasm experience-Intimacy	0.00	0.01	0.01	-0.02, 0.03	0.32	0.746		1.70
Subjective orgasm experience-Rewards	-0.01	0.01	-0.03	-0.03, 0.01	-0.78	0.438		1.40

B, non-standardized beta; SE, standard error; β , standardized beta; 95% CI, 95% confidence interval; VIF, variance inflation factor.

TABLE 4 Multiple regression models for orgasmic satisfaction in women.

Predictors	B	SE	β	95% CI	t	p	R ²	VIF
Orgasmic satisfaction							0.11	
Age	0.01	0.00	0.09	0.00, 0.02	2.08	0.038		1.21
First masturbation experience	0.01	0.01	0.04	-0.01, 0.02	1.01	0.314		1.10
Current frequency of solitary masturbation	-0.07	0.06	-0.07	-0.18, 0.04	-1.27	0.203		1.88
Negative attitude toward masturbation	-0.05	0.02	-0.12	-0.09, -0.01	-2.80	0.005		1.15
Solitary sexual desire	0.03	0.01	0.19	0.01, 0.05	3.43	0.001		2.11
Subjective orgasm experience-Affective	0.06	0.01	0.24	0.04, 0.09	4.91	<0.001		1.65
Subjective orgasm experience-Sensory	-0.00	0.00	-0.03	-0.01, 0.00	-0.52	0.606		1.77
Subjective orgasm experience-Intimacy	0.00	0.01	0.01	-0.03, 0.03	0.12	0.906		1.68
Subjective orgasm experience-Rewards	-0.02	0.01	-0.08	-0.05, 0.00	-1.70	0.090		1.46

B, non-standardized beta; SE, standard error; β , standardized beta; 95% CI, 95% confidence interval; VIF, variance inflation factor.

Traditional sexual socialization could favor more permissiveness in men and more guilty feelings associated with women practicing masturbation (48). In turn, the differences found in solitary masturbation frequency coincide with previous works in the literature, and a more frequent masturbation frequency observed for men (25, 49, 50). Attitude to the sexual double standard (i.e., the distinct evaluation made of sexual behavior depending on whether it is practiced by a man or a woman) could explain these differences given the greater sexual freedom or permissiveness that men have been traditionally conferred than women (38). Alternative considerations have also been applied to explain these differences in association with hormone levels (51).

It is worth mentioning that no differences have been found in negative attitude toward masturbation between men and women. The fact that such differences are lacking could be related to an increasingly more positive change of attitude in both men and women, as observed in other attitudes like erotophilia (52). These results contradict those recently obtained in older people and reported by Sierra et al. (30), who

indicate that men older than 50 years take a more negative attitude toward masturbation than women of a similar age. This could indicate younger generations' positive attitude toward masturbation. This question reflects the need to further study in-depth attitudes toward masturbation and the factors related to it to better understand this matter (25). Regarding differences in solitary sexual desire, the highest level found for men is consistent with previous works that report similar results (27, 28, 53, 54). This is congruent with those studies showing a close association between masturbation and solitary sexual desire (55).

On subjective orgasm experience in solitary masturbation, and in line with the results obtained by previous studies that have examined the subjective orgasm experience in the heterosexual relationships context (36, 56), women report greater intensity than men, except on the Reward dimension, which has also been shown for the gay population (57). To explain differences in orgasm intensity between men and women, women have been proposed to better localize orgasms anatomically (56), which would be associated with perceiving greater intensity (58). It has

also been indicated that women could have a bigger repertoire to describe their orgasm sensations (57, 59). Regarding the differences in their dimensions, not finding discrepancies would be expected on the Rewards dimension, which is made up of the items “peaceful,” “relaxing,” and “soothing,” because both men and women have pointed out that relaxing is one of the main reasons to masturbate (13, 60, 61).

Regarding our second hypothesis, orgasm satisfaction in the sexual relationships context is explained in both men and women by some masturbation parameters. In the model for men and women, the Affective dimension of the subjective orgasm experience during masturbation significantly and positively explains orgasm satisfaction in the sexual relationships context. Former findings stress the importance of the Affective dimension of the subjective orgasm experience for the sexual relationships context, especially for women (62). So it might seem logical to think that this could be the case in the masturbation context where this dimension is more important for explaining orgasm satisfaction in sexual relationships.

Apart from the orgasm Affective dimension in the men’s model, higher solitary masturbation frequency is also associated with lower orgasm satisfaction. These results might appear to contradict works that have described how frequency is associated with more consistent orgasms (7). However, in line with previous studies (30, 52), this association might be explained by the compensatory model of masturbation; that is, masturbation serving as a substitute of unsatisfactory sexual relationships. Therefore, lower orgasm satisfaction in the sexual relationships context might be expected to be compensated by higher masturbation frequency (26, 63).

In women, apart from the Affective dimension of orgasm, age and solitary sexual desire are positively associated, and attitude toward masturbation is negatively associated, with orgasm satisfaction in sexual relationships. The positive association of age would be expected because former works inform about a higher orgasm pleasure level with increasing age (18, 61). Moreover, the positive relation between sexual desire and sexual functioning has been well-described (27, 28, 64). In fact solitary sexual desire is associated with higher masturbation frequency (1, 55), which might imply more self-erotic experiences and sexual self-knowledge (3). Finally, the fact that negative attitude toward masturbation is related to lower orgasm satisfaction is consistent with previous works (25, 65). This attitude has been associated with lower masturbation frequency (25), which might imply fewer opportunities for both sexual response self-knowledge and the associated pleasure points (7, 19).

Some differences between the models for men and women are worth stressing. The positive effect of age is only observed in women. This suggests that women benefit from enjoying more orgasm satisfaction as they age to a certain extent. Despite a negative association between age and orgasm capacity having been previously described (36, 66), these results are consistent

with some findings which reveal that women need time to interiorize a more positive relation with masturbation due to the stigmatization that their engagement in such behavior might imply (2). This suggests that the positive effects of masturbation could increase as women age. Besides, solitary masturbation frequency only has a significant effect on men, which falls in line with former results which point out that masturbation frequency in women is not significantly associated with orgasm outcomes (18). As higher masturbation frequency in men is associated with lower orgasm satisfaction in sexual relationships, it would be coherent to think that solitary sexual desire plays no relevant role to explain men’s orgasm satisfaction. Finally, the differences observed in the models of men and women fall in line with the previous literature, which emphasizes how women’s orgasm is associated with more variables than it is for men (56, 57, 67).

This study has its limitations, which must be taken into account to generalize its results. The study sample was formed by incidental non probabilistic sampling over social networks and only included the heterosexual population. The cross-sectional correlational experimental design and the performed statistical analyses do not allow for causality relations. So, it may be need longitudinal studies to have a deep approach about the relationship between masturbation and sexual relationships. Different parameters of masturbation could be taken into account in future studies, such as the duration of masturbation, the use of erotic toys, the techniques used or the consumption of pornography. Notwithstanding, the findings are believed relevant for its contribution to the study of masturbation and orgasm satisfaction in the sexual relationships context.

Conclusion

The obtained results confirm the differences between men and women in the masturbation parameters and their role to explain orgasm satisfaction in sexual relationships. The Affective dimension of the subjective orgasm experience during solitary masturbation is stressed as a common variable for both men and women to explain orgasm satisfaction in sexual relationships. More masturbation parameters associated with orgasm satisfaction are observed in women than men. These findings suggest that the relation between solitary masturbation and sexual relationships is a complex one. Masturbation in men could be a substitute for the satisfaction not achieved with orgasm in sexual relationship; in women, the negative attitude toward this behavior would be associated with lower orgasmic satisfaction, and a greater solitary sexual desire could promote more sexual self-knowledge. So it is important to consider these results to look more closely at the association between both sexual behaviors, and to further consolidate the usefulness of solitary masturbation in sexual therapy. Therefore, solitary masturbation is an available resource that should also be

promoted in the community context as it can improve the sexual health of the population.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving human participants were reviewed and approved by the Ethics Committee of Human Research of the University of Granada. The patients/participants provided their written informed consent to participate in this study.

Author contributions

The concept and design: JCS. Acquisition, analysis, interpretation of data, drafting of the manuscript, critical revision of the manuscript, and statistical analysis: JCS and OC. All authors contributed to the article and approved the submitted version.

References

- Burri A, Carvalheira A. Masturbatory behavior in a population sample of German women. *J Sex Med.* (2019) 16:963–74. doi: 10.1016/j.jsxm.2019.04.015
- Carvalheira A, Leal I. Masturbation among women: associated factors and sexual response in a Portuguese community sample. *J Sex Marital Ther.* (2013) 39:347–67. doi: 10.1080/0092623X.2011.628440
- Coleman E. Masturbation as a means of achieving sexual health. *J Psychol Hum Sex.* (2003) 14:5–16. doi: 10.1300/J056v14n02_02
- Kaestle CE, Allen KR. The role of masturbation in healthy sexual development: perceptions of young adults. *Arch Sex Behav.* (2011) 40:983–94. doi: 10.1007/s10508-010-9722-0
- Kiliç Onar D, Armstrong H, Graham CA. What does research tell us about women's experiences, motives and perceptions of masturbation within a relationship context?: a systematic review of qualitative studies. *J Sex Marital Ther.* (2020) 46:683–716. doi: 10.1080/0092623X.2020.1781722
- Driemeyer W. Masturbation and sexual health—a research overview. *Z Sexualforsch.* (2013) 26:372–83. doi: 10.1055/s-0033-1356159
- Matsick JL, Conley TD, Moors AC. The science of female orgasms: pleasing female partners in casual and long-term relationships. In: Aumer K, editor. *The Psychology of Love and Hate in Intimate Relationships*. Switzerland: Springer (2016). p. 47–63. doi: 10.1007/978-3-319-39277-6_4
- Kingsberg SA, Althof S, Simon JA, Bradford A, Bitzer J, Carvalho J, et al. Female sexual dysfunction—medical and psychological treatments, committee 14. *J Sex Med.* (2017) 14:1463–91. doi: 10.1016/j.jsxm.2017.05.018
- Rowland DL, Hevesi K, Conway GR, Kolba TN. Relationship between masturbation and partnered sex in women: does the former facilitate, inhibit, or not affect the latter? *J Sex Med.* (2020) 17:37–47. doi: 10.1016/j.jsxm.2019.10.012
- Dekker A, Schmidt G. Patterns of masturbatory behaviour: changes between the sixties and the nineties. *J Psychol Hum Sex.* (2003) 14:35–48. doi: 10.1300/J056v14n02_04
- Kontula O, Haavio-Mannila E. Masturbation in a generational perspective. *J Psychol Hum Sex.* (2003) 14:49–83. doi: 10.1300/J056v14n02_05

Funding

This study has been funded by the Ministerio de Ciencia, Innovación y Universidades through the Research Project RTI2018-093317-B-I00 and the Bursary FPU18/03102 for University Professor Training as part of OC's thesis (Psychological Doctoral Programme B13 56 1; RD 99/2011).

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- Klapilová K, Brody S, Krejčová L, Husárová B, Binter J. Sexual satisfaction, sexual compatibility, and relationship adjustment in couples: the role of sexual behaviors, orgasm, and men's discernment of women's intercourse orgasm. *J Sex Med.* (2015) 12:667–75. doi: 10.1111/jsm.12766
- Fahs B, Frank E. Notes from the back room: gender, power, and (In)Visibility in women's experiences of masturbation. *J Sex Res.* (2014) 51:241–52. doi: 10.1080/00224499.2012.745474
- Pinkerton SD, Bogart LM, Cecil H, Abramson PR. Factors associated with masturbation in a collegiate sample. *J Psychol Hum Sex.* (2003) 14:103–21. doi: 10.1300/J056v14n02_07
- Kontula T, Miettinen A. Determinants of female sex orgasm. *Socioaffect Neurosci Psychol.* (2016) 6:1–21. doi: 10.3402/snp.v6.31624
- Leff JJ, Israel M. The relationship between mode of female masturbation and achievement of orgasm in coitus. *Arch Sex Behav.* (1983) 12:227–36. doi: 10.1007/BF01542073
- Rowland DL, Sullivan SL, Hevesi K, Hevesi B. Orgasmic latency and related parameters in women during partnered and masturbatory sex. *J Sex Med.* (2018) 15:1463–71. doi: 10.1016/j.jsxm.2018.08.003
- Rowland D, Donarski A, Graves V, Caldwell C, Hevesi B, Hevesi K. The experience of orgasmic pleasure during partnered and masturbatory sex in women with and without orgasmic difficulty. *J Sex Marital Ther.* (2019) 45:550–61. doi: 10.1080/0092623X.2019.1586021
- Komisaruk BR, Beyer-Flores C, Whipple B. The science of orgasm. *Baltimore, MD: Hopkins University Press.* (2006).
- Marchand E. Psychological and behavioral treatment of female orgasmic disorder. *Sex Med Rev.* (2021) 9:194–211. doi: 10.1016/j.sxmr.2020.07.007
- Laan E, Rellini AH, Barnes T. Standard operating procedures for female orgasmic disorder: consensus of the international society for sexual medicine. *J Sex Med.* (2013) 10:74–82. doi: 10.1111/j.1743-6109.2012.02880.x

22. Castellini G, Fanni E, Corona G, Maseroli E, Ricca V, Maggi M. Psychological, relational, and biological correlates of ego-dystonic masturbation in a clinical setting. *Sex Med.* (2016) 4:e156–65. doi: 10.1016/j.esxm.2016.03.024
23. Sierra JC, Perla F, Santos-Iglesias P. Sexual guilt in youngsters: the influence of attitudes and sexual experience. *Rev Latinoam Psicol.* (2011) 43:73–81.
24. Hogarth H, Ingham R. Masturbation among young women and associations with sexual health: an exploratory study. *J Sex Res.* (2009) 46:558–67. doi: 10.1080/00224490902878993
25. Cervilla O, Vallejo-Medina P, Gómez-Berrocal C, Sierra JC. Development of the Spanish short version of negative attitudes toward masturbation inventory. *Int J Clin Health Psychol.* (2021) 21:100222. doi: 10.1016/j.ijchp.2021.100222
26. Gerressu M, Mercer CH, Graham CA, Wellings K, Johnson AM. Prevalence of masturbation and associated factors in a British national probability survey. *Arch Sex Behav.* (2008) 37:266–78. doi: 10.1007/s10508-006-9123-6
27. Dosch A, Belayachi S, Van Der Linden M. Implicit and explicit sexual attitudes: how are they related to sexual desire and sexual satisfaction in men and women? *J Sex Res.* (2016) 53:251–64. doi: 10.1080/00224499.2014.1003361
28. Moyano N, Vallejo-Medina P, Sierra JC. Sexual desire inventory: two or three dimensions? *J Sex Res.* (2017) 54:105–16. doi: 10.1080/00224499.2015.1109581
29. Cervilla O, Vallejo-Medina P, Gómez-Berrocal C, de la Torre D, Sierra JC. Validation of the orgasm rating scale in the context of masturbation. *Psicothema.* (2022) 34:151–59. doi: 10.7334/psicothema2021.223
30. Sierra JC, Santamaría J, Cervilla O, Álvarez-Muelas A. Masturbation in middle and late adulthood: its relationship to orgasm. *Int J Impotence Res.* (2022). doi: 10.1038/s41443-021-00520-w
31. Mosher DL. Negative attitudes toward masturbation. In: Fisher TD, Davis CM, Yarber WL, Davis SL, editors. *Handbook of Sexuality-related Measures*. Nueva York, NY: Routledge (2011). p. 487–8.
32. Spector IP, Carey MP, Steinberg L. Sexual desire inventory. In: Davis CM, Yarber WL, Bauserman R, Schreer G, Davis SL, editors. *Handbook of Sexuality-related Measures*. London, UK: Sage (1998). p. 174–6.
33. Mah K, Binik YM. Orgasm rating scale. In: Milhausen RR, Sakaluk JK, Fisher TD, Davis DM, Yarber WL, editors. *Handbook of Sexuality-Related Measures*. Nueva York, NY: Routledge (2020). p. 503–7.
34. McGahuey CA, Gelenberg AJ, Laukes CA, Moreno FA, Delgado PL, McKnight KM, et al. The Arizona sexual experience scale (ASEX): reliability and validity. *J Sex Marital Ther.* (2000) 26:25–38. doi: 10.1080/009262300278623
35. Sánchez-Fuentes MM, Moyano N, Granados R, Sierra JC. Validation of the Spanish version of the Arizona sexual experience scale (ASEX) using self-reported and psychophysiological measures. *Rev Iberoam Psicol Salud.* (2019) 10:1–14. doi: 10.23923/fj.rips.2019.01.021
36. Arcos-Romero AI, Sierra JC. Factorial invariance, differential item functioning, and norms of the orgasm rating scale. *Int J Clin Health Psychol.* (2019) 19:57–66. doi: 10.1016/j.ijchp.2018.11.001
37. Calvillo C, del Mar Sánchez-Fuentes M, Parrón-Carreño T, Sierra JC. Validation of the interpersonal exchange model of sexual satisfaction questionnaire in adults with a same-sex partner. *Int J Clin Health Psychol.* (2020) 20:140–50. doi: 10.1016/j.ijchp.2019.07.005
38. Álvarez-Muelas A, Gómez-Berrocal C, Sierra JC. Study of sexual satisfaction in different typologies of adherence to the sexual double standard. *Front Psychol.* (2021) 11:609571. doi: 10.3389/fpsyg.2020.609571
39. Sierra JC, Moyano N, Vallejo-Medina P, Gómez-Berrocal C. An abridged Spanish version of sexual double standard scale: factorial structure, reliability and validity evidence. *Int J Clin Health Psychol.* (2018) 18:69–80. doi: 10.1016/j.ijchp.2017.05.003
40. R Core Team. *R: A Language and Environment For Statistical Computing*. Vienna, Austria: R Foundation for Statistical Computing (2020).
41. RStudio Team. *RStudio: Integrated Development Environment for R [Computer software]*. Boston, MA: RStudio, PBC (2020).
42. Stekhoven DJ, Bühlmann P. Missforest-non-parametric missing value imputation for mixed-type data. *Bioinformatics.* (2012) 28:112–18. doi: 10.1093/bioinformatics/btr597
43. Revelle W. *Psych: Procedures for Personality and Psychological Research*. Illinois, USA: Northwestern University, Evanston (2022). Available online at: <https://cran.r-project.org/package=psych> (accessed October 20, 2021).
44. Clayton AH, Hamilton DV. Female orgasmic disorder. In: Balon R, Taylor Segraves R, editors. *Clinical Manual of Sexual Disorders*. Washington, DC: American Psychiatric Publishing, Inc. (2009). p. 251–71.
45. Ma G-, Zou Z-, Lai Y-, Zhang X, Zhang Y. Regular penis-root masturbation, a novel behavioral therapy in the treatment of primary premature ejaculation. *Asian J Androl.* (2019) 21:631–4. doi: 10.4103/aja.aj_a_34_19
46. Waldinger MD. Delayed and premature ejaculation. In: Balon R, Taylor Segraves R, editors. *Clinical Manual of Sexual Disorders*. Nueva York, NY: American Psychiatric Publishing (2009). p. 273–304.
47. Driemeyer W, Janssen E, Wiltfang J, Elmerstig E. Masturbation experiences of Swedish senior high school students: gender differences and similarities. *J Sex Res.* (2017) 54:631–41. doi: 10.1080/00224499.2016.1167814
48. Sierra JC, Perla F, Gutiérrez-Quintanilla R. Attitudes toward masturbation in adolescents: psychometric properties of Spanish version of attitudes toward masturbation inventory. *Univ Psychol.* (2010) 9:531–42. doi: 10.11144/javeriana.upsy9-2.amap
49. Malo de Molina C, Valls Blanco JM, Pérez Gómez A. *La conducta sexual de los españoles*. Barcelona: Ediciones B (1988).
50. Mercer CH, Tanton C, Prah P, Erens B, Sonnenberg P, Clifton S, et al. Changes in sexual attitudes and lifestyles in Britain through the life course and over time: findings from the national surveys of sexual attitudes and lifestyles (NATSAL). *Lancet.* (2013) 382:1781–94. doi: 10.1016/S0140-6736(13)62035-8
51. Randolph JF, Zheng H, Avis NE, Greendale GA, Harlow SD. Masturbation frequency and sexual function domains are associated with serum reproductive hormone levels across the menopausal transition. *J Clin Endocrinol Metab.* (2015) 100:258–66. doi: 10.1210/jc.2014-1725
52. Sierra JC, Gómez-Carranza J, Álvarez-Muelas A, Cervilla O. Association of sexual attitudes with sexual function: General vs. specific attitudes. *Int J Environ Res Public Health.* (2021) 18:10390. doi: 10.3390/ijerph181910390
53. Peixoto MM, Gomes H, Correia A, Pires I, Pereira T, Machado PP. Translation and validation of the Portuguese version of the sexual desire inventory-2: assessing gender differences. *Sex Relatsh Ther.* (2020) 35:89–102. doi: 10.1080/14681994.2018.1472374
54. Vallejo-Medina P, Rojas-Paoli I, Álvarez-Muelas A. Validation of the sexual desire inventory in Colombia. *J Sex Marital Ther.* (2020) 46:385–98. doi: 10.1080/0092623X.2020.1739181
55. Vowels LM, Vowels MJ, Mark KP. Uncovering the most important factors for predicting sexual desire using explainable machine learning. *J Sex Med.* (2021) 18:1198–216. doi: 10.1016/j.jsxm.2021.04.010
56. Arcos-Romero AI, Sierra JC. Factors associated with subjective orgasm experience in heterosexual relationships. *J Sex Marital Ther.* (2020) 46:314–29. doi: 10.1080/0092623X.2019.1711273
57. Mangas P, Granados R, Cervilla O, Sierra JC. Validation of the orgasm rating scale in context of sexual relationships of gay and lesbian adults. *Int J Environ Res Public Health.* (2022) 19:887. doi: 10.3390/ijerph19020887
58. Mah K, Binik YM. Are orgasms in the mind or the body? psychosocial versus physiological correlates of orgasmic pleasure and satisfaction. *J Sex Marital Ther.* (2005) 31:187–200. doi: 10.1080/00926230590513401
59. Arcos-Romero AI, Moyano N, Sierra JC. Psychometric properties of the orgasm rating scale in context of sexual relationship in a Spanish sample. *J Sex Med.* (2018) 15:741–49. doi: 10.1016/j.jsxm.2018.03.005
60. Laumann EO, Gagnon JH, Michael RT, Michaels S. *The Social Organization of Sexuality: Sexual Practices in the United States*. Chicago: University of Chicago press (1994).
61. Rowland DL, Kolba TN, McNabney SM, Uribe D, Hevesi K. Why and how women masturbate, and the relationship to orgasmic response. *J Sex Marital Ther.* (2020) 46:361–76. doi: 10.1080/0092623X.2020.1717700
62. Mah K, Binik YM. Do all orgasms feel alike? evaluating a two-dimensional model of the orgasm experience across gender and sexual context. *J Sex Res.* (2002) 39:104–13. doi: 10.1080/00224490209552129
63. Regnerus M, Price J, Gordon D. Masturbation and partnered sex: substitutes or complements? *Arch Sex Behav.* (2017) 46:2111–21. doi: 10.1007/s10508-017-0975-8
64. Sierra JC, Díaz G, Álvarez-Muelas A, Calvillo C, Granados R, Arcos-Romero AI. Relación del deseo sexual con la excitación sexual objetiva y subjetiva. *Rev Psicopatol Psicol Clin.* (2019) 24:173–80. doi: 10.5944/rppc.25374
65. Kelly MP, Strassberg DS, Kircher JR. Attitudinal and experiential correlates of anorgasmia. *Arch Sex Behav.* (1990) 19:165–77. doi: 10.1007/BF01542230
66. Sierra JC, Vallejo-Medina P, Santos-Iglesias P, Lameiras Fernández M. Validation of Massachusetts general hospital-sexual functioning questionnaire (MGH-SFQ) in a Spanish population. *Aten Prim.* (2012) 44:516–24. doi: 10.1016/j.aprim.2012.02.004
67. Tavares IM, Laan ETM, Nobre PJ. Sexual inhibition is a vulnerability factor for orgasm problems in women. *J Sex Med.* (2018) 15:361–72. doi: 10.1016/j.jsxm.2017.12.015