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Masturbation and Partnered Sex: Substitutes or Complements?

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Abstract Drawing upon a large, recent probability sample of American adults ages 18–60 (7648 men and 8090 women), we explored the association between sexual frequency and masturbation, evaluating the evidence for whether masturbation compensates for unavailable sex, complements (or augments) existing paired sexual activity, or bears little association with it. We found evidence supporting a compensatory relationship between masturbation and sexual frequency for men, and a complementary one among women, but each association was both modest and contingent on how content participants were with their self-reported frequency of sex. Among men and women, both partnered status and their sexual contentment were more obvious predictors of masturbation than was recent frequency of sex. We conclude that both hypotheses as commonly evaluated suffer from failing to account for the pivotal role of subjective sexual contentment in predicting masturbation.

Keywords Masturbation · Sexual desire · Gender differences · Partnered sexual behavior

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Introduction

Historically, masturbation has been considered an embarrassing or invasive subject in the study of human sexual behavior, despite its common occurrence. Because of this, few large population-based survey projects have included measures of masturbation in their inventory of sexual behaviors. While the Kinsey reports were the first to collect and publish figures on masturbation in the U.S. population, Kinsey's study was far from nationally representative. It was not until the National Health and Social Life Survey (NHSLS) in 1992 that a population-based dataset documented Americans' masturbation practices. Drawing upon their probability sample of 18–60 year olds, the NHSLS reported that 61% of men and 38% of American women masturbated in the past year (Das, 2007). Data from other countries reveal similar patterns. The Australian Study of Health and Relationships (ASHR, ages 16–59) found that 65% of men and 35% of women masturbated in the past year (Richters, Grulich, de Vissen, Smith, & Rissel, 2003). In Britain's National Survey of Sexual Attitudes and Lifestyles II, 86% of men and 57% of women ages 16–44 reported masturbating within the past year (Gerressu, Mercer, Graham, Wellings, & Johnson, 2008). However, annual rates were not very helpful here, since they tell us nothing about the regularity of the behavior or of the motivation behind it.

Rates of masturbation are thought to increase during adolescence, peak in young adulthood, and then decrease throughout the rest of the life course (Herbenick et al., 2010; Laumann, Gagnon, Michael, & Michaels, 1994). In analyses of sex differences in sexual behaviors, significant distinctions were consistently found, exceeded only by pornography use among men (Hald, 2006; Oliver & Hyde, 1993; Petersen & Hyde, 2010). In the 2010 National Survey of Sexual Health and Behavior (NSSHB), the cohort with the highest overall rates of masturbation (25- to 29-year-old men and women) still

display obvious sex distinctions, with 44% of men reporting masturbating two or more times per week, while only 13% of women reported the same (Herbenick et al., 2010; Reece et al., 2010). While these trends are occasionally offered as evidence of repressive societal sexual scripts that constrained women's pursuit of physical pleasure, or social stigmas that hindered women from reporting their actual (higher) rates of masturbation, others have critiqued such arguments as simplistic and consider the data simply evidence for a higher male sex drive (Baumeister, Catanese, & Vohs, 2001; Leitenberg, Detzer, & Srebnik, 1993; Shulman & Horne, 2003).[1] Subjective desire to pursue private pleasure, orgasm, and sexual release motivates masturbation. But that does not suffice as an explanation, since if pleasure is so attractive, one might wonder why more people do not masturbate several times a day. Indeed, there is considerable variation in the practice. What we are after in this study is more circumscribed—to better understand its relationship with paired sexual behavior. We sought to update the population-based estimates on masturbation in the US using 2014 data from over 15,000 adults ages 18–60 and evaluated the question of whether having a stable sexual partner diminished masturbation, contributed to it, or exhibited no apparent association with it.

The Relationship Between Sex and Masturbation

A handful of theories have been proposed to explain the relationship between masturbation and the frequency of paired sexual intercourse. The compensatory model holds that masturbation and paired sexual activity are inversely associated; that is, masturbation is an outlet for sexual energy when paired sexual activity is not possible, either due to lack of a partner or the unwillingness or inability of a partner to engage in sex as often as desired. Thus, the compensatory model views masturbation as substituting for sexual desires left unfulfilled by (preferred) paired sexual activity (Dekker & Schmidt, 2003; Kontula & Haavio-Mannila, 2002; Pinkerton, Bogart, Cecil, & Abramson, 2002*)*.

The complementary model hypothesizes that masturbation augments paired sexual activity rather than replaces it. In this model, masturbation is believed to enhance or accompany the sex life of partnered adults and may even be practiced in conjunction with partnered sex (Laumann et al., 1994; Pinkerton et al., 2002*)*. The idea behind this model is that paired sex stimulates demand for additional sex and sexual activities, including masturbation. Conversely, the absence of paired sex is thought to diminish overall demand (or perceived need) for sexual activity.

Still others have perceived masturbation as an autonomous source of sexual fulfillment largely unrelated to the availability or frequency of paired sex, an entirely different avenue through which one might explore their sexuality or fulfill sexual desires (Abramson, 1973).

Some support has been found for each of these seemingly contradictory hypotheses. One study evaluated several sex surveys in various European nations and found that masturbation was unrelated to partnered status, but noted that perspectives on masturbation formed in adolescence continued through the life course and influenced men's use of masturbation as an autonomous way to gain sexual pleasure (Kontula & Haavio-Mannila, 2002).

A study using a stratified probability sample from Britain found that women's frequency of masturbation increased with greater frequency of sex in the past 4 weeks, whereas for men the opposite association was noted, suggesting different models at work for men and women (Gerressu et al., 2008). Data from the National Social Life, Health, and Aging Project (NSHAP), a probability sample of older American adults ages 57–85, revealed that the youngest groups of men and women in the sample reported both the most sex and were also the most likely to masturbate when compared to the sample's oldest men and women. While it was concluded that this was evidence against a compensatory model of the interaction between sex and masturbation, the finding may also be a function of diminishing sex drive in older adults, reducing overall interest in both forms of sexual activity. It cannot be determined which of these explanations garners more evidence, since while comparisons were made across age groups, between-person comparisons were not part of the analysis (Waite, Laumann, Das, & Schumm, 2009).

In a large convenience sample of Portuguese women, masturbation was cited by 9% as a substitute for unavailable partnered sex (Carvalheira & Leal, 2012). However, the same study found that 13% of the participants reported perceiving that masturbating increased their frequency of partnered sex. Carvalheira and Leal concluded there was more evidence favoring the complementary model for women, since masturbation appeared related to a wider repertoire of sexual activities among them. In consonance, women with a high level of sexual interest were found to complement paired sexual activity with masturbation (Das, Parish, & Laumann, 2009).

A large study of urban Chinese (from the nationally representative Chinese Health and Family Life survey) found that men and women whose sexual partner was gone for an extended period were more likely to have masturbated in the past year, as were those who had no regular sexual partner (but still had sex), but not among those who did not have sex in the past year. In other words, being away from a sexual partner or having sex

[1] While masturbation self-reports may be prone to underestimation, due to social desirability bias, and survey questions on masturbation may be subject to greater refusals, there nevertheless seems to be little current evidence of a profound and systematic response bias on such questions.

while lacking a stable partner predicted masturbation (following the compensatory model), but those who were not recently sexually active were less apt to masturbate.

Hence, it is premature to conclude the relationship between masturbation and paired sexual activity as *either* substitutionary or complementary. Instead, as one study found, the relationship may work both ways with heterogeneous effects. Das (2007) asserted that the relationship of masturbation to sexual frequency differs between men and women. Consistent with the complementary model, Das' work found that those most likely to report masturbation were (1) men without a stable sex partner but who had sex over the previous year and (2) women who found sex physically but not emotionally fulfilling. However, (3) women without a stable sexual partner who had not had sex—and (4) men who were not emotionally or physically satisfied with the sex they were having—were both also likely to report masturbating, supporting the compensatory model of the masturbation-intercourse linkage. It certainly raises the question of whether greater clarity can actually be had here or whether contingencies and qualifications will continue to characterize the study of masturbation patterns.

Our study makes a unique contribution to the literature because it simultaneously examined the relationship between masturbation, sexual frequency, and sexual contentment—that is, contentment with the recent frequency of sex, a variable seldom considered in earlier studies. If masturbation and paired sex are linked in a simple *compensatory* relationship, then recent sexual frequency should be inversely related to the likelihood of having masturbated. A *complementary* model hypothesis would conclude the opposite. However, the inclusion of a measure of contentment with recent sexual frequency alters a straightforward expectation. In fact, it poses a challenge to the basic supposition of both models, suggesting that the actual frequency of sex is subordinate to how participants feel about it. A participant who has sex only once in the previous 2 weeks but is content with that may not exhibit unfulfilled desire for more sex, while a participant who had had sex four times but whose desired sexual frequency was twice that may display far more unfulfilled desire for sex and thus be more likely to masturbate. Can either be said to be obviously compensating (for lack of sex) or complementing (coupled sex with masturbation)? Rather, the latter example is doing both: complementing sex with masturbation in order to compensate for unmet demand and desire.

We examined each of these possibilities, evaluating considerations often overlooked in the previous literature (due presumably to data limitations). And we did so using recent measures of both sexual frequency and recent masturbation—in the past 2 weeks—since we hold that measures more distant in time (e.g., past month or year) are much less suitable for evaluating both the association between the two variables and the role of sexual contentment in masturbation. Given these unique measures, we ought to be able to draw clearer conclusions about the connection between sex and masturbation than previous studies have.

Method

Participants

The Relationships in America (RIA) project fielded a survey to a national probability sample of 15,738 adults between the ages of 18 and 60 years in January and February 2014. The data collection was conducted by GfK, a research firm with a strong record of generating high-quality data for academic projects. GfK recruited the first online research panel that is representative of the US population (called the KnowledgePanel®). Members of the KnowledgePanel® are randomly recruited by telephone and mail surveys, and households are provided with access to the Internet and computer hardware if needed. Unlike other Internet research panels sampling only individuals with Internet access who volunteer for research, this panel was based on a sampling frame which included both listed and unlisted numbers, those without a landline telephone and was not limited to current Internet users or computer owners, and did not accept self-selected volunteers. It is a "panel" in that participants have agreed to answer a series of surveys for GfK over time. This particular survey, however, was cross-sectional in nature. As a result, it is a random, nationally representative sample of the American population. An evaluation of Knowledge Networks' Internet probability sample survey methodology compared favorably to online nonprobability samples as well as random-digit-dial telephone surveys (Chang & Krosnick, 2009). The main survey completion rate for the RIA survey instrument was 62%.[2] Each case in the RIA sample was assigned a weight based on the sampling design and their probability of being selected, ensuring a sample that was nationally representative of American adults aged 18–60. These sample weights were used in every statistical procedure displayed herein unless otherwise noted.

Measures

The KnowledgePanel® is also the source of the widely cited 2009 Indiana University National Survey of Sexual Health and Behavior (NSSHB), a sex study which included a question

[2] Note that the main completion survey rate (62 percent) did not take into account the success rate of recruitment into the KnowledgePanel®. The *initial* construction of the panel exhibited a success rate of 33 percent (Callegaro & DiSogra, 2008). However, the KnowledgePanel® is refreshed with regularity, with new participants cycling on and previous participants cycling off.

that asked participants, "How often do you masturbate?"[3] The RIA, however, measured masturbation a bit differently. It asked the participant, "When did you last masturbate?" (Participants were first screened beforehand by a question that asked whether they had ever masturbated). Nine response options ranged from today to over a year ago. We hold that this is a valid measure of masturbation patterns, given that the question was specific and time-delineated. The more common "average pattern" approach to asking about masturbation lends itself to a few standard problems. First, there is social desirability: masturbation remains embarrassing for many to admit. An "average pattern" question lends itself to reporting lower frequencies. Second, it has a tendency to regress toward a lower mean when asked about "average" experience; that is, someone who masturbated several days in a row might think this was uncharacteristic of their average pattern and instead report "once a week" or "a few times a month" if offered an "average pattern" question. Third, people are prone to recall bias: who remembers what one was doing "on average" two months ago (Graham, Catania, Brand, Duong, & Canchola, 2003)? Moreover, the "last-instance" approach remains an adequate measure of frequency as well, since a participant who typically masturbates about once a month is not likely—on average—to have done so yesterday.

While other studies have looked at *any* masturbation in the past three months, past year, or ever (Das, 2007; Das, Parish, & Laumann, 2009; Hurlburt & Whittaker, 1991; Pinkerton et al., 2002), we distinguished participants who indicated they masturbated within the past 2 weeks from those who did not so report. Although the "past 2 weeks" distinction is an arbitrary demarcation, 63% of men reported doing so in that time period, as did 35% of women (providing ample variation). We also chose the two-week cutoff since it matched the same time period as our measure of recent sexual frequency.

The reported frequency of paired sexual activity in the past 2 weeks was skewed. In order to not give too much weight to the small group who reported very frequent sexual activity, we employed frequency of sexual activity as a categorical variable with categories "0," "1," "2–3," and "4 or more." In the overall sample, 43% of participants reported no sex in the past 2 weeks, while 22% reported having had sex four or more times in that same period.

We also examined the influence of contentment with their current level of sexual frequency as a key link in the association between masturbation and sexual frequency. Participants were asked, "Are you content with the amount of sex you are having?" Answer choices were "Yes," "No, I'd prefer more," and "No, I'd prefer less." Very few participants—only 3%—chose "No, I'd prefer less." For the purposes of our analysis, we chose to recode contentment as a dichotomous variable with those responding "yes" or "no, I'd prefer less" assigned a 1 and those responding "no, I'd prefer more" assigned a 0. This decision made interpreting interaction terms (in Table 4) substantially easier and allowed us to better assess the hypotheses that masturbation is a substitute for paired sexual activity. Thus, the sexual contentment measure should be viewed as a dichotomous variable indicating whether a participant's desired sexual frequency was being attained (or exceeded) versus not attained, not whether they were satisfied with their sex life in general.

Control Variables

The two most unsurprising things we know about masturbation are its association with sex/gender and age. When considering frequency of masturbation in the past month and past year in the 2009 NSSHB, masturbation was "strikingly more prevalent among men than women" for all age cohorts (Herbenick et al., 2010: 263). Our data also revealed that masturbation and age were very linearly associated, as the percentage of people masturbating within the past week and the past day declined linearly with age for both men and women. Hence, gender and age were the most obvious control variables. We also controlled for being "partnered," that is, identifying as currently in a relationship (1 = being married, cohabiting, or self-reporting being in a romantic relationship) as a measure of sexual opportunity, as distinct from actual recent frequency of sex.

Masturbation practices also appear to vary by race/ethnicity, education, and other demographic characteristics. Black men and women have reported lower annual rates of masturbation than non-Hispanic White adults (Das, 2007). Masturbation rates are also lower among Asian-American women, possibly due to the emphasis that is placed on sexual modesty, restraint, the importance of following social codes, and a marital context for sexual expression (Okazaki, 2002). Even though Black women were the most likely to have *not* masturbated in the past year in the 1992 NHSLS, they were also the most likely to have masturbated at least once a week. A similar pattern appeared there for Asian men (Laumann et al., 1994). Thus, controls for race/ethnicity were included in all regression estimates. We employed the following categories: "White, non-Hispanic," "Black, non-Hispanic," and "Hispanic," while "other race" was combined with "2+ races."

Reported frequency of masturbation appears to increase with education. For example, among men and women in the 1992 NHSLS who did not complete high school, less than half reported having masturbated in the past year (45% of men and 25% of women). But men and women who had completed graduate degrees displayed a far different pattern: 80% of men and 60% of women said they had masturbated in the past year (Laumann et al., 1994). Those with a college degree or higher not only displayed the highest frequency of mastur-

[3] Unlike the RIA, the NSSHB asked about both solo and paired masturbation. The ratio of solo to paired masturbation in the past month ranges from 4-to-1 to about 2-to-1.

bation, they also reported the most pleasure while doing so: 95% of men and 87% of women with at least some graduate education reported experiencing an orgasm every time they masturbated, compared with 60% of men and 46% of women without a high school degree (Laumann et al., 1994). The strong association between education and masturbation among Americans has been replicated in international studies (e.g., Das, 2007; Gerressu et al., 2008; Richters et al., 2003). Explanations for the link between education and masturbation include the internalization of more permissive sexual scripts or greater embeddedness in more sexually permissive peer networks (Das, 2007). Additionally, more educated persons have greater access to public debate, information, and sex education, which may reduce guilt by shifting perspective on masturbation toward a clinical rather than moral one, or they may simply be more likely to report the behavior (Gerressu et al., 2008; Kontula & Haavio-Mannila, 2002). Participant's education was accounted for by using a set of four education dummy variables: less than high school, high school, some college, and Bachelor's degree or greater.

Data Analysis

In order to evaluate the three models of association between masturbation and paired sex—that they are compensatory, complementary, or independent of each other—we began with summary statistics comparing participants who did and did not report masturbation in the past 2 weeks, employing a chi-squared test of association with a Rao–Scott adjustment.[4] Then we sorted male and female masturbation reports by both the recent frequency of sex and their report of sexual contentment before conducting a series of logistic regressions predicting masturbation within the past 2 weeks, all sorted by sex/gender. The final analysis examined the influence of multiplicative interaction effects between sexual frequency and contentment. This approach enabled us to evaluate the models or hypotheses about the association between masturbation and paired sex while uniquely exploring a possible moderating role of sexual contentment.

[4] Since large-scale surveys are complex and typically involve multi-stage sampling, clustering, and stratification, the observations cannot be assumed independent and identically distributed. Rao and Scott (1981, 1984) showed that a chi squared test can still be used if the test statistic accounted for survey design effects—an idea that led to the development of several adjusted chi-squared tests. For these adjusted tests, under the null hypothesis of no association, a Rao-Scott test statistic approximately follows a chi-squared distribution with (rows-1) (columns-1) degrees of freedom. The specific adjustment used in our tests in this study was the Rao–Scott second-order correction, which provided an additional correction to better control Type I error (Thomas & Rao, 1987). Furthermore, since a better approximation can be obtained by transforming the adjusted test statistic to refer to an F distribution instead of a chi-squared distribution, statistical software packages such as R and SAS often report the results of an F test instead, and that is what we reported here.

Results

Table 1 provides an initial examination of the relationship between sexual frequency and masturbation. Our estimates suggest that the average sexual frequencies were pretty similar for those who reported masturbating in the past 2 weeks and those who did not, with individuals who reported no sex in the past week being four percentage points *less* likely (than those who had sex once) to report masturbating in the past 2 weeks, but slightly more likely (2–5 percentage points) to have masturbated than those reporting having had sex two or more times. Overall, frequency of recent sex did not appear to account—at least at face value—for any notable differences in masturbation. One important factor that may affect the relationship between sexual frequency and masturbation is subjective contentment with the amount of sex the participant is having. The bottom row of Table 1 suggested a clear association between contentment (with sexual frequency) and masturbation. Participants who reported being content with their frequency of sex were nearly 30 percentage points less likely to have reported masturbation in the past 2 weeks (when compared with participants who were not content). Other bivariate associations shown here suggested an obvious gender distinction, a potential race effect (Whites notably more likely to report recent masturbation than Blacks and Hispanics), a linear education effect, and a modest association with masturbation among those who were not currently partnered.

In Table 2, we examined this relationship more closely by reporting masturbation rates separately by gender, sexual frequency, and contentment with amount of sex. The figures in parentheses indicate the number of participants in each category in this table. We again found that masturbation rates were strongly associated with whether or not the individual indicated contentment with the amount of sex they reported having, sorted by frequency of sex in the past 2 weeks. Within the group of individuals who reported no sex in the past 2 weeks, masturbation rates were 29 percentage points lower for men and 30 percentage points lower for women who reported being content than for those men and women who said they wanted to have more sex. This difference persisted even at elevated levels of recent sex. For example, among those who reported having had sex four or more times in the past 2 weeks, masturbation rates were 15 percentage points lower for men and 23 percentage points lower for women who were content with their sexual frequency than for those who wanted to have more sex. These associations suggest that the relationship between sexual frequency and masturbation may be more about subjective desire for sex than any objective measure of time since last sex.

Among women who were content with their sexual frequency, those who have more sex were more likely to report masturbation, with masturbation rates of 21% for women who reported having no sex in the past 2 weeks compared to a

Table 1 Summary estimates sorted by recent masturbation

	Masturbated in the past 2 weeks		
	Yes	No	*F*
Age	38.6 years	40.8 years	($t = -6.5$)
Female	35%	65%	392.3*
Male	61%	39%	
Partnered	45%	55%	28.7*
Not partnered	54%	46%	
Race/ethnicity			
White	52%	48%	34.4*
Black	37%	63%	
Hispanic	35%	65%	
Other race	56%	44%	
Education			
Less than high school	29%	71%	47.8*
High school	41%	59%	
Some college	52%	48%	
Bachelor's degree or more	55%	45%	
Sexual frequency (past 2 weeks)			
Never	49%	51%	6.3*
Once	53%	47%	
2–3 times	47%	53%	
4+ times	44%	56%	
Content with amount of sex	35%	65%	486.4*
Not Content with amount of sex	64%	36%	
N	7220	6891	

Weighted chi-squared test with Rao and Scott adjustment

* $p < .01$

masturbation rate of 33% for women who reported having sex four or more times. (The increase was linear across four frequencies.) This suggests at face value that sex and masturbation are apt to be complements for women who are achieving their desired frequency of sex. For men who were content with their amount of sex (about 43% of men), there was very little association between sexual frequency and masturbation, with masturbation rates hovering in a nonlinear manner within five percentage points of 50%, regardless of sexual frequency.

Men who said they were not having sex as often as they would like both reported the highest levels of masturbation overall and exhibited the strongest association between sexual frequency and masturbation. Among sexually discontented men, the masturbation rate for those who have had no sex in the past 2 weeks was 79%, compared with 60% for men who have had sex four or more times. This time it was a linear association, suggesting that masturbation is more apt to be an additional alternative to sex among men if they are not experiencing their desired amount of sex. In contrast, among women who were discontented with their frequency of sex, recent masturbation rates varied little, ranging from 50 to 56%. Notably, their overall recent masturbation rates—and lack of obvious association with recent sex—were largely similar to that of sexually contented men.

Table 3 shows that these differences (by contentment) persisted in logistic regression models that accounted for race, education, age, partnered status, and recent sexual frequency. The results displayed there indicate that partnered status—a measure of sexual access or opportunity—was powerfully inversely associated with the odds of reporting having masturbated within the past 2 weeks, a finding that held among both sexually contented and discontented men and women. The odds of partnered men and women to have masturbated in the past 2 weeks were significantly lower across the board than men and women who were not partnered, regardless of recent sexual frequency. It bears keeping in mind, then, that recent sexual frequency is just that—recent—and may well fluctuate.

Among men who were content with their sexual frequency, we saw few discernible trends in the likelihood of masturbation

Table 2 Percent reporting having masturbated within the past 2 weeks, sorted by frequency of recent sex and level of contentment with frequency of sex

	Men		Women	
	Content	Not Content	Content	Not Content
No sex	50%	79%	21%	51%
	(524)	(1354)	(371)	(761)
Sex once	54%	73%	26%	55%
	(202)	(491)	(142)	(190)
2–3 times	48%	69%	29%	50%
	(350)	(553)	(301)	(205)
4+ times	45%	60%	33%	56%
	(513)	(311)	(380)	(152)

Weighted chi-squared test with Rao and Scott adjustment ($F = 42.89, p < .01$ for men, $F = 36.39, p < .01$ for women). The weighted sample size of each cell is given in parentheses. Survey weights are employed in the calculation of the percentages

Table 3 Odds ratios from logistic regressions predicting masturbation within past 2 weeks

	Men		Women	
	Content	Not content	Content	Not content
Sexual frequency past 2 weeks				
Once	1.47	0.97	1.51*	1.30
	(0.21)	(0.16)	(0.19)	(0.18)
2–3 times	1.21	0.76	1.74**	1.14
	(0.17)	(0.16)	(0.16)	(0.18)
4 + times	1.16	0.61**	2.16**	1.26
	(0.17)	(0.18)	(0.17)	(0.25)
Partnered	0.53**	0.42**	0.71*	0.60**
	(0.18)	(0.17)	(0.17)	(0.15)
Observations	2978	3938	4528	2585

Standard errors for odds ratios are reported in parentheses. All regressions employ controls for age, race and education

** $p < .01$; * $p < .05$

based on recent sexual frequency, save for greater odds of having masturbated among those who reported sex once (compared with those who reported no sex). Those who reported having sex 2–3 times—or four or more times—in the past 2 weeks displayed statistically indistinguishable odds of having masturbated in the past 2 weeks as men who reported having no sex at all. However, the pattern was different for men who were sexually discontented. Among them, the odds of recent masturbation among those who have had sex 2–3 times, or 4 or more times, in the past 2 weeks were significantly lower than those who have not had sex at all in the past 2 weeks.

For women, the pattern appeared to be reversed. The odds of recent masturbation among women who reported being content with their sexual frequency were more than twice as high if they had had sex four or more times when compared to those who not had any sex in the past 2 weeks (OR = 2.16). In this way, sex and masturbation again appeared complementary among them. Meanwhile, there was no discernible association, net of controls, between frequency of recent sex and masturbation for women who reported sexual discontentment.

In Table 4, we examined the relationship between recent masturbation and sexual contentment using another approach. Instead of analyzing contented and discontented men and women separately (i.e., as four separate samples), we modeled recent masturbation using data for all men and for all women and included sexual contentment as a predictor variable. The two baseline models (column 1 for men and column 3 for women) revealed information comparable to that found in Table 3. Partnered men and women exhibited significantly lower odds of recent masturbation (50 and 67% as high) than unpartnered men and women, respectively, even after controlling for both recent sex and sexual contentment—pathways by which one presumes sexual partnership affects masturbation. This provided evidence that the effect of partnered status is *not* simply the effect of stable access to sex. Moreover,

Table 4 Odds ratios from logistic regressions predicting masturbation within past 2 weeks, before and after interaction effects with sexual contentment

	Men		Women	
Sexual frequency past 2 weeks				
Once	1.17	0.94	1.39*	1.27
	(0.12)	(0.16)	(0.13)	(0.19)
2–3 times	0.97	0.75	1.48**	1.15
	(0.12)	(0.15)	(0.12)	(0.17)
4 + times	0.90	0.61**	1.83**	1.29
	(0.12)	(0.18)	(0.13)	(0.24)
Content with amount of sex	0.36**	0.25**	0.31**	0.25**
	(0.09)	(0.14)	(0.09)	(0.13)
Sex once*content		1.68*		1.25
		(0.25)		(0.25)
Sex 2–3 times*content		1.76*		1.59*
		(0.22)		(0.22)
Sex 4 + times*content		2.04**		1.72*
		(0.23)		(0.28)
Partnered	0.50**	0.48**	0.67**	0.66**
	(0.12)	(0.12)	(0.11)	(0.11)
Observations	6952	6952	7159	7159

Standard errors for odds ratios are reported in parentheses. All regressions employ controls for age, race and education

** $p < .01$; * $p < .05$

the recent frequency of sex was strongly associated with greater likelihood of masturbation in women only (in the baseline models).

To see if the relationship between recent masturbation and sexual contentment depended on sexual frequency, we added interaction terms to the models. The interaction-effects models appear in columns 2 and 4. The significance of the interaction

between sexual frequency and sexual contentment showed that the effect of sexual contentment on recent masturbation was indeed different for different amounts of recent sex. Because of the interaction terms, the odds ratios in columns 2 and 4 require particular care in interpretation. The odds ratio for sexual contentment in these models should be interpreted as odds ratios only for men and women who have not had sex in the past 2 weeks, since the unique effect of sexual contentment on recent masturbation coefficients are conditioned on the moderator—frequency of recent sex—being zero (Jaccard, 2001). Similarly, the odds ratio for sexual frequency should be interpreted as the effects of recent sexual frequencies (on recent masturbation) for men and women who were discontented with their sex lives (that is, contentment = 0).

Given these qualifications, the estimates documented that—among discontented women—sexual frequency predicted greater likelihood of recent masturbation. Put differently, women who reported an active (recent) sexual life but nevertheless articulated discontentment with the frequency of sex were more apt to masturbate recently than women who had not had sex recently (but were similarly discontented). Indeed, the column 4 model estimates revealed that the significant differences by sexual frequency that we observed in column 3 were largely driven by those women who were content with their level of sexual frequency.

The interaction terms between contentment and frequency of sex require similar diligence in interpretation. For example, the significant odds ratio of 1.68 (for men, second column) indicated that the odds of recent masturbation among sexually contented men who have had sex once in the past 2 weeks were 1.68 times as high as contented men who have not had any sex in the past 2 weeks. For another example, the odds of recent masturbation among sexually contented women who have had sex four or more times in the past 2 weeks were 1.72 times as high as contented women who reported no recent sex. Interpreted in light of the baseline models in columns 1 and 3, then, we can assert with confidence that the apparent effect of recent sex on masturbation among women was moderated (almost entirely) by sexual contentment.

To help visualize the interaction effects, Figs. 1 and 2 display a series of predicted probabilities of having masturbated in the past 2 weeks separately for partnered and unpartnered men and women, respectively. Predicted probabilities at different levels of sexual frequency appear for participants sorted by contentment.[5] And besides the different baseline probabilities for men (Fig. 1) and women (Fig. 2), the graphs visually revealed the obvious effect of sexual discontentment; these are the topmost lines, and hence greatest probability of having masturbated (in nearly all cases).

The figures reinforced the limitation of recent sexual frequency as a simple linear predictor of masturbation. Decisions to masturbate seemed far more dependent on subjective sentiments about unmet desire than about objective levels of recent sex.

Discussion

What does recent sex and sexual contentment have to do with masturbation among adult men and women? It is safe to say that they are not independent. But the association between sexual frequency and masturbation appears "masked." It largely failed to materialize until we tested for its contingency on sexual contentment. When we did, the compensatory model modestly fits sexually unsatisfied men, and a complementary model fits sexually satisfied women. That is, results among men revealed that for those who would prefer more sex, recent sex mildly reduced masturbation. In the presence of sexual contentment among women, increasing sexual frequency was associated with a modest increase in masturbation, a finding in keeping with some previous claims (Gerresu et al., 2008).

Given that those are the normative states for men and women—57% of women reported contentment, but only 42% of men did so—it is no surprise that many have associated the compensatory model with men and the complementary model with women. But the popular assumption that the compensatory model fits men in general, and the complementary model fits women in general, should be dismissed, because the empirical reality suggests that both models are contingent on sexual desire (which happens to vary by sex/gender), and that additional sexual desire (or discontentedness) was indeed the key predictor of masturbation for both men and women. This is visible in Figs. 1 and 2, where the gaps *between* the lines were far more pronounced than the slopes of those lines—that is, the effects of additional recent sex.

That pattern was already visible in Table 1, where we learned that while 35% of adults who reported sexual contentment had masturbated in the previous 2 weeks, 64% who were discontented had also done so. Indeed, overall masturbation rates among both men and women who wanted more sex were high and the slopes pretty mild. Hence, sexual frequency exhibited a weaker and more contingent relationship with masturbation than expected by either model. Subjective sexual contentment, on the other hand, was central to understanding masturbation patterns among both men and women. In fact, sexually discontented women masturbated at rates comparable to sexually contented men.

[5] The predicted probabilities were calculated for each individual case. We took the mean predicted probability for all combinations of partnered, sexual contentment, and frequency of sex, rather than calculate probabilities based on logistic models using specific values for the covariates (i.e., age = mean age, education = some college, race = White, Black, or Hispanic). In other words, it was a two-step process rather than a single step process. .

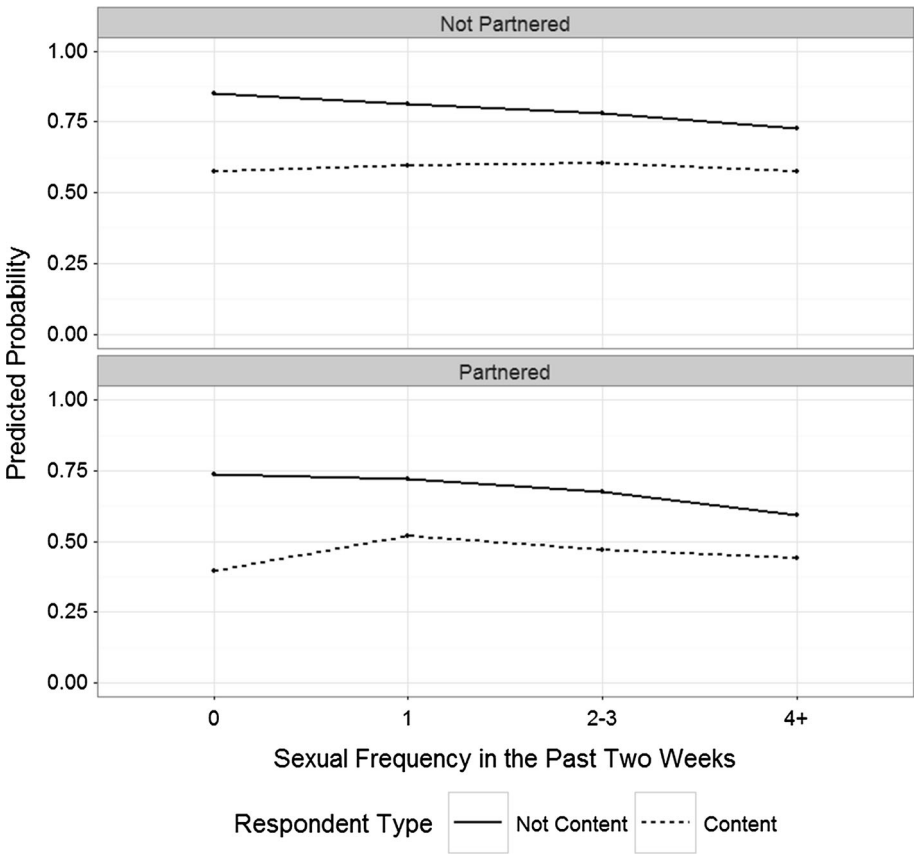

Fig. 1 Predicted probabilities of masturbating in the last 2 weeks (Men)

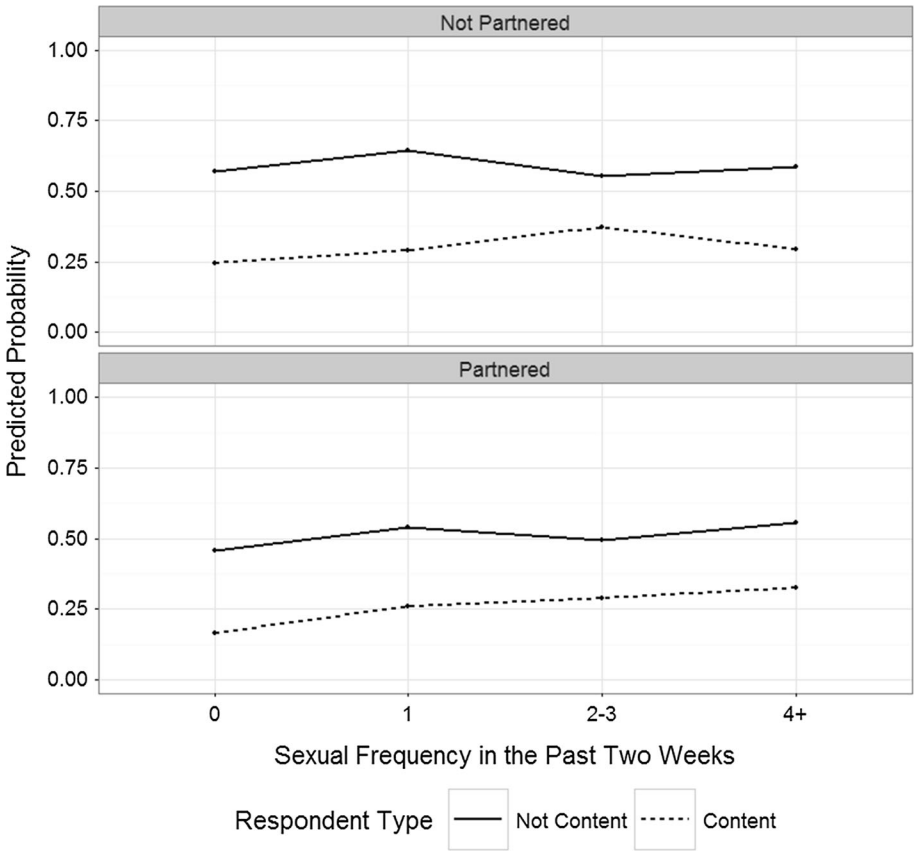

Fig. 2 Predicted probabilities of masturbating in the last 2 weeks (Women)

By itself, sexual discontentedness does not signal support for either the complementary or the compensatory hypothesis, since discontentedness was not tightly dependent on frequency of sex, but instead hinged on meeting or falling short of personal (yet undoubtedly socialized) sexual expectations and wishes. This conclusion flies in the face of long-standing popular assumptions (nested in the compensatory model) that men simply or mechanically replace a lack of sexual access with masturbation. Masturbation hence has much to do with subjective psychosexual states—including the unmeasured but certainly variable stimulation of sexual desire—rather than any fixed physical need for periodic sexual release. This deserves further consideration itself.

Another noteworthy result was the stable influence (against masturbation) of having a sexual partner, independent of sexual frequency and contentment (and controlling for age, etc.). This constitutes a curiosity of sorts, since one might expect having a partner to be associated with masturbation via access to sex, not in spite of it. Instead, the "partnered" odds ratio appeared to be affected only modestly by the addition of other predictor variables. Perhaps participants in a sexual union tend to anticipate the possibility of sex with their partner and hence perceive either less felt need to masturbate or wish to focus their sexual energy on the probability of upcoming coupled sex. For those not in sexual unions, masturbation may be perceived as more predictable than forthcoming coupled sex.

Limitations

Our study was limited by the fact that sex was not defined for participants when they were asked about their contentment levels; participants were left to define sex for themselves. Some might limit sex to coitus, while others might include a variety of other sexual activities in their definitions of sex. However, a study of university students asked participants to categorize a number of sexual activities as "sex" or not. It found that only 10% of students categorized "Masturbating in each other's presence to orgasm" as sex (Byers, Henderson, & Hobson, 2009). Although our survey did not ask about solo masturbation, it is unlikely that solo masturbation would be considered "sex" by most if masturbation in the presence of a partner was not. And while a question that specifically defined "sex" would have been preferable to the more general question that was asked, we do not believe that this substantially affected the results of our study.

Second, our study was limited by the fact that we did not know the participants' actual desired frequency of sex, only the general presence of contentedness. Future research would benefit by knowing the magnitude of the deviation of a participant's actual sexual frequency from their desired frequency, as well as better understanding the social sources that (artificially) stimulate or suppress sexual desire in men and women.

Conclusion

To summarize, then, we set out to test the compensatory and complementary models of the association between masturbation and the frequency of recent sex among adult men and women. We noted little independent association between masturbation and frequency of sex; it was contingent on contentment for both men and women. Women who were contented with their sex lives appeared more apt to supplement recent sex with masturbation, while men who were not content with their sex lives were mildly less likely to masturbate as instances of recent sex increased. (And contentedly sexless persons were consistently less apt to masturbate.) But each of those models—and their concern with sexual frequency—seem far less effective at predicting masturbation than a general consistent effect of subjective sexual discontent. Hence, neither the compensating nor the complementing that are going on are profound patterns, and they are each contingent on subjective contentment with recent sexual frequency. Our results provided evidence that deviations from desired sexual frequency were more important in predicting masturbation than actual frequency of paired sex.

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Compliance with Ethical Standards

Conflict of interest Regnerus and Price are uncompensated fellows of the Austin Institute, and Gordon was formerly a paid research assistant of the Austin Institute. Regnerus was the principal investigator of the Relationships in America survey data collection project.

Ethical Approval The Relationships in America survey data collection project was approved by the Institutional Review Board of the University of Texas at Austin and was performed in accordance with the ethical standards as laid down in the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards.

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