Medical Marijuana Program

450 Columbus Blvd., Suite #901, Hartford, CT 06103-1840 • (860) 713-6066
Fax: (860) 706-5361 • **E-mail**: dcp.mmp@ct.gov • **Website**: www.ct.gov/dcp/mmp

Petition to Add a Medical Condition, Medical Treatment or Disease to the List of Debilitating Conditions

INSTRUCTIONS: Please complete each section of this Petition and attach all supportive documents. All attachments must include a title referencing the Section letter to which it responds. Any Petition that is not fully or properly completed will not be submitted to the Board of Physicians.

Please Note: Any individually identifiable health information contained in a Petition shall be confidential and shall not be subject to disclosure under the Freedom of Information Act, as defined in section 1-200, Connecticut General Statutes.

Section A: Petitioner's Information

[redacted]

Section B: Medical Condition, Medical Treatment or Disease

Please specify the medical condition, medical treatment or disease that you are seeking to add to the list of debilitating medical conditions under the Act. Be as precise as possible in identifying the condition, treatment or disease.

Female Orgasmic Difficulty/Disorder (FOD)

Section C: Background

Provide information evidencing the extent to which the condition, treatment or disease is generally accepted by the medical community and other experts as a valid, existing medical condition, medical treatment or disease.

- Attach a comprehensive definition from a recognized medical source.
- Attach additional pages as needed.

Please see attached.

Section D: Negative Effects of Current Treatment

If you claim a treatment, that has been prescribed for your condition causes you to suffer (i.e. severe or chronic pain, spasticity, etc.), provide information regarding the extent to which such treatment is generally accepted by the medical community and other experts as a valid treatment for your debilitating condition.

- Attach additional pages as necessary.
- If not applicable, please indicate N/A.

Please see attached.

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Section E: Negative Effects of Condition or Treatment

Provide information regarding the extent to which the condition or the treatments thereof cause severe or chronic pain, severe nausea, spasticity or otherwise substantially limits one or more major life activities.

- Attach additional pages as necessary.

Section F: Conventional Therapies

Provide information regarding the availability of conventional medical therapies, other than those that cause suffering, to alleviate suffering caused by the condition or the treatment thereof.

- Attach additional pages as necessary.

Section G: General Evidence of Support for Medical Marijuana Treatment

Provide evidence, generally accepted among the medical community and other experts, that supports a finding that the use of marijuana alleviates suffering caused by the condition or the treatment thereof.

- Attach additional pages as necessary.

Section H: Scientific Evidence of Support for Medical Marijuana Treatment

Provide any information or studies regarding any beneficial or adverse effects from the use of marijuana in patients with the condition, treatment or disease that is the subject of the petition.

- Supporting evidence needs to be from professionally recognized sources such as peer reviewed articles or professional journals.
- Attach complete copies of any article or reference, not abstracts.

Attached via email

Section I: Professional Recommendations for Medical Marijuana Treatment

Attach letters in support of your petition from physicians or other licensed health care professionals knowledgeable about the condition, treatment or disease at issue.

To be sent via email

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Section J: Submission of Petition

In the event you are unable to answer or provide the required documentation to any of the Sections above (excluding Section D); provide a detailed explanation indicating what you believe is "good cause" for not doing so.

- Attach additional pages as necessary.

n/a

I hereby certify that the above information is correct and complete.

My signature below attests that the information provided in this petition is true and that the attached documents are authentic. I formally request that the commissioner present my petition and all supporting evidence to the Board of Physicians for consideration.

Signa [redacted]

Date Signed: 9/20/23

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AN ATTITUDE SURVEY OF THE EFFECTS OF MARIJUANA ON SEXUAL ENJOYMENT

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Determined attitudes on the effects of marijuana on sexual enjoyment by self-report for a group of 84 graduate students of health sciences. The students were grouped in three categories: those who had sexual experience while under the influence of marijuana (experienced smokers), those who have smoked marijuana but who have not had such experience (non-experienced smokers), and non-smokers. Results are again inconclusive despite the fact that a majority in each category responded in a positive manner to the initial question concerning the effect of marijuana on the enjoyment of sexual intercourse. There is sufficient support to indicate that at least some experienced smokers have derived an enhancement of sexual pleasure while they were using marijuana. The implication is that there may be value in researching the use of marijuana in treatment of sexual disorders.

One of the persistent questions related to marijuana usage is that of its effect on sexual performance and enjoyment. Part of the mystique associated with marijuana usage involves its purported qualities as an aphrodisiac. Although marijuana long has been rumored to have these qualities, little systematic research has been directed to this area. Nevertheless, there are several accounts of an enhancement of sexual pleasure as an effect of marijuana usage (Brown & Stickgold,

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[2]Appreciation is expressed to Clifford Hurndon for his assistance in the preparation of this manuscript.

1974; Chausow & Saper, 1974; Hager, 1975). Bouguet (1950) stated that in North Africa and Egypt there is a strong belief that marijuana enhances sexual satisfaction and that this is an important cause for initiating use. Chopra and Chopra (1967) reported that 10% of a sample of approximately 1200 users listed increased sexual excitement as a cause that led to the cannabis habit. Goode (1969) surveyed 200 marijuana users with regard to the effects of marijuana on sexual enjoyment. In response to the question, "Do you think being high on marijuana stimulates sex interest, or not?", 38% replied that it did not; 5% replied that it had a decidedly negative effect; 13% replied that the effect depended on either their mood, partner or both; but 44% replied that marijuana definitely increases their sexual desire. With respect to the male-female response pattern, 39% of the men and 50% of the women claimed increased sexual interest. There is, however, insufficient evidence at the present time for conclusive statements on the relationship between marijuana and sexual enjoyment. The need for further investigations in this area is obvious. The present study is an assessment of attitudes with regard to the effects of marijuana on sexual excitement.

Method

Subjects and Instruments

Eighty-four graduate students of health sciences enrolled in a southeastern medical center served as *Ss*. A 57-item multiple choice and true-false questionnaire was developed by one of the authors to determine the attitudes of the individuals in the sample with regard to sexual behavior and marijuana usage as well as the actuarial characteristic of the sample. Included among these questions were 15 Lie (L) scale items from the MMPI[3] (Reproduced by permission for research purpose only. Copyright 1943, renewed 1970 by the University of Michigan. Published by The Psychological Corporation, New York, N.Y. All rights reserved.) These questions were used as a rough validity check of the responses.

Fifty-one percent of the 84 students in this survey were between the ages of 24 and 28; 44% were between the ages of 19 and 23. As might be expected, only 4% of the students were above 28 and 1% below 18 years of age. Seventy-eight percent of the respondents were male and 22% female.

Procedure

An explanation of the purpose of the questionnaire (i.e., to investigate the perceived effects of marijuana on sexual pleasure and satisfaction) was given to the students in a classroom setting. Individuals who had participated in sexual activity while under the influence of marijuana were asked to complete the questionnaire with respect to their personal experience. Those who had not had such experience, whether or not they had ever used marijuana, were asked to answer the question in terms of what they thought the relationship between marijuana and sexual activity would be.

The completed questionnaires were collected and the answers tabulated. Individuals who scored above 11 on the Lie scale questions and those who neglected to note whether they were experienced users of marijuana were omitted from further consideration. Eleven questionnaires were eliminated for these reasons.

Results

A majority of the sample (59 of 84) reported that they had at least once, but most of these smokers reported their use as less than 15 times. Thirty-nine percent of those surveyed reported that they had engaged in sexual intercourse

[3]Since there is evidence to indicate that item responses obtained to selected items isolated from the context of a personality inventory may not be comparable to those obtained within the context, the results of this research should not be considered applicable to the standardized complete form of the inventory.

while under the influence of marijuana. Of the remainder of the sample, 26 were smokers and 25 were not. Since all *Ss* were asked to complete the questionnaire regardless of their experience, the data are best viewed with a consideration of three *S* types: Experienced smokers (33 *Ss*), non-experienced smokers (26 *Ss*), and non-smokers (25 *Ss*). The pertinent results are presented in Table 1.

TABLE 1

GROUP RESPONSES TO QUESTIONS THAT CONCERN EFFECT OF MARIJUANA ON SEXUAL PLEASURES

Question	A Experienced smokers ($N = 33$) (%)	B Non-experienced smokers ($N = 26$) (%)	C Non-smokers ($N = 25$) (%)	D Total ($N = 84$) (%)
34. Marijuana usage has the following effect on enjoyment and satisfaction associated with sexual intercourse:				
A. Increases pleasure	88	77	52	74
B. Decreases pleasure	6	8	20	11
C. No effect	6	15	28	15
35. While under the influence of marijuana the sensations associated with sexual intercourse are:				
A. Positive effect	48	69	48	55
B. Negative effect	12	12	12	12
C. No effect	36	19	24	27
D. No response	4	0	16	6
46. Marijuana usage has the following effect on the frequency of engaging in sexual intercourse:				
A. Positive effect	27	38	32	32
B. Negative effect	3	15	12	10
C. No effect	64	46	44	52
D. No response	6	1	12	6
49. My partner's use of marijuana has the following effect on my sexual enjoyment:				
A. Increases pleasure	48	54	44	49
B. Decreases pleasure	3	8	4	44
C. No effect	12	38	52	5
D. No response	7	0	0	2
51. Marijuana usage affects the satisfaction and enjoyment associated with oral sex as follows:				
A. Increases pleasure	42	54	20	39
B. Decreases pleasure	3	15	20	12
C. No effect	39	27	52	39
D. No response	16	4	8	10
52. I engage in more varied sexual activity while under the influence of marijuana:				
A. More varied	12	54	40	33
B. No more varied	76	42	40	55
C. No response	12	4	20	12
53. Marijuana usage affects the frequency of my engaging in oral-genital sex as follows:				
A. Positive effect	24	38	28	30
B. Negative effect	0	4	4	2
C. No effect	64	54	56	58
D. No response	12	4	12	10

TABLE 1 (continued)

Question	A Experienced smokers (N = 33) (%)	B Non-experienced smokers (N = 26) (%)	C Non-smokers (N = 25) (%)	D Total (N = 84) (%)
54. When both my partner and I use marijuana, sexual pleasure and satisfaction is affected as follows:				
A. Increases pleasure	76	65	32	60
B. Decreases pleasure	3	8	16	8
C. No effect	12	23	40	24
D. No response	9	4	12	8
55. The use of marijuana has the following effect on the intensity of sexual orgasm:				
A. Increases intensity	58	35	36	44
B. Decreases intensity	6	15	12	11
C. No effect	27	46	40	37
D. No response	9	4	12	8
57. An aphrodisiac increases sexual pleasure and I feel marijuana is an aphrodisiac.				
A. True	61	35	36	45
B. False	27	50	50	44
C. No response	12	15	14	11

Experienced smokers (cf. Table 1) held the most positive views on the pleasure-enhancing effects of marijuana. Marijuana was seen as increasing sexual pleasures and sensations as well as the intensity of orgasm. Usage by the partner or by both individuals was seen as enhancing sexual enjoyment. In general, these students did not feel that marijuana had any major effect on the frequency of sex or oral sex. The majority of this group (61%) considered marijuana an aphrodisiac.

Non-experienced smokers (see Table 1) differed only slightly in their ideas about how marijuana would influence sexual behavior. Marijuana was felt by most students to increase pleasure and sensations associated with sexual intercourse and oral sex. Usage by the partner or by both members was viewed as enhancing pleasure. In general, marijuana was felt to have little or no effect on the frequency of intercourse or oral sex, the variety of sexual encounters, or the intensity of orgasm. In contrast to experienced smokers, this group did not consider marijuana to be an aphrodisiac.

Non-smokers (cf. Table 1) conceded that marijuana would increase the pleasure and sensations of sexual intercourse, but in general viewed marijuana as having no effect. Similarly, marijuana was not considered an aphrodisiac.

When the total sample (cf. Table 1) is considered, highest percentages of positive responses are seen in those items that pertain to increased pleasure, sexual sensations, and intensity of orgasms as well as increasing variety of sexual experiences. Smoking by both partners also is viewed as enhancing pleasure. Respondents reported no effect or a split decision on marijuana's effect on frequency of intercourse or oral sex, and pleasure associated with oral sex, as well as pleasure associated with partner's usage. Similarly, the aphrodisiac question was a split decision; 45% viewed marijuana as an aphrodisiac and 44% said no. Yet, very few respondents felt that marijuana would decrease pleasure or have deleterious effects.

Discussion

The results of this study revealed rather complicated attitudes about the effects of marijuana on sexual excitement, yet several general statements are apparent. Enthusiasm for marijuana as an agent that enhanced sexual pleasure was most prominent in the group of experienced smokers, with the non-experienced smokers and non-smokers following in that order. Very few *Ss* in any of the groups felt that marijuana use would decrease pleasure or have negative effects, yet only the experienced smokers considered marijuana to be an aphrodisiac.

There are at least two possible explanations for the mode of action of marijuana in this regard. The first is that smokers are more inhibited or sexually conflicted and that cannabis use is directed at lessening inhibitions, decreasing anxiety, and/or repressing conflicts. Brill and Christie (1974) in their follow-up study of the psychosocial adaptation of a collegiate population speculated that although users are sexually more active, they are also more maladjusted with regard to sex and marriage. If marijuana is being used to diminish sexual inhibitions, the mechanism might be similar to the punishment-lessening effects of benzodiazepines (Stein, Belluzzi, & Wise, 1977). Winstead and his associates (Winstead, Blackwell, & Lawson, 1978) have viewed drug use as a biological coping device aimed at decreasing an individual's level of discomfort, which is seen as a combination of internal personality susceptibility and external enviromental stress. Such a theory would view marijuana use at the time of a sexual encounter as an individual's attempt to cope with the stress of the situation.

An alternate explanation is that marijuana enhances sexual pleasure by a direct euphorogenic mechanism. Research by Heath and his associates (Heath, 1964, 1972; Heath & Gallant, 1964; Heath, John, & Fontana, 1968) suggests that the active constituents of marijuana produce a unique effect on the activity of brain cells associated with pleasureable feelings. Other data confirm this, as marijuana users have been found to begin sexual experience at an earlier age and to have more sexual experience as well as a more liberal attitude toward sex (Hochman & Brill, 1973). Pleasure enhancement also might be related to marijuana's reported influence on temporal span of awareness and the secondary increase in concentration on present events (Melges, Tinklenberg, Hollister, & Gillespie, 1971).

Obviously both mechanisms might be possible in different individuals or in the same individual at different points in time. Alternately, the effects merely may be dose-related.

Unfortunately, our present study does not answer this question of mode of action. Further research is necessary before any definitive answers are available. Nevertheless, the possibility that marijuana has a role as a treatment adjunct for sexual dysfunctions should be explored.

When one is considering the results of this study, it is important to note several limitations. As is true in much survey research, the validity of individual responses is almost impossible to verify, although an attempt to do so has been made here by inclusion of the Lie scale items from the MMPI. Also, the limited nature of the sample in terms of socioeconomic background must be considered as well. Obviously generalization beyond equivalent samples is questionable at best. Problems of multiple drug use and the confounding effects of drug interactions have not been addressed in spite of the known pattern of simultaneous alcohol and marijuana use (Kandel & Faust, 1975). It is the intention of the authors to present these findings not as conclusive, but for their heuristic value for further investigations.

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SEXUAL MEDICINE ORIGINAL RESEARCH

Assessment of the Association of Cannabis on Female Sexual Function With the Female Sexual Function Index

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ABSTRACT

Introduction: Cannabis use has increased in the last decade, and the impact of cannabis on female sexual function remains unclear.

Aim: To assess the impact of frequency of use, chemovar (tetrahydrocannabinol, cannabinol, or both) type, and method of consumption on female sexual function among cannabis users.

Methods: Adults who visited a single-partner cannabis dispensary's locations were invited to participate in an uncompensated, anonymous online survey October 20, 2019 and March 12, 2020. The survey assessed baseline demographics, health status, cannabis use habits as well as used the validated Female Sexual Function Index (FSFI) to assess sexual function.

Main Outcome Measure: The main outcomes of this study are the total FSFI score (sexual dysfunction cutoff <26.55) and subdomain scores including desire, arousal, lubrication, orgasm, satisfaction, and pain.

Results: A total of 452 women responded with the majority between the ages of 30−49 years (54.7%) and in a relationship or married (81.6%). Of them,72.8% reported using cannabis more than 6 times per week, usually through smoking flower (46.7%). Women who reported more cannabis use, reported higher FSFI scores (29.0 vs 26.7 for lowest vs highest frequencies of reported use, $P = .003$). Moreover, an increase in cannabis use frequency by one additional use per week was associated with an increase in total FSFI ($\beta = 0.61$, $P = .0004$) and subdomains including desire domain ($P = .02$), arousal domain ($P = .0002$), orgasm domain ($P = .002$), and satisfaction domain ($P = .003$). For each additional step of cannabis use intensity (ie, times per week), the odds of reporting female sexual dysfunction declined by 21% (odds ratio: 0.79, 95% confidence interval: 0.68−0.92, $P = .002$). Method of consumption of cannabis and chemovar type did not consistently impact FSFI scores or odds of sexual dysfunction.

Conclusion: Increased frequency of marijuana use is associated with improved sexual function among female users, whereas chemovar type, method of consumption, and reason for use does not impact outcomes. **Kasman AM, Bhambhvani HP, Wilson-King G, et al. Assessment of the Association of Cannabis on Female Sexual Function With the Female Sexual Function Index. Sex Med 2020;XX:XXX−XXX.**

Key Words: Cannabis; Marijuana; Female Sexual Function; Female Sexual Dysfunction; FSFI

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All authors have completed the ICMJE uniform disclosure form at www.icmje.org/coi_disclosure.pdf and declare no support from any organization for the submitted work; no financial relationships with any organizations that might have an interest in the submitted work in the previous 3 years; no other relationships or activities that could appear to have influenced the submitted work.

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INTRODUCTION

The impact of cannabis use on sexual function is a matter of debate. An estimated 22.2 million people within the United States use cannabis monthly, and there are more than a 100 million lifetime users.[1−3] There have been major policy changes governing cannabis use since the 1960s as calls for legalization began with medical legalization in 1996 by California followed by adult use in 2012 by Colorado and Washington State.[4] There are now 29 states, and the District of Columbia have legalized use of cannabis either for medical or adult use.[5] As legalization has become more prevalent and users have become more widespread, there is a need to better understand the systemic effects of cannabis.[6]

Cannabis' effect on sexual arousal and sex steroid hormones has been previously studied.[7,8] Women who use cannabis have reported increased sexual frequency and increased endocannabinoids have been associated with increased arousal; however, examination of sexual function with regard to cannabis has led to conflicting reports.[7,9] Prior studies have either examined sexual function using a mix of validated and non-validated instruments with varied results.[10,11] Although a few studies have found a positive dose-dependent effect on arousal and shown a positive effect with pleasure, these studies have been small and have not examined other domains of female sexual function such as lubrication, pain, and overall satisfaction.[12] Interestingly, a large Australian survey found that men who used cannabis were more likely to report impaired sexual function, whereas women cannabis users did not have higher rates of sexual dysfunction.[13] To date, no studies have examined female sexual function with a validated survey in a large sample size nor have examined the impact of the cannabis chemovar (categorization of a plant species based on chemical composition, eg, tetrahydrocannabinol [THC] or cannabinol [CBD] dominant) or the method of consumption. Chemovar may be important as the receptors for THC and CBD are different, which may account for the psychoactive effects of THC compared with CBD.[14] Therefore, we sought to characterize the association between female sexual function and cannabis use by using a validated questionnaire (Female Sexual Function Index [FSFI]) using a U.S. population.

METHODS

Study Population

After institutional review board approval, adults who visited a single-partner cannabis dispensary were invited to participate in an uncompensated, anonymous online survey via a provided hyperlink or QR code upon purchase between October 20, 2019 and March 12, 2020. The partner dispensary was chosen based on a large customer base and willingness to distribute our survey. The survey was distributed throughout all locations of the partner dispensary.

Survey Instruments

All participants were administered the same anonymous survey in the English language via the online survey platform Qualtrics (Provo, UT). Informed consent was waived given the online nature of the survey, and waiver of documentation was provided before proceeding with the survey. The first half of the survey queried participants for demographic information, past medical history, and adult drug use habits. After selection of sex, female participants were directed to the validated FSFI. The FSFI is a validated 19-item survey instrument designed to assess female sexual function over the preceding 4 weeks.[15] It assesses 6 individual domains including desire, arousal, lubrication, orgasm, satisfaction, and pain. Each domain is scored via a Likert scale score from either 0−5 or 1−5 with a cutoff total score of 26.55 to define sexual dysfunction as per previous validation studies to define female sexual dysfunction.[15,16] To score, each domain sum is multiplied by a specific factor ratio and then summed to obtain the total FSFI score with a maximum of 36. As the FSFI was developed and validated in sexually active women, sexually inactive participants were excluded from the analysis.

Covariates

Demographics collected included age, race, primary region of residence (international or per U.S. census divisions), and relationship status. Clinical variables were height, weight, number of visits to a primary care provider in the last 3 months, tobacco smoking history, and the presence/absence of 13 common chronic comorbidities within the United States (ie, hypertension, hypercholesterolemia, diabetes, heart disease, arthritis, lung disease, kidney disease, thyroid disease, cancer, neurologic disease, liver disease, depression, and anxiety).[17] Responses (yes/no) to these variables were collapsed to a single continuous variable, "total comorbidities" for the purpose of analysis. The complete distribution of these comorbidities can be found in Supplemental Table 1.

Cannabis use variables included frequency of use within the last 4 weeks, method of consumption, primary cannabis chemovar (THC or CBD dominant), and reason for use. Options for frequency of use were never, 1−2 times per week, 3−5 times per week, and 6+ times per week. The frequency-response relationship was assessed in our regression analyses by converting this categorical variable to a continuous variable as follows: never users were assigned a value of 0; 1−2 times per week, a value of 1.5; 3−5 times per week, a value of 4; and 6+ times per week, a value of 6.1. These continuous variable values were chosen as the average weekly use frequency of their respective categorical variables. The options for method of consumption included smoking flower, edibles, smoking concentrates/extracts, tincture/oils, vaping, and other. 9 options were given for reason for use after performing a review of the literature: relax/unwind, improve mood, help with pain, help with sleep, help with stress, help with depression, glaucoma, nausea/loss of appetite, and neurologic condition.[18] The complete distribution of reason for use is illustrated in Supplemental Table 1.

Statistical Methods

Patient characteristics and survey responses were analyzed using descriptive statistics, including proportions, median, and mean ± SD. Categorical variables were analyzed by the χ^2 test or Fisher's exact test as appropriate. Normally distributed continuous variables were analyzed by Student's t-test, whereas skewed continuous variables were analyzed by the Wilcoxon rank sum test. Multiple linear regression was used to identify factors associated with the overall FSFI score, as well as each FSFI domain. We used multivariable logistic regression to identify factors associated with female sexual dysfunction. In this analysis, female sexual dysfunction was defined as a FSFI score of less than 26.55.[15] All data were analyzed using R v3.5.3 (R Foundation for Statistical Computing, Vienna, Austria). The significance

Table 1. Cohort demographics and stratification by frequency of cannabis use

Characteristic	Overall	Frequency of cannabis use		
		≥3 times per wk	≤2 times per wk	
N	452	392	60	*P* value
Age, y Overall (range)	42 (20–79)			
<30	67 (14.8)	58 (14.8)	9 (15.0)	.23
30–39	117 (25.9)	101 (25.8)	16 (26.7)	
40–49	130 (28.8)	109 (27.8)	21 (35.0)	
50–59	81 (17.9)	76 (19.4)	5 (8.3)	
60+	55 (12.2)	47 (12.0)	8 (13.3)	
Race (%)				
Caucasian	337 (74.6)	300 (76.5)	37 (61.7)	.02*
Black/African	15 (3.3)	14 (3.6)	1 (1.7)	
Hispanic/Latino	55 (12.2)	45 (11.5)	10 (16.7)	
Other	45 (10.0)	33 (8.4)	12 (20.0)	
Region (%)				
West	159 (35.2)	130 (33.2)	29 (48.3)	.05*
International	96 (21.2)	87 (22.2)	9 (15.0)	
Midwest	34 (7.5)	27 (6.9)	7 (11.7)	
Northeast	81 (17.9)	74 (18.9)	7 (11.7)	
South	75 (16.6)	69 (17.6)	6 (10.0)	
Unknown	7 (1.5)	5 (1.3)	2 (3.3)	
Relationship status (%)				
Married	245 (54.2)	210 (53.6)	35 (58.3)	.59
In a relationship	124 (27.4)	111 (28.3)	13 (21.7)	
Single	79 (17.5)	67 (17.1)	12 (20.0)	
Education (%)				
4-y degree	130 (28.8)	118 (30.1)	12 (20.0)	.01*
2-y degree	67 (14.8)	58 (14.8)	9 (15.0)	
Doctorate	32 (7.1)	27 (6.9)	5 (8.3)	
High school or less	33 (7.3)	33 (8.4)	0 (0.0)	
Professional degree	108 (23.9)	84 (21.4)	24 (40.0)	
Some college	82 (18.1)	72 (18.4)	10 (16.7)	
Weight, lbs (mean [SD])	155.20 (37.44)	154.69 (37.73)	158.48 (35.54)	.47
Height, cm (mean [SD])	165.41 (6.97)	165.43 (6.88)	165.31 (7.54)	.91
PCP visits in last 3 mo (%)				
0	213 (47.1)	181 (46.2)	32 (53.3)	.59
1	170 (37.6)	150 (38.3)	20 (33.3)	
2+	69 (15.3)	61 (15.6)	8 (13.3)	
Cannabis use frequency (%)				
Never	7 (1.5)	0 (0.0)	7 (11.7)	<.001
1–2 times per wk	53 (11.7)	0 (0.0)	53 (88.3)	
3–5 times per wk	63 (13.9)	63 (16.1)	0 (0.0)	
6+ times per wk	329 (72.8)	329 (83.9)	0 (0.0)	
Tobacco use (%)				
Never smoker	203 (44.9)	167 (42.6)	36 (60.0)	.05*
Current smoker	59 (13.1)	56 (14.3)	3 (5.0)	
Former smoker	189 (41.8)	168 (42.9)	21 (35.0)	
Method of consumption (%)				
Smoking flower	211 (46.7)	193 (49.2)	18 (30.0)	<.001*
Edibles	50 (11.1)	38 (9.7)	12 (20.0)	
Other	22 (4.9)	15 (3.8)	7 (11.7)	
Smoking concentrates	24 (5.3)	23 (5.9)	1 (1.7)	

(continued)

Table 1. Continued

Characteristic	Overall	Frequency of cannabis use		
		≥3 times per wk	≤2 times per wk	
N	452	392	60	*P* value
Tincture or oils	69 (15.3)	56 (14.3)	13 (21.7)	
Vaping	73 (16.2)	67 (17.1)	6 (10.0)	
Primary reason for use (%)				
Medical	364 (80.5)	327 (83.4)	37 (61.7)	<.001*
Recreational	88 (19.5)	65 (16.6)	23 (38.3)	
Cannabinoid (%)				
THC dominant	208 (46.0)	189 (48.2)	19 (31.7)	<.001*
Both THC and CBD	192 (42.5)	168 (42.9)	24 (40.0)	
Only CBD dominant	49 (10.8)	35 (8.9)	14 (23.3)	
Total comorbidities (%)				
0	111 (24.6)	87 (22.2)	24 (40.0)	.004*
1	111 (24.6)	94 (24.0)	17 (28.3)	
2	123 (27.2)	110 (28.1)	13 (21.7)	
3+	107 (23.7)	101 (25.8)	6 (10.0)	
FSFI score (mean [SD])				
Total score	28.6 (5.44)	28.9 (5.30)	26.7 (5.98)	.003*
Desire score	3.74 (1.11)	3.8 (1.10)	3.5 (1.12)	.03*
Arousal score	4.7 (1.19)	4.8 (1.17)	4.3 (1.24)	.003*
Lubrication score	5.2 (1.19)	5.2 (1.15)	4.9 (1.43)	.09
Orgasm score	4.9 (1.35)	5.0 (1.32)	4.6 (1.48)	.01*
Satisfaction score	4.74 (1.34)	4.79 (1.32)	4.39 (1.42)	.03*
Pain score	5.27 (1.18)	5.30 (1.12)	5.06 (1.49)	.14

BMI = body mass index; CBD = cannabidiol; FSFI = female sexual function index; OR = odds ratio; PCP = primary care physician; SD = standard deviation; THC = tetrahydrocannabinol.
Comorbidities included hypertension, diabetes, heart disease, arthritis, lung disease, kidney disease, thyroid disease, hypercholesterolemia, cancer, neurologic disease, liver disease, depression, and anxiety.
Region represents primary residence.
*Significant ($P < .05$).

level for all statistical tests was set at <0.05, and all tests were 2 sided.

RESULTS

Survey respondent demographics including age, race, relationship status, education, and cannabis use characteristics are outline in Table 1. In total, 452 women completed the survey with the majority between the ages of 30–49 years (54.7%) and in a relationship or married (81.6%). Most participants were educated with either a 4 year or professional degree (52.7%) and had not seen their primary care physician within the last 3 months (47.1%). Of them, 72.8% reported using cannabis more than 6 times per week in the last 4 weeks, usually through smoking flower (46.7%). Overall, 118 women reported sexual dysfunction with a FSFI score of <26.55.

When stratified by frequency of use (≥3 times per week vs <3 times per week), those who used more frequently had overall higher FSFI scores (28.9 vs 26.7, $P = .003$) and had higher FSFI subdomain scores except for pain (5.3 vs 5.06, $P = .14$). More frequent users tended to smoke flower (49.2% vs 30%) and vape (17.1% vs 10%), whereas less frequent users reported using edibles more commonly (20% vs 9.7%; $P < .001$). In addition, the dominant cannabinoid chemovar that more frequent users reported was THC dominant (48.2% vs 31.7%) compared with CBD dominant (8.9% vs 23.3%, $P < .001$). More frequent users had more comorbidities compared with less frequent users with 25.8% with 3 or more compared with 10% ($P = .004$). The most common reason for cannabis use was to relax (81%) followed by relieve stress (74.1%) and help with sleep (73.9%; Supplemental Table 1).

Demographics, health status (eg, body mass index, primary care provider visits, tobacco use), and cannabis use and methods were assessed in relation to total FSFI and FSFI subdomains using linear regression (Table 2). Women older than the age of 50 years were more likely to have lower total FSFI scores (25.04 vs 27.12, $P = .03$) as were those who had more comorbidities (26.68 vs 27.12, $P = .02$). An increase in cannabis use frequency by one additional use per week was associated with an increase in total FSFI ($\beta = 0.61$, SE = 0.17, $P = .0004$) and subdomains

Table 2. Linear regression models of female sexual function index scores and demographics, health status, and marijuana use habits

	Total FSFI		Desire domain		Arousal domain		Lubrication domain		Orgasm domain		Satisfaction domain		Pain domain	
Characteristic	β	*P* value	β	*P* value	β	*P* value	β	*P* value	β	*P* value	β	*P* value	β	*P* value
Age, y														
<30	Ref		Ref		Ref		Ref		Ref		Ref		Ref	
30–39	−1.32	.12	−0.29	.11	−0.28	.14	−0.08	.69	−0.25	.24	−0.40	.06	−0.02	.91
40–49	−0.32	.71	−0.30	.10	−0.15	.42	−0.09	.62	0.11	.62	−0.08	.73	0.19	.31
50–59	−2.08	.03*	−0.54	.008*	−0.53	.01*	−0.57	.008*	−0.14	.57	−0.16	.51	−0.14	.50
60+	−1.32	.21	−0.48	.03*	−0.22	.34	−0.48	.04	0.29	.27	−0.22	.40	−0.21	.38
Race														
White	Ref		Ref		Ref		Ref		Ref		Ref		Ref	
Black	−1.06	.46	0.02	.94	−0.26	.40	−0.03	.93	−0.58	.10	−0.40	.27	0.18	.56
Hispanic	0.69	.42	0.45	.01*	0.22	.25	0.19	.30	−0.09	.68	−0.11	.62	0.02	.90
Other	−2.12	.02*	−0.21	.27	−0.51	.01*	−0.33	.10	−0.70	.002*	−0.22	.33	−0.16	.42
Relationship status														
Married/in a relationship	Ref		Ref		Ref		Ref		Ref		Ref		Ref	
Single	0.86	.21	0.23	.12	0.43	.005*	0.24	.12	0.06	.71	−0.19	.28	0.09	.57
Region														
West	Ref		Ref		Ref		Ref		Ref		Ref		Ref	
International	−0.18	.82	0.00	.99	−0.08	.63	0.10	.54	−0.05	.80	−0.11	.57	−0.04	.80
Midwest	1.87	.07	0.16	.46	0.37	.09	0.41	.07	0.48	.06	0.51	.05*	−0.06	.78
Northeast	−0.33	.66	−0.05	.77	−0.10	.53	−0.02	.89	−0.04	.82	−0.19	.31	0.07	.66
South	0.79	.30	0.03	.87	−0.03	.85	0.36	.03*	0.00	.99	0.11	.56	0.32	.05*
BMI														
Normal	Ref		Ref		Ref		Ref		Ref		Ref		Ref	
Underweight	−2.91	.11	−0.01	.97	−0.53	.19	−1.14	.01	−0.63	.17	−0.33	.48	−0.28	.49
Overweight	0.34	.59	0.03	.82	0.08	.59	0.08	.55	0.02	.91	−0.05	.73	0.19	.18
Obese	0.16	.85	0.02	.91	0.06	.75	0.12	.52	0.10	.63	−0.21	.33	0.06	.73
Extremely obese	0.43	.65	−0.08	.68	0.06	.76	0.01	.95	0.39	.11	−0.04	.88	0.09	.67
Tobacco use														
Never	Ref		Ref		Ref		Ref		Ref		Ref		Ref	
Current	0.92	.27	0.14	.42	0.17	.36	0.17	.37	0.25	.25	0.06	.79	0.14	.45
Former	−0.01	.98	0.12	.31	−0.04	.76	0.09	.46	−0.08	.59	−0.15	.29	0.04	.77
PCP visits in last 3 mo														
0.00	Ref		Ref		Ref		Ref		Ref		Ref		Ref	
1.00	−0.91	.12	−0.23	.07	−0.14	.28	−0.12	.38	−0.11	.47	−0.24	.11	−0.02	.88
2+	−0.62	.43	−0.06	.71	−0.10	.58	−0.17	.32	−0.06	.78	−0.03	.87	−0.10	.57

(continued)

Table 2. Continued

Characteristic	Total FSFI		Desire domain		Arousal domain		Lubrication domain		Orgasm domain		Satisfaction domain		Pain domain	
	β	*P* value	β	*P* value	β	*P* value	β	*P* value	β	*P* value	β	*P* value	β	*P* value
Cannabis use frequency (continuous)	0.61	.0004*	0.09	.02*	0.14	.0002*	0.07	.08	0.14	.002*	0.13	.003*	0.05	.20
Method of consumption														
Smoking flower	Ref		Ref		Ref		Ref		Ref		Ref		Ref	
Edibles	−0.59	.51	−0.11	.55	−0.11	.59	−0.19	.34	−0.08	.73	−0.01	.98	−0.10	.60
Other	−1.22	.36	−0.03	.90	−0.10	.72	0.11	.71	−0.15	.66	−0.36	.27	−0.68	.02*
Smoking concentrates	−1.67	.16	−0.23	.36	−0.06	.82	−0.28	.29	−0.59	.05	−0.30	.32	−0.28	.41
Tincture or oils	−0.09	.91	−0.04	.82	0.19	.30	−0.12	.53	0.09	.67	−0.25	.23	0.04	.85
Vaping	0.04	.96	−0.13	.44	−0.06	.70	0.19	.27	−0.03	.89	−0.11	.58	0.18	.30
Primary reason for use														
Medical	Ref		Ref		Ref		Ref		Ref		Ref		Ref	
Recreational	1.03	.15	0.22	.14	0.21	.18	0.01	.93	0.27	.13	0.29	.11	0.03	.83
Cannabinoid														
THC dominant	Ref		Ref		Ref		Ref		Ref		Ref		Ref	
Both THC and CBD	0.32	.57	0.06	.61	0.11	.39	0.15	.24	0.21	.14	0.06	.69	−0.26	.03*
CBD dominant	0.28	.77	0.09	.66	−0.07	.74	0.15	.50	0.21	.40	0.01	.96	−0.10	.64
Total comorbidities (continuous)	−0.44	.04*	−0.03	.44	−0.05	.33	−0.08	.08	−0.11	.04*	−0.09	.09	−0.08	.07

BMI = body mass index; CBD = cannabidiol; FSFI = female sexual function index; OR = odds ratio; PCP = primary care physician; THC = tetrahydrocannabinol.
Comorbidities included hypertension, diabetes, heart disease, arthritis, lung disease, kidney disease, thyroid disease, hypercholesterolemia, cancer, neurologic disease, liver disease, depression, and anxiety.
Region represents primary residence.
*Significant ($P < .05$)

Table 3. Multivariable logistic regression identifying factors associated with female sexual dysfunction (FSFI total < 26.55)

Characteristic	OR (95% CI)	*P* value
Age, y		
<30	Ref	
30–39	1.65 (0.73–3.77)	.22
40–49	0.85 (0.37–2.02)	.71
50–59	1.76 (0.73–4.38)	.21
60+	1.28 (0.48–3.42)	.62
Race		
White	Ref	
Black	2.52 (0.69–8.3)	.14
Hispanic	0.51 (0.20–1.19)	.14
Other	1.71 (0.78–3.67)	.17
Relationship status		
Married/relationship	Ref	
Single	0.66 (0.33–1.27)	.23
Unknown	1.01 (0.05–9.08)	1.00
Region		
West	Ref	
International	0.66 (0.32–1.35)	.27
Midwest	0.36 (0.12–0.95)	.05
Northeast	0.63 (0.31–1.24)	.19
South	0.71 (0.36–1.40)	.34
BMI		
Normal	Ref	
Underweight	2.45 (0.43–11.85)	.28
Overweight	1.04 (0.57–1.85)	.91
Obese	0.94 (0.43–1.99)	.87
Extremely obese	1.12 (0.47–2.53)	.79
Tobacco use		
Never	Ref	
Current	0.48 (0.18–1.16)	.12
Former	1.04 (0.63–1.70)	.88
PCP visits in last 3 mo		
0	Ref	
1	1.33 (0.78–2.29)	.30
2+	0.99 (0.47–2.03)	.99
Cannabis use frequency (continuous)	0.79 (0.68–0.92)	.002*
Method of consumption		
Smoking flower	Ref	
Edibles	1.42 (0.65–3.02)	.37
Other	1.06 (0.32–3.22)	.92
Smoking concentrates	1.63 (0.55–4.48)	.35
Tincture or oils	1.2 (0.57–2.52)	.62
Vaping	1.01 (0.48–2.05)	.99
Cannabinoid		
THC dominant	Ref	
Both THC and CBD	0.64 (0.38–1.09)	.10
CBD dominant	1.34 (0.58–3.05)	.49
Total comorbidities (continuous)	1.26 (1.05–1.52)	.02*

BMI = body mass index; CBD = cannabidiol; FSFI = female sexual function index; OR = odds ratio; PCP = primary care physician; THC = tetrahydrocannabinol.

Comorbidities included hypertension, diabetes, heart disease, arthritis, lung disease, kidney disease, thyroid disease, hypercholesterolemia, cancer, neurologic disease, liver disease, depression, and anxiety.

Region represents primary residence.

*Significant ($P < .05$)

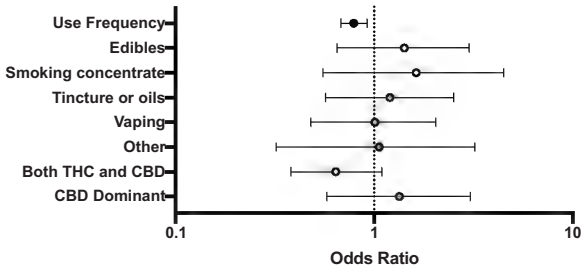

Figure 1. Forest plot demonstrating results of multivariable logistic regression with regard, to factors associated with female sexual dysfunction (FSFI total < 26.55). CBD = cannabidiol; FSFI = female sexual function index; THC = tetrahydrocannabinol.

including desire domain ($\beta = 0.09$, SE = 0.04, $P = .02$), arousal domain ($\beta = 0.14$, SE = 0.04, $P = .0002$), orgasm domain ($\beta = 0.14$, SE = 0.04, $P = .002$), and satisfaction domain ($\beta = 0.13$, SE = 0.04, $P = .003$). The method of consumption, cannabis chemovar, or primary reason for consumption did not consistently impact FSFI scores.

The odds of female sexual dysfunction, as defined by a FSFI total score less than 26.55, were assessed using logistic regression (Table 3). For each additional step of cannabis use intensity (ie, times per week), the odds of reporting female sexual dysfunction declined by 21% (odds ratio [OR]: 0.79, 95% confidence interval [CI]: 0.68−0.92, $P = .002$). In addition, having more comorbidities was associated with higher odds of sexual dysfunction (OR: 1.26, 95% CI: 1.05−1.52, $P = .02$). The methods of use and chemovar type were not associated with odds of developing sexual dysfunction (Figure 1).

DISCUSSION

To our knowledge, this study is the first to use a validated questionnaire to assess the association between female sexual function and aspects of cannabis use including frequency, chemovar, and indication. In this survey of more than 400 women, we found a dose response relationship between increased frequency of cannabis use and reduced odds of female sexual dysfunction. In addition, while the increase in index scores was small (and possible below clinical significance for some domains), increased cannabis use was associated with improved sexual desire, arousal, orgasm, and overall satisfaction as well as overall improved FSFI scores as compared with less frequent users. Older women and those with more comorbidities tended to have more sexual dysfunction. Importantly, our study did not find an association between cannabis chemovar (eg, THC vs CBD dominant), reason for cannabis use, and female sexual function.

As cannabis use has been shown to be associated with increased sexual frequency in the United States, it is possible this may cause positive effects on sexual experiences.[7] Much of the research focusing on sexual function and experiences with regard to cannabis began in the 1970s and 1980s. Cannabis' potential positive effect on female sexual function was noted as early as 1970 by Tart[19] who sought to describe the common experiences of cannabis users. He noted in interviews with college students that orgasms are improved, arousal increases, and "sexual feelings are much stronger" leading to more satisfaction. Although this was a small, non-controlled qualitative study without detailed cannabis use characterization, it was suggestive of cannabis' positive effect on female sexual function and is consistent with the current report. In a similar interview-based study with 37 female cannabis, the authors found that frequent users (>5 times per week) reported increased sexual pleasure, orgasms, satisfaction, and intimacy compared with less frequent users (<5 times per week).[20] However, this observation did not reach statistical significance. However, in interviews in 84 graduate students, of which 18 were female students, heavy users of cannabis tended to report more positive sexual experiences (ie, pleasure and intensity of orgasm) compared with lower intensity users.[21] These findings are similar to those by Koff[22] who, in a survey of 128 women, found that users of cannabis tended to enjoy sexual activity more than non-users. Interestingly, unlike most studies, he assessed if method of consumption had any impact on sexual experiences (eg, method of smoking and ingestion), and similar to the findings reported here, found no impact. However, the issue with these early studies has been that they represent a small, select sample size, and use non-validated questionnaires in an interview format.

More recently, researchers have used survey instruments to examine the effect of cannabis on female sexual function. However, many of these studies still do not use validated instruments or use sets of individual questions from them resulting in inconsistent findings. Johnson et al[23] surveyed 1,801 women asking specifically about sexual dysfunction and substance use. Although there was no significant increase in sexual dysfunction among cannabis users (10% of the survey respondents), inhibited orgasm (OR: 1.76, 95% CI: 1.12−2.74) and dyspareunia (OR: 1.69, 95% CI: 1.13−2.55) were more common among female cannabis users. This is in contrast to the present study that found orgasm to be improved in more frequent users, whereas pain during sexual activity was unaffected. In contrast, Lynn et al[10] surveyed 373 women (127 users of cannabis) and reported that frequent users had improved orgasms (OR: 2.10, 95% CI: 1.01−4.44). Other realms of sexual function, such as satisfaction, sex drive, lubrication, and dyspareunia, were not impacted by either use vs not or frequency of use. An Australian survey of 8,650 men and women, of which 754 reported cannabis use, found no association between cannabis use and sexual dysfunction in women when comparing users vs non-users as well as frequency of use.[13] While sexual dysfunction was assessed, a validated questionnaire was not used to obtain composite scores. In contrast to these studies, Johnson et al,[23] who asked questions specifically about female sexual dysfunction, found that cannabis use was associated with inhibited orgasm in a survey of more than 1,500 women.

The exact mechanisms by which cannabis may increase sexual function in women is unknown. The endocannabinoid system

has been postulated to be involved in female sexual function, and prior studies have demonstrated that increased amounts of endogenous cannabinoids such as arachidonoyl ethanolamide and 2-arachidonoylglycerol are associated with increased sexual arousal.[9] Exogenous use may similarly lead to activation of the endocannabinoid system leading to increased sexual function as we found here. As many patients use cannabis to reduce anxiety, it is possible that a reduction in anxiety associated with a sexual encounter could improve experiences and lead to improved satisfaction, orgasm, and desire.[24] Similarly, THC can alter the perception of time which may prolong the feelings of sexual pleasure.[25] Finally, CB1, a cannabinoid receptor, has been found in serotonergic neurons that secretes the neurotransmitter serotonin, which plays a role in female sexual function thus activation of CB1 may lead to increased sexual function.[12]

Several limitations of the present study warrant mention. Our cohort of women was derived from a population of cannabis users who made a purchase at a single-partner cannabis dispensary during a specific time period that may represent a unique subset of cannabis users especially as prior reports show lower prevalence of cannabis use in the general population introducing possible selection bias. In addition, while respondents had purchased a product at the partner dispensary, the specific locations from which respondents purchased their product is unknown. However, the population was geographically diverse and was not representative of only 1 region within the United States. Any survey distributed in such a manner is subject to volunteer and recall bias. Although respondents were asked about chemovar, it is possible some respondents did not know the dominant chemovar in the product they purchased thus altering the results. In addition, while frequency was assessed the exact dosage of product (eg, milligrams of THC), duration of use or chronicity is unknown. The impact of frequency of use on sexual function was compared by dichotomizing less frequent and more frequent users with no comparison to a non-user control group. It is possible that inclusion of a non-user population may alter the findings. In addition, we cannot exclude the possibility of causation in that more frequent female cannabis users happen to have higher FSFI scores rather than causal relationship. Although the multivariable linear regression was adjusted for available factors, residual confounders may exist that were not examined and therefore alter the results. While the FSFI is the most commonly used female sexual function survey, it is not the only one (eg, Sexual Quotient-Female and Golombok Rust Inventory of Sexual Satisfaction), and use of another validated survey may yield differing results. Althoough the FSFI cutoff of 26.55 for female sexual dysfunction has been validated and was examined here in associated with frequency of cannabis use, the clinical significance in FSFI subdomain scores is unknown. Although other aspects of sexuality were not assessed, such as vaginismus, this would be a potential area for future study.[26] Finally, while the survey assessed cannabis use within the last 4 weeks, it did not differentiate between chronic and new users.

Our results demonstrate that increasing frequency of cannabis use is associated with improved sexual function and is associated with increased satisfaction, orgasm, and sexual desire. Neither, the method of consumption nor the type of cannabis consumed impacted sexual function. The mechanism underlying these findings requires clarification as does whether acute or chronic use of cannabis has an impact on sexual function. Whether the endocannabinoid system represents a viable target of therapy through cannabis for female sexual dysfunction requires future prospective studies though any therapy has to be balanced with the potential negative consequences of cannabis use.

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SUPPLEMENTARY DATA

Supplementary data related to this article can be found at https://doi.org/10.1016/j.esxm.2020.06.009.

ATTACHMENT

Petitioner: Suzanne Mulvehill, PhD Candidate

Executive Director, Female Orgasm Research Institute

Petition to add Female Orgasmic Difficulty/Disorder (FOD) as a condition of treatment for medical cannabis in the state of Connecticut.

Section C: Background

Note: The term Female Orgasmic Difficulty is also used in the research[1-5]

Female Orgasmic Disorder – DSM-5

Diagnostic Criteria 302.73 (F52.31)

A. Presence of either of the following symptoms and experienced on almost all or all (approximately 75%-100%) occasions of sexual activity (in identified situational contexts or, if generalized, in all contexts):
   1. Marked delay in, marked infrequency of, or absence of orgasm.
   2. Markedly reduced intensity of orgasmic sensations.

B. The symptoms in Criterion A have persisted for a minimum duration of approximately 6 months.

C. The symptoms in Criterion A cause clinically significant distress in the individual.

D. The sexual dysfunction is not better explained by a nonsexual mental disorder or as a consequence of severe relationship distress (e.g., partner violence) or other significant stressors and is not attributable to the effects of a substance/medication or anothermedical condition.

Specify whether:

Lifelong: The disturbance has been present since the individual became sexually active.

Acquired: The disturbance began after a period of relatively normal sexual function.

Specify whether:

Generaiized: Not limited to certain types of stimulation, situations, or partners.

Situational: Only occurs with certain types of stimulation, situations, or partners.

Section D:
Negative Effects of Current Treatment

There are no pharmeceutical treatments for FOD.[6-8] Furthermore, the only empirically validated treatment for FOD, Directed Masturbation, is only for Lifelong FOD,[9] which affects about 10-15% of women who have FOD. [10,11] There are no empirically validated treatments for Acquired or Situational FOD with a generally less optimistic prognosis.[9] Situational FOD is the most common type of orgasmic dsyfunction with no validated treatments. [12]

Section E:
Negative Effects of Condition or Treatment

Up to 41% of women have FOD, [13] an unchanged statistic for 50 years,[14] with little innovation in FOD treatments since the 1980s.[15] This is vastly more than will experience high blood pressure [16] or diabetes.[17] Furthermore, women with FOD reported 24% more mental health issues, 52.6% more PTSD, 29% more depressive disorders, 13% more anxiety disorders, and 22% more prescription drug use than women without FOD. [18]

Section F:
Conventional Therapies

Of the variety of treatment approaches that have been tested, the most consistent support emerges for directed masturbation, sensate focus, and psychotherapy. [15] Approaches with little evidence for efficacy as a primary mode of treatment include systematic desensitization, bibliotherapy, and coital alignment technique training. [15]

Section G:
General Evidence of Support for Medical Marijuana Treatment

Sexologist Diane Urman and certified sex therapist Seth Prosterman, both San Francisco-based therapists, recommend cannabis to clients who have trouble orgasming or have Lifelong FOD.[19] Dr. Tishler, a cannabis specialist, and chief operating officer of inhaleMD, Inc., recommends cannabis to his clients with FOD.[20] Canada House Clinics, formally Marijuana for Trauma, now with 16 locations throughout Canada, sponsored a two-part online article series on cannabis use for sexual disorders, including FOD.[21,22] Ashley Manta, a sexual assault survivor, discovered that cannabis helped her experience sexual pleasure and reduce sexual pain[23] and founded CannaSexual, and built her international coaching and professional speaking business on promoting cannabis's enhancing effect on sex and women's sexual functioning.[24]

Section H:
Scientific Evidence of Support for Medical Marijuana Treatment

Cannabis has been consistently shown in research over the last 50 years to help women orgasm, [25-35] and has been suggested as a treatment for FOD and other sexual disorders for decades. [25,27,31,33] The few studies that mentioned cannabis inhibited female orgasm, did not evaluate dosage, [30,36,37] which is recognized as an important factor in sexual functioning and orgasm response. [27] A recent study found that women who used cannabis more frequently were 2.10 times more likely to orgasm. [32] The first cannabis and sex study that dichotomized women with and without FOD, found that for women with FOD who used cannabis before partnered sex increased orgasm frequency (72.8%, n = 147/202, $p < .001$), improved orgasm satisfaction (67%, n = 136/202, $p < .0001$) or made orgasm easier (71% , n = 143/202, $p < .001$).[18]

Section I
Professional Recommendations for Medical Marijuana Treatment

To follow via email.

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September 20, 2023

Board of Medicine

RE: New Professional Recommendations for Medical Marijuana Treatment -Female Orgasmic Difficulty/Disorder (FOD)

Dear Board of Physicians,

I am petitioning the Board to add female orgasm difficulty/disorder (FOD) as a condition for

treatment in your State Medical Cannabis Program.

Up to 41% of women experience sexual problems in the National Health and Social Life survey of 3000 women. In the PRESIDE study over 31,000 women were surveyed. Again, 44% had sexual dysfunction and 20% had problems with orgasm. This is more than will experience glaucoma, Parkinson's, Crohn's and other approved conditions. Currently there are no conventional medications that can help.

Cannabis to improve sexual function in men and women has received a lot of attention in the last 10 years. Study after study has revealed there is improved enjoyment, sensation, pleasure and orgasm.

I have been certifying patients for Cannabis and studying the various benefits for 5 years. I am a Board-certified OBGYN (30 years) and practice Sexual Medicine (18 years).

Please consider the addition of Female Orgasmic Disorder to the list of approved conditions.

If I can be of further service or answer any questions, please do not hesitate to contact me.

Sincerely,

MD FACOG

USF '93 UF-Shands Jax '97

TransactionNumber: 305461

Call #:

Location:

Article Information

Journal Title: Journal of psychoactive drugs.

Volume: 14 **Issue:** 1-2
Month/Year: 1982**Pages:** 59-70

Article Author: Halikas, J

Article Title: Effects of regular marijuana use on sexual performance.

Customer Information

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Article Delivery Method: Hold for Pickup
Loan Delivery Method: Hold for Pickup
Electronic Delivery?

have contributed to current casual attitudes. Although one may not perceive it, counterculture beliefs have had their impact on the dominant culture.

Marijuana has some enhancing effect upon sexual proceedings for some individuals. It may be sexually evocative and gratifying. Nonspecific factors play an important role in this matter. Opposite effects also occur, and an endocrinologic basis for actual diminution of drives and potency may exist.

The final paradox is that cannabis' employment for sexual arousal is predominantly an activity of young adults. The older age groups most in need of sexual support and assistance are less frequently involved in its use. It is unclear why this dichotomy between need and utilization exists.

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Effects of Regular Marijuana Use on Sexual Performance

JAMES HALIKAS, M.D.*; RONALD WELLER, M.D.** & CAROLYN MORSE, M.A.***

During the last 15 years, the use of marijuana as a social intoxicant has become almost as commonplace as the use of alcohol among individuals under the age of 35. Throughout this era of marijuana use, it has been alleged that marijuana is a sexual stimulant; an aphrodisiac, an enhancer of sexual performance (Lewis 1970). Yet, virtually no systematic work has explored this reported effect of marijuana. Eric Goode (1972) found that for most of his surveyed group of marijuana users, marijuana indeed enhanced sexual desire and performance, and was subjectively perceived as a sexual stimulant. In response, Peterson (1972) maintained that these effects were dose- and setting-dependent. Koff (1974) also found that mood, expectation and setting were the sexually stimulating elements.

In 1975, Robert Kolodny and his colleagues presented the results of two endocrinologic studies of adult male marijuana users (Kolodny et al. 1975, 1974). They found that after more than six months of regular marijuana use, serum testosterone levels were significantly lower. Although these levels were not lowered beyond the range of normal, the uniformity of the trend was worrisome. In addition, at least one of the subjects noted potency problems, which disappeared after cessation of marijuana use, and 35% of the subjects were noted to have had lower sperm counts during the course of the study. Thus, although the current folklore indicates that marijuana is a sexual stimulant, there is at least some evidence that this may not be a universally achieved effect.

METHODOLOGY

In 1969-70, 100 regular marijuana users and 50 nonusers were systematically interviewed as part of a large descriptive study of marijuana use and its effects (Halikas 1974; Halikas & Rimmer 1974; Halikas, Goodwin & Guze 1972a, 1972b, 1971). As part of the criteria for admission to that study, all subjects were at least 18 years of age and White. The user group viewed themselves as regular marijuana users, and had used marijuana on more than 50 separate occasions during a time period lasting more than six months. In fact, the average duration of marijuana use at that time was more than two years, with an average frequency of two to three times per week. All subjects were paid volunteers. In addition to a thorough review of marijuana use and its effects on subjects' lives, the original interview collected descriptive information in a wide variety of psychosocial areas for each subject, including growth and development, education, a systematic psychiatric symptom review, developmental landmarks, family history and rearing practices, and current and past drug and alcohol use patterns.

Between 1975 and 1977, a study was undertaken to find and reinterview all of the subjects. Of the 150 index

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TABLE I

SEXUAL DEMOGRAPHIC CHARACTERISTICS

	Population		User Gender		Recent Usage		Abuse Status	
	Users (N = 97) %	Nonusers (N = 35) %	Males (N = 60) %	Females (N = 37) %	Less Frequent (N = 75) %	Frequent Users (N = 22) %	Male Nonabusers (N = 52) %	Male Abusers (N = 8) %
Ever married	52	74	48	56	52	50	54	13
	p = .057		Not significant		Not significant		p = .08	
Currently married	33	60	32	35	36	23	35	13
	p = .006		Not significant		Not significant		Not significant	
Age of first heterosexual intercourse less than 18	49	14	50	46	41	73	44	88
	p = .0008		Not significant		p = .02		p = .057	
More than one meaningful sexual relationship ever	68	49	68	69	67	73	63	100
	p = .07		Not significant		Not significant		Not significant	
Currently married, subjects unfaithful	17	19	11	23	19	0	6	100
	Not significant		Not significant		Not significant		No chi-square	
Unmarried subjects, number of sex partners in prior 12 months								
None	3	0	2	4	4	0	3	0
One	20	36	20	21	19	24	21	14
Two-Four	37	36	29	50	42	24	32	14
Five +	40	29	49	25	35	53	44	71
	Not significant		Not significant		Not significant		Not significant	
Partner swapping or group sex (all subjects)	5	6	5	5	4	9	4	13
	Not significant		Not significant		Not significant		Not significant	
Sexual orientation								
Heterosexual	88	97	88	87	87	91	86	100
Bisexual	6	0	5	8	8	0	6	0
Homosexual	6	3	7	5	5	9	8	0
	Not significant		Not significant		Not significant		Not significant	
Postpubertal homosexual experiences	26	6	22	32	24	32	23	13
	p = .02		Not significant		Not significant		Not significant	

subjects, one was known to have died. Of the 149 living subjects, 148 were found and 147 agreed to be reinterviewed. The subjects were found in 40 cities, in 25 states and three foreign countries. With the exception of the three subjects overseas, all subjects were interviewed in person by a social science professional, specially trained in the administration of the follow-up interview. Again, all the subjects were paid.

The follow-up interview collected descriptive information concerning the time interval between the index interview and the follow-up interview (approximately six years), in the areas of educational progress, legal problems, vocational experiences, social relationships, family events, intercurrent psychiatric problems and psychosocial adjustment, and a complete drug- and alcohol-interval history. Patterns of marijuana use during the interval and consequences in their lives, in a variety of areas, were canvassed.

One of the areas explored with the subjects was the effect of marijuana intoxication and regular marijuana use on sexual interest and performance. In this regard, eight global questions were asked of all the subjects interviewed, regarding the effect of marijuana intoxication on various aspects of intercourse, duration, ability to repeat, and interest in familiar partner. Approximately one-third of the way through the data collection phase of the project, an additional set of questions was added to the interview regarding the specific effects of marijuana intoxication on various sensory or sensual modalities involved in sexual activity. These included sight, hearing, tasting, snuggling and intimacy. Thus, information was obtained on these questions from about two-thirds of the total user population. All questions were asked for the time interval of the 12 months prior to the follow-up interview or for the most recent 12 months of marijuana use.

This report will present data dealing with the effects of marijuana use on sexual activity among the users with respect to gender differences, differences associated with differential frequency of use, and abuse-nonabuse characteristics of these users. Comparisons between the user group and the control group will be made relating to their patterns of sexual activity.

The mean age of the users at follow-up was 27.5, with a range of 23-38; mean age of the index nonusers was 28.3, ranging from 23-39. The population was well-educated: by the time of follow-up, 95% of the users and all of the nonusers had had some college experience. Also at the time of follow-up, 80% of both groups were employed in occupations that ranged from physician to ditch digger. The index users had now been using marijuana for approximately eight years. During the 12 months prior to the follow-up interview, 86% of the users had used marijuana. Nearly one-quarter were using marijuana five or more times per week during the prior 12 months. Another 30% were using marijuana one to four times per week.

Between the index and follow-up interviews, the distinction between the user and nonuser groups had blurred somewhat. At follow-up, 30% of the index nonusers reported that they either had been or were currently marijuana users. Sixty-two percent had used marijuana at some time in the preceding year, but only four percent had used it five or more times a week during that year. It seems that both groups could now be better described as user groups differing mainly in the length and frequency of their marijuana use, but both having marijuana use rates considerably above the national norm. This is not surprising, considering that the controls were originally obtained by word-of-mouth referral as nondrug using friends of the users. The nonusing peers of the users would naturally be expected to have had a greater opportunity to try marijuana and to develop more liberal attitudes toward the drug than a control group drawn from a different social milieu. That the users and controls exhibit considerable interchange and overlap in their marijuana usage patterns illustrates the comparability of the groups. Nevertheless, in order to maximize the contrast between users and nonusers, the "nonusers" who reported having been regular users (30%) at some time were excluded from the analyses reported here.

RESULTS

Sexual Demographics

A series of chi-square analyses were performed to compare subjects on a number of areas relevant to their sex lives, including marital status, living arrangements, infidelity rates and homosexual experiences (see Table I). The users were compared with the nonusers in one series of analyses. Differences among users were pursued by partitioning them according to gender, frequency of recent usage, and abuse-nonabuse characteristics in subsequent analyses.

Comparisons of users with comparison group: Among the users, 52% had been married at some time, compared with 74% of the nonusers ($p = .057$). Sixty percent of the nonusers and 33% of the users were currently married ($p = .006$). At the time of the follow-up interview, 30% of the users versus 63% of the nonusers were living with their spouse; 22% of the users were living with lovers compared with six percent of the nonusers; and 49% of the users were living alone, with friends or family versus 32% of the nonusers. Thus at

follow-up, approximately 52% of the users versus 69% of the nonusers were living with a sexual partner.

The two groups did not differ significantly in the number of divorces or separations, the age they were first married or the age they were first divorced. Of those currently married, 80% of both groups described their marriage as good, and over 80% of both groups had never been unfaithful. About five percent of each group had engaged in partner swapping, group sex or both. The currently unmarried users did not differ significantly from the unmarried nonusers in the number of sexual partners they had had in the year preceding follow-up.

Forty nine percent of the users and 14% of the nonusers had experienced their first heterosexual intercourse before the age of 18 ($p = .0008$). Since puberty, 26% of the users had had homosexual relations compared with only six percent of the nonusers ($p = .02$). About six percent of the users reported they were bisexual and another six percent claimed homosexuality as their primary sexual orientation. This compares with three percent homosexuality and no bisexuality among nonusers. This difference between groups was not statistically significant.

The users did not differ from the nonusers in the number of sexual problems reported or the number of times they sought treatment for such problems. About 10% of each group reported problems and/or treatment.

Comparisons of selected groupings of users:

1. Males and females: There were no significant differences between males and females on sexual demographic characteristics.
2. Frequent and less frequent users: Subjects ($N = 22$) who reported using marijuana at least five times per week in the year preceding follow-up were compared to those reporting less frequent usage ($N = 75$). More of the frequent users had had their first heterosexual intercourse before age 18 than had the less frequent users ($p = .02$). No other significant differences between the groups were found.
3. Male abusers and nonabusers: Nine percent of the user group were classified as marijuana abusers according to criteria established by Weller and Halikas (1980). Abusers manifested problems in three or four of the following areas: (a) adverse physiological and psychological drug effects; (b) control problems; (c) social and interpersonal problems; and (d) adverse subjective opinions of others. All but one of the abusers identified were male, so only the eight male abusers and 52 male nonabusers were included in these comparisons. Only one abuser had been married (13%) compared with 54% of the nonabusers ($p = .08$). The abusers had experienced heterosexual intercourse at an earlier age, with 88% before 18 years of age compared with 44% of the nonabusers ($p = .057$). These were the only sexual demographic variables that approached significance in this breakdown of subjects.

Summary of sexual demographics: The users differed from the controls in three main respects: (1) more users remained single; (2) the users first sexual relations occurred earlier; and (3) more users had engaged in homosexual activity. Among the users, females and males shared very similar sexual demographics. When frequent and less frequent users were compared, more frequent users had early (pre-18) heterosexual intercourse. The male marijuana abusers had sexual demographics similar to the frequent users. Table I presents the complete sexual demographic statistics of this population.

Sexual Activity and Substance Abuse Patterns

Subjects reported what role marijuana, alcohol and other drugs played in their first heterosexual experience and the proportion of the time they used these drugs in conjunction with their current sexual activity.

Users versus comparison group: No nonuser reported having used alcohol, marijuana or other drugs before their first sexual intercourse, compared with 33% of the users who had used an intoxicant ($p = .0015$) (see Table II). All of the subjects were asked if they had ever engaged in intercourse when intoxicated and, if so, would they have, had the intoxicant not been a factor. Forty six percent of the marijuana users had had this experience, and of these, 30% implicated alcohol, 17% cited marijuana and 52% blamed other drugs or a combination of intoxicants. By contrast, 33% of the nonusers had experienced undesired intercourse when intoxicated, with 76% of these citing alcohol and 12% implicating marijuana and another 12% indicating other drugs or a combination of drugs. The patterns of group differences were significantly different ($p = .05$) (see Table III).

With respect to ongoing sexual activity, about 65% of both groups used alcohol one percent to 10% of the time they had sex, but more nonusers than users had never used alcohol before sex and fewer nonusers reported using it at high levels of frequency ($p = .06$). None of the nonusers had used marijuana or other drugs more than 10% of the time they engaged in sexual activity. By contrast, 45% of the users had used marijuana more than 10% of the time they engaged in

TABLE II

INTOXICATION AND INITIAL INTERCOURSE

	Population		User Gender		Recent Usage		Abuse Status	
	Users (N = 97) %	Nonusers (N = 35) %	Males (N = 60) %	Females (N = 37) %	Less Frequent (N = 75) %	Frequent Users (N = 22) %	Male Nonabusers (N = 52) %	Male Abusers (N = 8) %
First intercourse after intoxicant?								
No	67	100	68	65	69	59	67	75
Yes, alcohol	23	0	22	24	23	23	24	13
Yes, marijuana	7	0	7	8	7	9	6	13
Yes, other drugs/combination of drugs	3	0	3	3	1	9	4	0
Group differences	p = .0015		Not significant		Not significant		Not significant	
Intoxicant influence first intercourse? (of those using intoxicant)	(N = 36) %	(N = 0) %	(N = 22) %	(N = 14) %	(N = 28) %	(N = 8) %	(N = 19) %	(N = 3) %
No effect	50	0	50	50	54	38	53	33
Made more willing	50	0	50	50	46	63	47	67
Group differences	No chi-square		Not significant		Not significant		Not significant	

sexual activity ($p < .0001$), and 67% of users versus 21% of nonusers had at some time used other drugs or combinations of drugs preceding intercourse ($p < .01$) (see Table IV).

Sexual activity and substance use patterns of selected groupings of users:

1. Males and females: The male and female users did not differ significantly on any of the substance use variables (see Tables II-V).
2. Frequent and less frequent users: The frequent users differed from the less frequent users only in terms of their current usage patterns. The frequent users more often used alcohol ($p = .10$), marijuana ($p = .004$) and other drugs ($p = .02$) in conjunction with their sexual activity than did the less frequent users (see Table IV). Moreover, their use of marijuana was more likely to be by design in preparation for sexual activity than was the use of the less frequent users ($p = .004$) (see Table V).
3. Male abusers and nonabusers: The abusers differed from the nonabusers marginally in one category, the use of other drugs before intercourse ($p = .07$) (see Table IV).

TABLE III

INTOXICANT EVER LEAD TO UNDESIRED INTERCOURSE?

	Population		User Gender		Recent Usage		Abuse Status	
	Users (N = 97) %	Nonusers (N = 35) %	Males (N = 60) %	Females (N = 37) %	Less Frequent (N = 75) %	Frequent Users (N = 22) %	Male Nonabusers (N = 52) %	Male Abusers (N = 8) %
"Yes," any intoxication	46	33	45	49	44	55	46	43
Of those answering "yes":								
Alcohol	30	76	28	34	29	33	27	33
Marijuana	17	12	24	12	17	25	27	0
Other drugs/combination of drugs	52	12	48	56	54	42	46	66
Group differences	p = .05		Not significant		Not significant		Not significant	

TABLE IV

PERCENT OF TIME DRUGS USED BEFORE INTERCOURSE

	Population		User Gender		Recent Usage		Abuser Status	
	Users (N = 97) %	Nonusers (N = 35) %	Male (N = 60) %	Female (N = 37) %	Less Frequent (N = 79) %	Frequent Usage (N = 22) %	Male Nonabusers (N = 52) %	Male Abusers (N = 8) %
Alcohol:								
0%	5	18	7	3	7	0	8	0
1%-10%	64	67	64	64	63	67	60	88
11%-25%	19	12	21	17	23	10	22	13
25% +	12	3	9	17	8	24	10	0
Group differences	p = .06		Not significant		p = .10		Not significant	
Marijuana:								
0%	2	41	3	0	3	0	4	0
1%-10%	53	59	52	54	60	29	50	63
11%-25%	22	0	21	23	22	19	22	13
25% +	24	0	24	23	15	53	24	25
Group differences	p < .00001		Not significant		p = .004		Not significant	
Other drugs/combination of drugs:								
0%	32	79	29	38	40	5	34	0
1%-10%	64	21	67	59	57	90	64	88
11%-25%	2	0	4	0	2	5	2	13
25% +	1	0	0	3	2	0	0	0
Group differences	p = .01		Not significant		p = .02		p = .07	

Summary of sexual activity and substance use patterns: The users as a group were more likely than nonusers to utilize intoxicating substances before sexual activity. Marijuana was consumed by the users more often than alcohol or other drugs in conjunction with sexual activity. However, it was less likely than alcohol to have been used before sexual initiation or undesired intercourse. Other drugs or combinations of intoxicants were most often linked to undesired intercourse. Frequent users were more likely to use marijuana by design in preparation for sex than were less frequent users.

General Marijuana-Induced Effects on Sexual Performance

The users were asked whether or not marijuana affected them with regard to the duration of intercourse, the quality of orgasm, the number of orgasms and their ability to repeat intercourse. Specifically, they reported whether marijuana increased, decreased, variably affected (i.e., was setting-dependent) or had no effect on each of these aspects of sexual performance.

Comparisons of selected groupings of users:

1. Males and females: In general, the majority of females reported no effect in any of these categories. A larger minority of males (39%) reported that marijuana increased or variably increased the duration of intercourse. This compares with 26% of the women reporting an increase or variable increase in duration (p = .05). More males (68%) than females (50%) reported that marijuana enhanced or variably enhanced the quality of their orgasm (p = .02). The number of orgasms increased or variably increased for 27% of the women and 19% of the men (not significant) and decreased for two percent of the men. The ability to repeat increased or variably increased for eight percent of the women and 17% of the men (not significant), and decreased for two percent of the men (see Table VI).
2. Frequent and less frequent users: When those who had used marijuana at least five times per

TABLE V

PERCENT OF TIME MARIJUANA USED BY DESIGN IN PREPARATION FOR SEXUAL ACTIVITY

	Gender		Recent Usage		Abuser Status	
	Males (N = 60) %	Females (N = 37) %	Less Frequent Users (N = 75) %	Frequent Users (N = 22) %	Male Nonabusers (N = 52) %	Male Abusers (N = 8) %
Coincidental use only	20	29	28	8	19	25
1%-10%	43	36	45	17	45	25
11%-25%	17	14	16	17	16	25
25% +	20	21	12	58	19	25
Group differences	Not significant		p = .004		Not significant	

TABLE VI

MARIJUANA-INDUCED EFFECTS ON SEXUAL PERFORMANCE

	Gender		Recent Usage		Abuser Status	
	Males (N = 60) %	Females (N = 37) %	Less Frequent Users (N = 75) %	Frequent Users (N = 22) %	Male Nonabusers (N = 52) %	Male Abusers (N = 8) %
Duration of intercourse:						
Increased	27	8	22	14	28	25
Decreased	0	0	0	0	0	0
Variable	12	8	10	14	10	25
No Effect	61	84	68	72	62	50
Group differences	p = .05		Not significant		Not significant	
Quality of orgasm:						
Enhanced	58	32	51	36	57	63
Decreased	0	0	0	0	0	0
Variable	10	8	8	14	8	25
No Effect	32	60	41	50	35	12
Group differences	p = .02		Not significant		Not significant	
Number of orgasms:						
Increased	12	16	16	5	12	13
Decreased	2	0	1	0	2	0
Variable	7	11	5	18	6	13
No Effect	80	73	78	77	80	75
Group differences	Not significant		Not significant		Not significant	
Ability to repeat:						
Increased	14	3	11	5	12	25
Decreased	3	0	3	0	4	0
Variable	3	5	4	5	4	0
No Effect	80	92	82	90	80	75
Group differences	Not significant		Not significant		Not significant	

week were compared with the others, there were no statistically significant differences (see Table IV).

3. Male abusers and nonabusers: Male abusers and nonabusers reported very similar effects of marijuana on their sexual performance and there were no statistically significant differences. It is interesting to note that the males reporting negative effects (i.e., a decrease in number of orgasms and a decrease in ability to repeat) were not among the abusers or the frequent users (see Table VI).

Summary of marijuana-induced effects on sexual performance: Over half of the males and less frequent users reported an enhancement of quality of orgasm. The majority of subjects reported no effect of marijuana on duration of intercourse, number of orgasms or ability to repeat. When effects were reported they were almost always positive. A very small percentage of males — not marijuana abusers or frequent users — reported negative effects on their performance. (See Table VI for a complete presentation of these data.)

TABLE VII

MARIJUANA-INDUCED EFFECTS ON SEXUAL PARTNER PREFERENCE

	Gender		Recent Usage		Abuser Status	
	Males (N = 60) %	Females (N = 37) %	Less Frequent Users (N = 75) %	Frequent Users (N = 22) %	Male Nonabusers (N = 52) %	Male Abusers (N = 8) %
Desire familiar partner:						
Increased	50	60	52	59	54	25
Decreased	3	3	4	0	2	13
Variable	12	11	11	14	10	25
No Effect	35	27	33	27	34	38
Group differences	Not significant		Not significant		Not significant	
Desire unfamiliar partner:						
Increased	43	14	28	41	39	63
Decreased	5	3	3	9	4	13
Variable	3	5	4	5	4	0
No Effect	49	78	65	46	53	25
Group differences	$p < .01$		Not significant		Not significant	
Desire multiple partners:						
Increased	12	3	8	9	14	0
Decreased	3	0	3	0	2	13
Variable	0	0	0	0	0	0
No Effect	85	97	89	91	84	88
Group differences	Not significant		Not significant		Not significant	
Desire homosexual partner:						
Increased	7	3	4	9	8	0
Decreased	2	0	1	0	2	0
Variable	0	3	0	5	0	0
No Effect	91	94	95	86	90	100
Group differences	Not significant		Not significant		Not significant	

TABLE VIII

MARIJUANA-INDUCED EFFECTS ON SPECIFIC SENSES DURING SEXUAL ACTIVITY*

	Gender		Recent Usage		Abuser Status	
	Males (N = 60) %	Females (N = 37) %	Less Frequent (N = 75) %	Frequent Users (N = 22) %	Male Nonabusers (N = 52) %	Male Abusers (N = 8) %
Touching:						
Enhanced	59	57	62	47	60	50
Decreased	0	0	0	0	0	0
Variable	3	3	4	0	3	0
No Effect	39	40	35	53	37	50
Physical Closeness:						
Enhanced	51	56	50	67	55	25
Decreased	0	0	0	0	0	0
Variable	9	4	8	0	10	0
No Effect	40	41	42	33	36	75
Snuggling:						
Enhanced	34	56	42	50	36	25
Decreased	0	0	0	0	0	0
Variable	9	4	8	0	7	25
No Effect	57	41	50	50	58	50
Taste:						
Enhanced	23	33	24	42	23	25
Decreased	0	0	0	0	0	0
Variable	0	4	2	0	0	0
No Effect	77	63	74	58	77	75
Smell:						
Enhanced	23	7	16	17	23	25
Decreased	3	0	0	8	3	0
Variable	0	4	2	0	0	0
No Effect	74	89	82	75	74	75
Hearing:						
Enhanced	17	11	16	8	19	0
Decreased	0	0	0	0	0	0
Variable	3	0	2	0	0	25
No Effect	80	89	82	92	81	75
Sight:						
Enhanced	11	7	10	8	13	0
Decreased	0	0	0	0	0	0
Variable	0	4	0	0	0	0
No Effect	89	93	90	92	87	100

*No group differences significant at or above .05 level.

TABLE IX

IS MARIJUANA AN APHRODISIAC?

	Gender		Recent Usage		Abuser Status	
	Males (N = 60) %	Females (N = 37) %	Less Frequent (N = 75) %	Frequent Users (N = 22) %	Male Nonabusers (N = 52) %	Male Abusers (N = 8) %
Yes, mild	36	34	33	54	38	25
Yes, strong	8	11	10	8	9	0
Variable effect	28	21	26	23	25	50
No effect	28	29	31	15	28	25
Group differences	Not significant		Not significant		Not significant	

Marijuana-Induced Effects on Sexual Partner Preference

Comparisons of selected groupings of users:

1. Males and females: A majority of subjects (60% of males, 72% of females) reported that marijuana increased or variably increased their desire for a familiar partner. Three percent of both males and females reported a decrease.

   More males than females reported an increased desire for an unfamiliar partner ($p < .01$). Marijuana had no effect on desire for multiple partners or homosexual partners for over 85% of both males and females. Further analysis revealed that all subjects reporting an increase in their desire for a homosexual partner claimed either bisexuality of homosexuality as their sexual orientation (see Table VII).
2. Frequent and less frequent users: There were no significant differences between frequent and less frequent users on sexual partner preference (see Table VII).
3. Male abusers and nonabusers: There were no significant differences between the groups, but this may be due to the small number of abusers in the sample. When percentage scores were examined, the groups appeared quite distinct, although this may reflect differences in sexual contacts more than differential effects of marijuana. In general, the abusers were more likely to experience an increase in their desire for an unfamiliar partner than for a familiar partner, a pattern unlike any of the other groups under study (see Table VII).

Summary of marijuana-induced effects on sexual partner preference: At least 50% of all groups reported an increase or variable increase in their desire for a familiar partner. A significantly greater percentage of males than females reported an increase in their desire for an unfamiliar partner. Higher proportions of frequent users and abusers also reported this increase. (See Table VII for the partner preference data.)

Marijuana-Induced Effects on Specific Senses During Sexual Activity

The users were asked if marijuana had effects on their senses of touching, smell, sight, taste and hearing as well as snuggling and physical closeness during sexual activity. They reported whether each sense was enhanced, decreased, variably enhanced or was unaffected (see Table VIII).

The modalities most affected by marijuana were the tactile-related senses of touching and physical closeness, which were reported enhanced or variably enhanced by 60% of the users. The next most affected was snuggling (50%), followed by taste (29%), smell (19%), hearing (17%) and sight (10%). Two male subjects reported that marijuana decreased their sense of smell.

The men and women did not differ significantly in their reports of any of these sensory effects, nor did the frequent and less frequent users. A smaller proportion of abusers reported enhancement of touching (50% vs. 63% for nonabusers) and of physical closeness (25% vs. 65%), but there were no significant differences between the groups in their reports on sensory modalities.

General Effects of Marijuana on Sexual Activity and Enjoyment

Perceived aphrodisiac: Over 70% of the users felt that marijuana acts as an aphrodisiac, but only about nine percent rated the effect strong. There were no significant group differences in this estimation (see Table IX).

Pleasure and satisfaction: A majority (81%) reported that feelings of sexual pleasure and satisfaction increased or variably increased when they used mari-

TABLE X

MARIJUANA-INDUCED EFFECTS ON SEXUAL ENJOYMENT*

	Gender		Recent Usage		Abuser Status	
	Males (N = 60) %	Females (N = 37) %	Less Frequent (N = 75) %	Frequent Users (N = 22) %	Male Nonabusers (N = 52) %	Male Abusers (N = 8) %
Feelings of Sexual Pleasure and Satisfaction:						
Increased	70	76	75	65	72	50
Decreased	3	0	2	0	3	0
Variable	5	14	8	12	6	0
No Effect	23	10	15	24	19	50
Feelings of Emotional Closeness and Intimacy:						
Increased	46	63	52	58	48	25
Decreased	3	0	2	0	3	0
Variable	14	7	10	17	13	25
No Effect	37	30	36	25	36	50

*No group differences reached .05 level of significance.

juana.

Emotional closeness and intimacy: Sixty four percent reported an increase or variable increase in feelings of emotional closeness and intimacy. Three percent of the males reported a marijuana-induced decrease in both these feelings (see Table X). Overall, however, the males did not differ from the females, nor did the frequent users differ strikingly from the less frequent users in their report of these marijuana-induced feelings.

The abusers reported less effect on their sexual pleasure and satisfaction, and their feelings of emotional closeness and intimacy than nonabusers. The differences, however, were not statistically significant.

Summary of general effects of marijuana on sexual activity and enjoyment: About three-quarters of the users considered marijuana an aphrodisiac, but less than 10% considered the effect strong. Feelings of marijuana-induced sexual pleasure and satisfaction were reported by high percentages (above 75%) of all groups except the abusers. Feelings of emotional closeness and intimacy were reported increased or variably increased by 60% or more of all groups except, again, the abusers. (See Table X for a detailed summary.)

CONCLUSIONS

The evidence from this study indicates that marijuana, when it affects the sexual experience, affects it in a positive way. The most uniformly reported effects were general ones: feelings of sexual pleasure and satisfaction, feelings of emotional closeness and intimacy, and a general concurrence that marijuana has mild aphrodisiac properties.

Specific performance variables were apparently not affected to any large extent. For the majority of these subjects, both men and women, marijuana does not increase the duration of intercourse, as was suggested in the early 1970's, nor does it increase the number of orgasms or the ability of these sexually active adults to repeat sexual activity. However, the majority of males reported an enhanced quality of orgasms while about 40% of the women reported this effect. If as many as one-third of women never or only occasionally experience orgasm (Fisher 1973), then one-third of the females in this sample would have little or no basis of comparison for this item. Controlling for this possibility, about 60% of the orgasmic females would then be reporting enhanced quality of orgasm — a figure roughly comparable to the men. This effect is probably less attributable to set and expectancy than some other general findings, and therefore suggests that marijuana may have some mild but specific effects on sexual performance.

Of the sensory variables, the items involving touch

were, in general, enhanced by marijuana for the majority of users. Enhancement of the other senses was reported by considerably fewer subjects.

Marijuana appeared to increase, in some nonspecific fashion, the desire for a partner (both familiar and unfamiliar) for about half of the male users. Marijuana consistently increased the desire for a familiar partner only on the part of the majority of the women. It may be reassuring for society to note that for most of these chronic marijuana users – men and women – marijuana intoxication did not increase their desire for an unfamiliar partner, for multiple partners or for a homosexual partner. Thus marijuana may be promoting fidelity, a virtue not often associated with this drug or its users.

Comparison of the marijuana users with the nonusers yielded three main differences: (1) more users remained single; (2) the users' first sexual relations occurred at an earlier age; and (3) more users had engaged in homosexual activity. The two groups were quite similar, however, with respect to infidelity rates, the single subjects' number of sexual partners, and participation in group sex or partner swapping.

More users than controls had used an intoxicant at the time of their first heterosexual intercourse, however alcohol was usually the associated drug in these instances. Moreover, the use of all intoxicants, including alcohol, was a less frequent phenomenon in the sex lives of the comparison group.

While a significant majority of the users agreed that marijuana is consistently an aphrodisiac, or at least under some circumstances, it is apparent that only the most frequent users often seek out the use of this substance specifically for its sexually stimulating qualities. For the others, their use of marijuana is more likely to be coincidental to their sexual behavior. While marijuana does appear to be a drug of choice for the users where sexual activity is concerned, the effects are mild, positive and facilitating, but not compelling.

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Cocaine and Sexual Dysfunction: The Curse of Mama Coca

RONALD K. SIEGEL, PH.D.*

If coke's a lady, free base is a bitch.
— Anonymous User, San Francisco 1980

The ancient Incas worshipped the sun as their father, but they referred to the bright star Spica in the constellation Virgo as "Mama Coca." Coca itself was considered so divine a plant that the title Mama Coca was bestowed on an Inca Queen — "The Mother of Coca" (Mortimer 1974: 66, 152). Throughout the ages, coca, and its chief alkaloid cocaine, have been referred to in a feminine way (e.g., Antonil 1978: 2):

> I began to find myself attracted — almost seduced . . . by the enigmatic figure of Mama Coca. . . . Coca and its alkaloids have almost always been associated with some sort of womanly or female principle: this has been made explicit . . . by the slang of New York City, where cocaine is often known as "girl" or "lady," and in that of Spanish America, where the terms used esoterically — such as *la nieve* (Bolivia), *la perica* (Colombia), and *la tia blanca* (Peru) — are all feminine in gender.

Coca and cocaine have also enjoyed a long historical association with sexual behavior. More than a thousand years before the Incan Empire, the Moche people developed a culture on the coastal plain of northern Peru. The Moche had no writing system, but their artistic productions communicated much about their lives. In their pottery and sculpture, archaeologists have uncovered a conspicuous sexual theme. The iconography depicts a variety of coital positions as well as fellatio, homosexuality, bestiality, and exhibitionism (Kauffmann-Doig 1979). The early explorers and chroniclers of the Spanish Conquest considered such art to be "perverse" and "degenerate." Furthermore, they suggested that "sodomistic, homosexual and bestial perversions" resulted from the chewing of coca leaves (Bejarano 1952). Early psychiatric commentaries also noted that "not one single way of abnormally performing the libido sexualis" was lacking in the iconography, and they thus concluded the art resulted from a cocaine psychosis that affected the "libido center" (Valdizan 1915).

Not all analysts though, agreed with this interpretation. Some found a relationship between the "horrifying" pottery and the practice of cranial trephining. Accordingly, Posnansky (1925) argued that trephining could have deformed the libido centers resulting in an abnormal state of "non-satisfaction." The pottery was viewed as a sublimation of a frustrated sexual impulse resulting from this brain damage. However, more recent scholars do not view art with such "x-rated" eyes. They find the sexual iconography imbued with a votive content, perhaps serving in religious-magical ceremonies in the celebration of fertility or reproduction (Kauffmann-Doig 1979; Muelle 1932).

Nonetheless, cocaine and sex have remained intimately linked. During the Gay 90's, for example, when

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EPIDEMIOLOGY & RISK FACTORS

How Cannabis Alters Sexual Experience: A Survey of Men and Women

Ellen Wiebe, MD,[1] and Alanna Just, MPhil[2]

ABSTRACT

Introduction: Cannabis is reported to enhance sexual function; yet, previous studies have shown that physiological and subjective indices of sexual arousal and motivation were associated with decreased availability of circulating endocannabinoid concentrations.

Aim: To explain this contradiction, we evaluated which aspects of sexual experience were enhanced or diminished by cannabis use.

Methods: We used an online questionnaire with a convenience sample of people who had experience with cannabis. We asked questions regarding various aspects of sexual experience and whether they are affected by cannabis. We also asked about sexual dysfunction.

Main Outcome Measure: Aspects of participant sexual experience enhanced by cannabis.

Results: We analyzed results from 216 questionnaires completed by people with experience using cannabis with sex. Of these, 112 (52.3%) said they used cannabis to alter their sexual experience. Eighty-two participants (38.7%) said sex was better, 34 (16.0%) said it was better in some ways and worse in others, 52 (24.5%) said it was sometimes better, and only 10 (4.7%) said it was worse. Of 202 participants, 119 (58.9%) said cannabis increased their desire for sex, 149 of the 202 participants (73.8%) reported increased sexual satisfaction, 144 of 199 participants (74.3%) reported an increased sensitivity to touch, and 132 of 201 participants (65.7%) reported an increased intensity of orgasms. Out of 199 participants, 139 (69.8%) said they could relax more during sex, and 100 of 198 participants (50.5%) said they were better able to focus. Of the 28 participants who reported difficulty reaching orgasm, 14 said it was easier to reach orgasm while using cannabis, but only 10 said that sex was better.

Clinical Implications: The information in this study helps clarify which aspects of sexual function can be improved or interfered with by cannabis use.

Strengths & Limitations: We asked about specific sexual effects of cannabis and were therefore able to understand the paradox of how cannabis can both improve and detract from sexual experience. Limitations of this study include bias that may have been introduced because the sample included only people who responded to the advertisements; it may not represent the general population of people who use cannabis. Moreover, over one-third of our sample said they use cannabis daily and so represent heavier than average users.

Conclusion: Many participants in our study found that cannabis helped them relax, heightened their sensitivity to touch, and increased intensity of feelings, thus enhancing their sexual experience, while others found that cannabis interfered by making them sleepy and less focused or had no effect on their sexual experience. **Wiebe E, Just A. How Cannabis Alters Sexual Experience: A Survey of Men and Women. J Sex Med 2019;16:1758–1762.**

Key Words: Cannabis; Sexual Experience; Sexual Dysfunction

INTRODUCTION

Cannabis has a reputation for enhancing sexual function. Several surveys in the 1970s found that both men and women reported that using cannabis enhanced their sexual experience.[1,2] Women reported greater increases in desire and satisfaction than men.[3] Various hypotheses for why people report cannabis-related enhancement of sexual experiences include the effect of cannabis

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Table 1. Participant demographic information

Demographic	Frequency	Percent of respondents
Gender (n = 211)		
Female	133	63
Male	76	36
Transgender	2	1
Education (n = 210)		
Some high school	5	2.4
High school diploma/General Education Development	15	7.1
Some college/university	77	36.7
College/university degree	113	53.8
Ethnic origin (n = 193)		
White/Caucasian	141	73.1
South or East Indian	52	26.9
Born in Canada (n = 209)		
Yes	142	67.9
No	67	32.1

Table 2. Participant responses regarding cannabis use

Participant responses	Frequency	Percent of respondents
Frequency of cannabis use (n = 217)		
Daily	82	37.8
Most weeks	51	23.5
Sometimes	57	26.3
Not any more	27	12.4
Experience using cannabis during sex? (n = 216)		
Yes	209	96.8
No	7	3.2
Have you used cannabis specifically to alter your sexual experience? (n = 217)		
Never	104	47.9
Rarely	27	12.4
Occasionally	64	29.5
Usually	15	6.9
Always or almost always	7	3.2
Do you prefer to be high on cannabis when you have sex? (n = 209)		
Yes	86	41.1
No	123	58.9
How has using cannabis altered your sexual experience? (n = 212)		
Better	82	38.7
No change	34	16.0
Worse	10	4.7
Better in some ways, worse in others	34	16.0
Sometimes better but at other times no change or worse	52	24.5

on heightened perceptions, time distortion, relaxation, and decreased inhibition.[1] A large survey of 8,656 Australians found that daily cannabis use was associated with having more sexual partners and sexually transmitted infections. Moreover, daily cannabis use was related to increased reports of difficulty reaching orgasm in men but was unrelated to sexual problems in women.[4]

Conversely, a more recent study showed that increases in both physiological and subjective indices of sexual arousal were significantly associated with decreased endocannabinoid concentrations.[5] In rodents, studies have shown that sexual motivation is decreased following cannabinoid administration and increased following cannabinoid receptor antagonism.[6,7]

Cannabis (or marijuana) is commonly used. The 2015 National Survey on Drug Use and Health in the United States reported that 22.2 million Americans had used cannabis in the previous month.[8] In many jurisdictions, including Canada, where this study was conducted, and in 13 US states, cannabis is legal for recreational use.[9,10] The leaves and flowering tops of cannabis plants contain at least 489 distinct compounds, distributed among 18 different chemical classes and harboring more than 70 different phytocannabinoids.[11] The main cannabinoids are delta-9-tetrahydrocannabinol and cannabidiol. Endogenous cannabinoids (or endocannabinoids) bind to the same receptors as those of tetrahydrocannabinol, the psychoactive component of cannabis. There are cannabinoid receptors in the ovary, endometrium, and myometrium,[12,13] and this may be relevant to sexual effects.

The purpose of this study was to explore what people experience when using cannabis with sex and whether they specifically use cannabis to enhance sexual experience. We hypothesized that cannabis use has both negative and positive effects on sexual experience and that the positive effects would be greater than the negative ones.

METHODS

This study consisted of an online questionnaire for people in the community who had experienced using cannabis during sex. The questionnaire included demographic questions plus questions regarding frequency of cannabis use, purposes for cannabis use, whether participants engaged in sexual activity while under the influence of cannabis, and whether cannabis use enhanced, interfered with, or made no difference in their sexual experience. We designed the survey with input from a sexologist colleague and pilot tested it before posting.

Men and women were recruited from various sites using various methods: word of mouth, posters in cannabis retail outlets, cannabis advocacy groups, women's groups, university bulletin boards, and a classified advertisement website (Craigslist). In the cannabis shops, we talked to the vendors (shop managers) and, if permitted, posted the study information with the URL link to the online questionnaire (using SurveyMonkey). When contacting people by e-mail (eg, through word of mouth, advocacy groups) the link was given. No identifying information was collected.

Table 3. Aspects of participant sexual experience that were enhanced by cannabis use

Aspect of sexual experience that was enhanced	Frequency	Percent of respondents
Desire for sex (n = 202)	119	58.9
Sexual satisfaction (n = 202)	149	73.8
Vaginal lubrication (n = 153)	44	28.8
Erectile function/hardness (n = 133)	49	36.8
Sensitivity to touch (n = 199)	144	74.3
Intensity of orgasm (n = 201)	132	65.7
Ability to orgasm (n = 195)	86	44.1
Ability to relax during sex (n = 199)	139	69.8
Ability to focus during sex (n = 198)	100	50.5
Sexual confidence (n = 198)	107	54.0
Emotional closeness to partner (n = 197)	117	59.4

Data from the questionnaires were entered into an SPSS Statistics 25 (IBM Corp; Armonk, NY) database by a research assistant, and descriptive statistics were prepared. We used *t*-tests for continuous variables and chi-square tests for categorical variables to compare men to women. For the open-ended questions on the questionnaire, thematic analysis was used. The 2 investigators began by looking at the whole, then use detailed coding to discover themes.[14–16] Investigators met several times to discuss and revise themes until a consensus was reached.

RESULTS

Out of the 373 respondents, 350 said they had previously used cannabis, and only responses from these respondents were analyzed (see Table 1 for demographic information). The ages of respondents ranged from 17 to 75 years, with a mean of 29.9 years and a median of 25 years. The majority of participants (96.8%) had experience using cannabis during sex, 52.3% of whom reported using cannabis specifically to alter their sexual experience. When asked how cannabis affected sex, 16.0% of the 212 respondents said sex was better, 16.0% said it was better in some ways and worse in others, 24.5% said it was sometimes better in some ways and worse in others, and 4.7% said it was worse (Table 2).

Participants were asked how specific aspects of their sexual experience were altered by cannabis use during sex (Table 3). Participants reported an increased desire for sex (n = 119 of 202), increased sexual satisfaction (n = 149 of 202), increased vaginal lubrication for women (n = 44 of 153), increased erectile function/hardness for men (n = 49 of 133), increased sensitivity to touch (n = 144 of 199), increased intensity of orgasms (n = 132 of 201), increased ability to orgasm (n = 86 of 195), increased ability to relax during sex (n = 139 of 199), increased ability to focus during sex (n = 100 of 198), increased sexual confidence (n = 107 of 198), and increased emotional closeness to their partner (n = 117 of 197). Only 2 aspects differed significantly between men and women; 62 out of 122 women (50.8%) said that it was easier to reach orgasm when using cannabis, but only 22 out of 70 men (31.4%) did ($P = .038$). Additionally, 37 out of 127 women (29.4%) said it was more

Table 4. Open-ended questions and participant responses

Theme	Participant response
Cannabis increases sensitivity and intensifies the experience.	The occasional night of stoned sex can be incredibly loving, intimate, and intense.
	More physically intense, emotionally intimate, rhythmic. I am able to last longer and am more interested in giving oral sex and extending foreplay.
	Be more present. More pleasure.
Relaxation improves the experience.	[I am] more relaxed and engaged in the act, more likely to let go = higher chance of orgasm.
	It's a lot easier to come, both because I get out of my own head a bit and because physically I'm just more in the moment and more sensitive.
Cannabis improves or worsens focus and that affects sexual pleasure.	It helps the mind focus on the pleasure of touch. Every sense is heightened, you feel light and warm and in the moment of bliss.
	Sex can be much better, but as a woman who has to focus to reach orgasm, doing so is more difficult. That being said, when it does happen it is more intense.
Cannabis can interfere with sexual pleasure; this interference is often related to using too much.	It depended. Sometimes it enhanced the experience, sometimes I became self-conscious and paranoid and it detracted from the experience.
	Sometimes when stoned and having sex I lose my concentration and stop for some reason.
	Too distracted to be completely present.
	I'm usually too tired from the marijuana to be in the mood.
	Too much makes it worse, but just a little bit makes it better.

difficult to focus during sex compared to 8 out of 70 men (11.4%) ($P < .03$).

We asked questions regarding sexual dysfunction to determine whether people used cannabis to treat this condition. Eight people (7 women and 1 man) reported that sex was often painful. Of these 8 people, all said they were better able to relax when using cannabis. Seven reported increased sexual satisfaction, 6 reported increased focus, 6 reported increased emotional closeness to their partner, and 5 said it was easier to have an orgasm when using cannabis. Twenty-eight people reported difficulty reaching orgasm; of these, 14 said it was easier to reach orgasm when using cannabis. Ten said that sex was better, 7 said that sex was better in some ways and worse in others, 6 said that sex was better sometimes and not others, 4 reported no changes, and 1 said that sex was worse when using cannabis.

In response to open-ended questions and comments, people expanded on their answers, and we were able to identify several themes (Table 4). The most important theme was that cannabis increased sensitivity and intensified the sexual experience. The next most important theme was about how relaxation improved the sexual experience. Many people commented on how cannabis could improve or worsen focus and how that affected sexual pleasure. The descriptions of how cannabis could interfere with sexual pleasure were varied but appeared to be mostly about using too much.

DISCUSSION

The general impression that sex is better with cannabis does not fit with what we know about the physiological responses to cannabinoids.[5–7] The results from this survey shed some light on this contradiction. The reports of increased sensitivity to touch and intensity of feelings, both of orgasms and emotional closeness, would logically improve sexual experience. The relaxation described would likely improve sexual experiences in stressful situations and in anxious people. Reports of enhanced focus or increased distraction may relate to the amount of cannabis used or individual reactions to cannabis. This is also true of reported sleepiness and paranoia. None of these reactions to cannabis is specifically related to physiological sexual response, but they do impact sexual experience. We found only a few differences between men and women, with women having more difficulty with focus and less difficulty achieving orgasm when using cannabis. This may be due to women needing more focus, and, as a result, women may have more difficulty achieving orgasm. This survey is limited by being a convenience sample of people who responded to the advertisements. As such, it may not represent the general population of people who use cannabis. Over one-third of our sample said they used cannabis daily and so represent heavier than average users. Further research is needed to delineate the different effects of cannabis on sexual experience and more specifically on sexual dysfunction.

CONCLUSION

In this survey of people who had used cannabis with sex, the majority found that cannabis helped them relax, heightened sensitivity to touch, and increased intensity of feelings, thus enhancing sexual experience. Others found that cannabis made them sleepy, less focused, and distracted, and some reported no change in their experience.

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EW

Category 2

(a) Drafting the Article
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(b) Revising It for Intellectual Content
EW; AJ

Category 3

(a) Final Approval of the Completed Article
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September 20, 2023
Board of Physicians
Connecticut Department of Consumer Protection
Medical Marijuana Program
450 Columbus Blvd, Suite 901
Hartford, CT 06103-1840

RE: Section I: Professional Recommendations for Medical Marijuana Treatment
Female Orgasmic Difficulty/Disorder (FOD)

Dear Board of Physicians,

I write to support the petition to add female orgasm difficulty/disorder (FOD) as a condition of treatment for the state of Connecticut's Medical Cannabis Program. FOD is an under-reported public health problem of enormous proportion. Up to 41% of women will experience this problem.[1] This is vastly more than will experience high blood pressure [2] or diabetes.[3] Unfortunately, despite the pervasive and pernicious effects of Female Orgasm Difficulty/Disorder, there are no conventional medications that can help.[4] Cannabis for female sexuality has actually been researched for over 50 years. Study after study has revealed that cannabis helps women with this issue. [5-16] Yet no state has yet put FOD on their list of approved indications. I hope that Connecticut will be a leader.

I have been a practicing Cannabinoid Specialist for over 12 years. I am faculty at both Harvard Medical School and MassGeneral Brigham Hospital. My research focus is on cannabinoids for human sexuality. In my practice, I have been prescribing medical cannabis to patients who have FOD and can attest that women report benefit from cannabis in ways no other medication or program can match.

If I can be of further service or answer any questions, please do not hesitate to contact me.

Harvard Medical School
President, Association of Cannabinoid Specialists
CEO, inhaleMD

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Male–female differences in the effects of cannabinoids on sexual behavior and gonadal hormone function

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ABSTRACT

The putative role of the endocannabinoid system and the effects of cannabis use in male and female sexual functioning are summarized. The influence of cannabis intake on sexual behavior and arousability appear to be dose-dependent in both men and women, although women are far more consistent in reporting facilitatory effects. Furthermore, evidence from nonhuman species indicate somewhat more beneficial than debilitating effects of cannabinoids on female sexual proceptivity and receptivity while suggesting predominantly detrimental effects on male sexual motivation and erectile functioning. Data from human and nonhuman species converge on the ephemeral nature of THC-induced testosterone decline. However, it is clear that cannabinoid-induced inhibition of male sexual behavior is independent of concurrent declines in testosterone levels. Investigations also reveal a suppression of gonadotropin release by cannabinoids across various species. Historical milestones and promising future directions in the area of cannabinoid and sexuality research are also outlined in this review.

The use of cannabis for recreational and medicinal purposes has been documented worldwide for centuries. During this time, a large body of contradictory claims regarding the effects of cannabis on sexual functioning and behavior has accumulated. Some suggest that cannabis acts as an effective aphrodisiac, whereas the Indian Hemp Drugs Commission (1894) believed that it was toxic to sexual health. These conflicting accounts have sparked many empirical studies since the 1970s. In this review, the works of neuroscientists, endocrinologists, pharmacologists, psychologists and clinicians are integrated in an attempt to produce a comprehensive picture of the relationship between cannabis use and sexuality in males and females.

Cannabis

Despite the long history of cannabis use, serious research on cannabinoids did not begin until the last few decades of the twentieth century (Vettor et al., 2008). In the late 1960s, Δ^9-tetrahydrocannabinol (THC) was identified as the main psychoactive component of cannabis, whereas other constituents such as cannabidiol (CBD) and cannabinol (CBN) were noted to elicit other physiological effects (Isbell et al., 1967). The identification of THC became a major impetus for further cannabinoid research, evident by a notable increase of publications in this area after its discovery (Vettor et al., 2008). This boost of interest in cannabis waned as researchers were repeatedly unsuccessful in their attempt to pinpoint cannabis' mechanism of action. Initially, nonspecific pathways, such as alterations in cell membrane fluidity, were proposed as the likely mechanism, but these speculations soon led to a dead end, along with comparatively fewer publications on cannabinoids in the ensuing decade. In the late 1980s, however, a landmark study found cannabinoids displayed binding properties indicative of their interaction with a specific receptor (Devane et al., 1988) and with this finding, there was a resurgence of cannabinoid research.

The endocannabinoid system

Cannabinoid receptors

In the early 1990s, a cannabinoid receptor was genetically determined and its distribution was then mapped in the brain using in situ hybridization and radioligand binding analysis (Herkenham et al., 1991; Matsuda et al., 1990). This receptor, termed CB_1, generally exists as a presynaptic receptor and its activation inhibits neurotransmitter release from the axon terminal (reviewed in Schlicker and Kathmann, 2001). Its distribution is widespread in the brain with high densities in several brain regions, such as the striatum, hippocampus, and cerebellum, as well as moderate to low densities

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in the amygdala, midbrain, and cerebral cortex (Herkenham et al., 1991; Tsou et al., 1998). Within these brain regions, pharmacological and electrophysiological studies revealed that the CB_1 receptor is situated on terminals that release gamma-aminobutyric acid (GABA), glutamate, serotonin, dopamine, and acetylcholine, and is inferred to be regulating these types of neurotransmitters in the central nervous system (reviewed in Schlicker and Kathmann, 2001).

The distribution of CB_1 receptors throughout these brain structures positions this system to modulate sexual behavior through multiple potential mechanisms. Specifically, there are four major pathways through which cannabinoids could modulate sexual behavior given their pattern of distribution. First, CB_1 receptors within the striatum and cerebellum produce reductions in motor activity and motor incoordination (DeSanty and Dar, 2001; Patel and Hillard, 2001; Lichtman et al., 1996; Egashira et al., 2002), indicating that any effects cannabinoid exert on sexual function may in part be mediated by changes in motor function elicited by this subpopulation of receptors. Second, CB_1 receptors within corticolimbic structures (particularly the prefrontal cortex, amygdala and hippocampus) regulate stress responsivity and emotional behavior (Rubino et al., 2008; Hill et al., 2009; McLaughlin et al., 2007), indicating that cannabinoids may be able to exert effects on sexual behavior indirectly through their ability to modulate the expression of stress and anxiety. Third, CB_1 receptors are located within the dorsal raphe and ventral tegmental area, which are the nuclei containing the cell bodies for the serotonergic and dopaminergic input to the forebrain, respectively (Haring et al., 2007; Matyas et al., 2008). Activation of CB_1 receptors is capable of modulating the synaptic release of both dopamine and serotonin, two neurotransmitters which are intricately involved in the regulation of genital reflexes, sexual motivation and inhibition (Hull et al., 2004; Giraldi et al., 2004). Thus, cannabinoids may modulate sexual function through direct regulation of the synaptic release of serotonin and dopamine. Fourth, CB_1 receptors are distributed throughout neuropeptide populations within the hypothalamus and are known to regulate the release of several peptides important for sexual activity, physiology and reproductive neuroendocrinology, such as oxytocin (Sabatier and Leng, 2006) and gonadotropin releasing hormone (Gammon et al., 2005). Thus, cannabinoids may exert their effects on sexual activity through direct effects within the hypothalamus on the network of peptidergic neurons which regulate the physiological and endocrinological underpinnings of sexual activity. The possible involvement of these systems will be discussed at greater length in this review with respect to documented changes in sexual activity and reproductive neuroendocrinology.

Several years after the discovery of the CB1 receptor, evidence for a second cannabinoid receptor, CB_2, materialized when the receptor was successfully cloned from a promyelocytic cell line by Munro and colleagues (1993). CB_1 and CB_2 receptors are among the most abundant G protein-coupled receptors (GPCRs) and mainly couple to inhibitory G_i and G_o proteins (reviewed in Mackie, 2008). Despite these similarities, the two receptors diverge in important ways. Specifically, compared to CB_1, the CB_2 receptor has a more limited distribution and is primarily located in peripheral tissue, such as thymus, spleen, and immune cells (Munro et al., 1993). Although both utilize similar signal transduction pathways, their differential localization suggests that they regulate separate physiological functions.

Endogenous cannabinoid receptor ligands

The presence of endogenous receptors for THC suggested the existence of an endogenous substance that naturally binds to these receptors. The search for the first endocannabinoid ended in the 1990's when it was discovered and named “anandamide” (AEA), after the Sanskrit word, *ananda*, for bliss (Devane et al., 1992). A second endocannabinoid, 2-arachidonoylglycerol (2-AG) was found shortly after (Sugiura et al., 1995). Several other ligands have been posited as potential endocannabinoids, such as *N*-dihomo-γ-linolenoylethanolamine, *N*-docosatetraenoylethanolamine, *O*-arachidonoylethanolamine (virodhamine), oleamide, *N*-arachidonoyl dopamine and *N*-oleoyl dopamine (reviewed in Pertwee, 2005). However, the full characterization of these ligands as endocannabinoids is still not conclusive and thus, in this review, only AEA and 2-AG will be discussed as endocannabinoids.

The synthesis, transport, and metabolism of endocannabinoids are highly regulated processes (for review see Bisogno, 2008 and Ahn, et al., 2008). The synthesis of endocannabinoids is ‘on demand' following post-synaptic depolarization, increases of intracellular calcium and/or activation of various phospholipase enzymes. This is a unique synthesis process given that neuromodulators are normally produced in advance and stored in vesicles (reviewed in Mackie, 2008; Pertwee, 2008).

Furthermore, following their synthesis, AEA and 2-AG do not behave like classical neurotransmitters. They are believed to be discharged into the synapse by the post-synaptic cell to activate cannabinoid receptors on the axon terminals of the pre-synapse and inhibit neurotransmitter release. Upon receptor activation, endocannabinoids are removed by cellular uptake, possibly through the actions of a specific transporter. They are then metabolized by intracellular enzymes. Anandamide is mainly metabolized by fatty acid amide hydrolase (FAAH) and to a lesser extent by cyclooxygenase-2, lipoxygenases and cytochrome P450 (reviewed in Pertwee, 2008). 2-AG is metabolized primarily by monoacylglycerol lipase (MAGL), but also by FAAH (Dinh et al., 2002).

In addition to activating CB_1 and CB_2 receptors, endocannabinoids can also interact with other GPCRs and ion channels. They can interact with several types of potassium channels, serotonergic 5-HT_3 receptors, alpha7 nicotinic receptors and vanilloid receptor-type 1 (TRPV1) channels (Oz, 2006).

Collectively, endocannabinoids, the enzymes involved in their synthesis and metabolism, along with the cannabinoid receptors are known as the endocannabinoid system. Since the effects of cannabis are mediated via the activation of cannabinoid receptors, findings on the relationship between cannabis and sexuality can shed light on the relationship between endocannabinoids and sexuality, and vice versa. In this review, we will consider evidence involving both cannabinoids and endocannabinoids and their impact on sexual functioning and behavior in an array of species ranging from rodents to humans.

Human sexuality and cannabinoids

Women

Sexual functioning

So far, there are only a handful of scientific studies that have investigated the effects of cannabis on women's sexual behavior and they have exclusively used self-report data. Despite this shortcoming, these studies show a fairly consistent trend of beneficial effects of cannabis use on female sexual functioning. In a survey conducted by the National Commission on Marihuana and Drugs (1972), women were found to be more likely than men to report an increase in sexual desire following cannabis use. An ensuing survey conducted by Kolodny et al. (1979) which included 500 female participants found that cannabis consumption led to increased sensitivity to touch and relaxation, and as a result, sexual responsiveness, while having no concurrent effect on vaginal lubrication, orgasm frequency, or orgasm intensity. Furthermore, in contrast to data from the National Commission on Marijuana and Drugs, this study did not find increased desire in conjunction with cannabis use. A study by Koff (1974) of 345 undergraduate students seemed to reconcile these discrepant findings on sexual desire, as it found a dose-dependent effect of cannabis intake. Specifically, 71% of female participants reported increased sexual motivation after smoking one cannabis joint, but reported

decreases after larger consumption. Moreover, 43% of female participants recounted heightened sexual pleasure after cannabis intake. This positive impact of cannabis on sexual pleasure was replicated in a later interview-based study carried out by Halikas et al. (1982). In this study, 90% of women reported that cannabis use amplified sexual pleasure and satisfaction to various extents. Likewise, 40% of women also reported that cannabis improved to some degree the quality of their orgasm. One recent study that did report a negative effect of cannabis use on female sexual functioning found that it was associated with painful sex and inhibited orgasm, even after participants' sociodemographics and psychiatric diagnoses were controlled for (Johnson et al., 2004).

Nonetheless, this collection of surveys, although limited by the subjective nature of their method of data collection, overall converges on the positive effect of moderate cannabis consumption on female sexuality in two areas: sexual desire and sexual functioning, the latter including sexual satisfaction, pleasure and orgasmic quality.

Men

Sexual functioning

Unlike the studies on cannabis use and female sexuality, there is far less consistency in regards to research on cannabis use and male sexuality. With respect to positive outcomes, Tart (1970) noted that cannabis use intensified sexual arousal, increased sexual thoughts, and prolonged sexual performance. Furthermore, in an interview study conducted with 800 males between the ages of 18 and 30, Kolodny and colleagues (1979) found that 83% of men reported that cannabis consumption enhanced sexual pleasure. To follow up on this finding, Halikas and colleagues (1982) also surveyed male cannabis users. In this sample, 75% reported cannabis consumption enhanced sexual pleasure and satisfaction, 68% reported that it elevated the quality of their orgasm, and 39% reported that the duration of sexual intercourse was extended. Weller and Halikas (1978) in a later survey replicated similar results with 70% of users reporting increased sexual pleasure and satisfaction, 58% reporting enhanced orgasmic equality, and 27% reporting prolonged sexual intercourse. As these are self-report data, they are subject to multiple potential interpretations.

While these findings seem to depict cannabis as an aid to male sexuality, results on the effect of cannabis on erectile functioning are not nearly as positive. Anecdotal evidence suggesting a positive correlation between erectile dysfunction and cannabis use emerged early and from diverse locations, including North America, North Africa, and India (Chopra and Chopra, 1957; Scher, 1970). For example, Kolodny et al. (1974) noted that of the two men with erectile dysfunction in their study, one regained erectile functioning after terminating his cannabis use. Furthermore, when Cohen (1982) compared the prevalence of erectile dysfunction between daily cannabis users and a control group of men, a sizeable difference emerged, 19% and 8%, respectively. A recent study, using veno-occlusive plethysmography, documented a relationship between cannabis use and vascular erectile dysfunction in young men, which is marked by the presence of early endothelial dysfunction. This suggests that chronic cannabis use may cause early endothelial damage (Aversa et al., 2008), one possible pathway linking cannabis consumption to erectile dysfunction.

The effects of cannabis use on male sexuality appear to be dose-dependent. Abel (1981) noted this in his review published a quarter of a century ago. He concluded that a small amount of cannabis can enhance sexual activity, but larger quantities may inhibit sexual motivation. Koff (1974) provided additional evidence for this dose effect. Respondents in Koff's (1974) survey reported that one joint was more effective than two or more in increasing sexual desire and pleasure. A large sample of Indian men who were chronic cannabis users reported similar dose effects (Chopra and Jandu, 1976). Koff (1974) suggested that the noxious effect of large cannabis doses arises through a general depression of behavior rather than sex-specific effects.

Collectively, studies on male sexuality and cannabis use appear to document that cannabis intake facilitates sexual desire while simultaneously hindering erectile functioning. This is in contrast with the current literature on female sexuality and cannabis use which suggests cannabis use has positive effects on both sexual desire and functioning. These two bodies of research do share one similar finding: the effect of cannabis on both female and male sexual desire may only be positive in a moderate amount, above which the influence becomes detrimental.

Although the actual direct and indirect effects of marijuana on male and female sexual functioning are not fully understood, many speculations have been put forth in explaining the cannabinoid effects on human sexual functioning. Several researchers (e.g., Halikas et al., 1982) have proposed that cannabis exerts its positive effect on sexual functioning by increasing tactile sensitivity. However, this explanation seems unlikely, as marijuana has been reported to produce either a negative or no effect on touch sensitivity in nonsexual situations (Reese, 1977). Another possible means through which cannabis achieves its facilitatory effects may be the slowing of temporal perception, which causes enjoyable activities, such as sexual intercourse, to appear to last longer (Jarvik and Brecher, 1977; Melges et al., 1971). This perceptual manipulation may occur along with increased concentration on the present, which may also enhance the sexual experience (Melges et al., 1971). Such cannabis-induced experiential changes are also believed to promote sensate focus, bringing forth an erotic experience of the entire body, rather than specific erogenous zones (Gawin, 1978). Accordingly, some individuals reported that cannabis intake allowed them to expand their sensuality beyond the genital to the entire body during sexual intercourse, thereby enhancing their sexual pleasure (Lewis, 1970).

Other researchers believe that the positive effects of cannabis are independent of its psychoactive properties but may be merely a placebo effect, given cannabis' reputation of being an aphrodisiac. Indeed, there is evidence to suggest that the sexual experiences of cannabis users may be influenced by their expectations of the drug (Crenshaw and Goldberg, 1996). Alternatively, it is also possible that cannabis is eliciting its effects by directly stimulating regions of the brain that control sexual activity (Weller and Halikas, 1978). A more popular posited mechanism behind cannabis' influence on sexual functioning is disinhibition and relaxation (Kolodny et al., 1979, Dawley et al., 1979; McKay, 2005). This is believed to allow more focus and attention to be directed towards sexual pleasure, rendering the experience more enjoyable. Related to this explanation, Kolansky and Moore (1972) reported that cannabis consumption led to a period of sexual disinhibition in some women.

Furthermore, given the convincing body of research demonstrating a link between sexual arousal and androgens in women (e.g., reviewed in Motofei and Rowland, 2005), as well as evidence revealing an enhancement of sexual desire following androgen administration (e.g., van Anders et al., 2005), a possible mechanism behind cannabis and elevated female sexual functioning may be increased androgen levels. For example, it is possible that androstenedione, the major androgen produced by the adrenal cortex, is secreted in greater quantities following cannabis use. Previous studies found that THC increased the levels of adrenocorticotropic hormone (ACTH) as well as the adrenal steroid corticosterone in rats (Jackson and Murphy, 1997; Manzanares et al., 1999) and cortisol in humans (D'Souza et al., 2004). Together, these findings point to the strong possibility that adrenal androgens may also be boosted by THC. Existing data on testosterone levels and cannabis consumption in women are conflicting. Earlier studies reported that women who use cannabis frequently and for extended periods of time had significantly higher levels of plasma testosterone (Kolodny et al., 1977, 1979) and higher scores on specific measures of sexual activity,

such as orgasmic frequency, compared to age-matched women who had never consumed cannabis (Kolodny et al., 1977). However, a more recent study using a cross-sectional design found no difference in testosterone levels between habitual marijuana users and non-users (Block et al., 1991). It remains to be determined whether dose and temporal parameters account for the conflicting data.

There is currently insufficient evidence to characterize the relative strength of the various explanations of marijuana's influence on sexual functioning. It is possible and indeed likely that several of these mechanisms may be possible in different cannabis users or in the same individual at different times. The specific effects of cannabis use in a given person can also be influenced by the user's immediate environment, expectations, personality type, age and relationship status (Tart, 1970; Crenshaw and Goldberg, 1996). The possibility that different mechanisms are at work behind the effect of cannabis and that the effect of cannabis depends on the user's various characteristics may account for the diversity of individual differences in reported marijuana responsiveness.

Testosterone

Ho and colleagues (1970) found that radiolabeled THC accumulated in the testes of rats, suggesting that cannabinoids may affect reproductive processes. This led to a flurry of investigations on the effect of cannabis intake on testosterone levels, conducted utilizing either acute or chronic cannabinoid administration. Acute studies involved measuring participant testosterone level before and after their single cannabinoid intake. Chronic studies either compared the testosterone values of participants with different levels of personal cannabis usage or subjected participants to an extended period of cannabis administration after which their testosterone quantities were compared with their baseline levels. It is important to note that results from chronic studies involving heavy cannabis users are likely to be confounded by other types of recreational drug use. Both chronic and acute studies are summarized below in a chronological fashion.

Kolodny and colleagues (1974) first followed up on the findings from Ho and colleagues (1970) using human participants and found that chronic consumption of cannabis significantly lowered plasma testosterone levels. Moreover, when Kolodny and colleagues (1974) separated the cannabis users by intake concentration, the testosterone reduction was found to be significantly greater in heavy users (more than 10 cannabis joints per week) than moderate users (5–9 joints per week).

This discovery quickly triggered a series of subsequent studies. First, Mendelson and colleagues (1974) decided to study this effect with a different research design. They utilized a within-subjects design instead of the between-subjects design used by Kolodny and colleagues (1974). Mendelson and colleagues (1974) first subjected 27 cannabis users to a 5-day cessation period to obtain a baseline. Subsequently, his group recorded the participants' daily plasma testosterone levels during a 21-day period of cannabis use and an ensuing 4-day cessation period. Employing this design, they found no significant differences in plasma testosterone level between heavy and casual users or at any period of the study. However, they did note a trend of lower testosterone levels in heavy users. Nonetheless, all subjects, including the heavy users, exhibited plasma testosterone quantities that were well within the normal range.

Motivated by these conflicting results, Schaefer and colleagues (1975) performed another within-subject study. They recruited 12 casual cannabis users and led them through a 1-day washout, followed by placebo and either10 mg or 20 mg THC cannabis joints in the subsequent three days. On the fifth day, each participant received a 20 mg THC joint and after 90 min of smoking, plasma was collected. Although testosterone values for all the participants were found to be within the normal range and, in fact, on the high end, the researchers did find a small (8%) but significant reduction in testosterone levels 90 min following the intake of the 20 mg THC joint (Schaefer et al., 1975).

Cushman (1975) decided to use a between-subject design similar to the initial Kolodny and colleagues (1974) study, but like the previous within-subject studies, no differences were observed between cannabis smokers and nonsmokers. In Cushman's (1975) study, the male student participants who smoked an average of five cannabis joints per week, thus comparable to the moderate users in the Kolodny and colleagues (1974) study, had similar plasma testosterone values as the non-smoking controls. Again, all testosterone levels were within the normal range.

One study that may explain the discrepant findings was conducted by Kolodny and colleagues (1976). Kolodny's group measured plasma testosterone levels at 15, 30, 60, 120 and 180 min after acute cannabis exposure and compared these values to those obtained in the same individuals during a nonsmoking period. They discovered a significant plasma testosterone reduction at 30 min that continued to the 180-min time point and concluded that cannabis use may temporarily decrease testosterone production. This seems to suggest that the absence of a testosterone decline in some studies may be the consequence of an insufficient or excessive temporal lag between the last exposure to cannabis and testosterone measurement.

Taking into account the findings of Kolodny and colleagues (1976), Wall and colleagues (1978) measured plasma testosterone in eight casual cannabis users at numerous time points for 6 h following their single bolus infusion of either 10 mg THC or placebo. They observed a depression of plasma testosterone from 3.5 h to 6 h post-infusion, which seemed to resonate with findings of Kolodny and colleagues (1976). The ephemeral nature of testosterone reduction after cannabis intake was further buttressed by Cohen's (1976) study where testosterone levels were found to decrease 2–3 h after cannabis consumption. Also, Cohen (1976) documented that testosterone levels progressively dropped to 60% of baseline values after 4 weeks of cannabis smoking and returned to 84% of baseline after a 1-week cessation period, highlighting the reversible nature of the inhibitory effect of cannabis consumption on testosterone levels. Collectively, these three studies demonstrate that cannabis use does temporarily reduce testosterone levels, notwithstanding other evidence of non-significant effects.

This general consensus was challenged by a later study performed by Mendelson's group, using similar methods to their previous investigation with the important addition of an hourly measurement of plasma testosterone over a 24-h period on the last day of baseline, the twenty-first day of cannabis use and the third day of cessation. Mendelson and colleagues (1978) found, for the second time, no correlation between cannabis use and plasma testosterone fluctuations. All subjects, surprisingly, also possessed plasma testosterone levels in the higher range of normalcy. One likely explanation for this finding is that 21 days of cannabis intake is inadequate for producing a robust inhibition.

Kolodny and colleagues (1975) responded with a follow-up study, employing a similar within-subjects design to Mendelson and colleagues (1978) that entailed daily marijuana consumption of standardized potency for 8 weeks. Significant declines in testosterone levels were observed only after 5 weeks and an even greater decline was observed in subsequent weeks.

Nevertheless, two later studies did not detect an effect of cannabis use on plasma testosterone values with either acute (Cone et al., 1986) or chronic consumption (Block et al., 1991). The acute consumption study did demonstrate, however, that intake of cannabis in the form of one or two joints did produce a nonsignificant trend towards a decrease in testosterone levels (Cone et al., 1986).

Despite the lack of coherence among findings on the effect of cannabis on testosterone levels, there is one consistent finding. Specifically, all studies that have documented a statistically significant testosterone decrease after cannabis consumption have also

found that the measured testosterone levels in these users are still within the normal range, suggesting that this effect is not likely of behavioral significance.

Animal models of sexuality, cannabinoids and endocannabinoids

Females

Sexual functioning

Unlike the research on the effects of cannabinoids in women, findings in females of other species are conflicting. The first controlled study on cannabinoids and female sexual behavior in rats was conducted by Gordon and colleagues (1978) prior to the discovery of the endocannabinoid system. Gordon and colleagues (1978) demonstrated that THC failed to elicit sexual receptivity in the absence of ovarian hormones and in estrogen-treated rats, THC did not mimic progesterone. These findings indicated that THC was not exerting its influence on rodent sexual behavior by acting like an estrogen or progesterone-like substance, both of which are not critical to the endocrine mediation of human sexual behavior.

With regards to THC and sexual behavior, Gordon and colleagues (1978) found a biphasic effect: a low dose of THC facilitated lordosis and a high dose interfered with sexual receptivity in estradiol-primed female rats. This dose-dependent effect echoes the findings on women's sexuality and cannabinoids, where low levels of cannabis consumption were found to be facilitatory while heavy intake was detrimental (Koff, 1974). Furthermore, when the adrenal steroids in the female rats were removed via adrenalectomy, the facilitatory effect of THC persisted, indicating that THC was acting centrally rather than behaving like an ovarian steroid or enhancing those adrenal secretions which tend to facilitate lordosis.

Another early study also found positive effects of THC on rodent sexual behavior. Turley and Floody (1981) chose to investigate not only sexual receptivity but also proceptivity, the active sexual solicitation of a male, since this may be more relevant to women's sexual behavior. By measuring ultrasonic vocalizations and observing lordosis in estradiol-primed female hamsters, these researchers concluded that THC stimulated both sexual receptivity and proceptivity. Moreover, Turley and Floody (1981) also came to the same conclusion as Gordon and colleagues (1978), i.e. that the effects of THC were centrally instead of hormonally mediated.

A more recent study by Mani and colleagues (2001) revived the discussion of cannabinoid mediation of behavioral estrus. This research group examined in detail the mechanisms underlying the influence of cannabinoids on sexual behavior. In the first of a series of experiments, they found that intracerebroventricular administration of THC enhanced lordosis in estrogen-treated female rats to levels comparable to female rats primed with both estrogen and progesterone. Moreover, Mani and colleagues (2001) observed that the enhancing effect of THC was attenuated by blocking both progesterone receptors and dopamine $D_{1/5}$ receptors. Pharmacologically antagonizing the CB_1 receptor blocked both dopamine- and progesterone-induced sexual facilitation. These results suggest that CB_1 receptors, and not CB_2 receptors, are involved in a cross-talk circuit with dopamine and progesterone which regulates female rodents' sexual behavior. Evidence that the CB_1 receptor is found within the ventromedial hypothalamus and the medial basal hypothalamus further buttress this hypothesis as both brain regions express progesterone and dopamine receptors and are critical for sexual behavior regulation in the female rat.

Altogether these studies indicate that cannabinoids may serve as a proxy for progesterone and facilitate sexual receptivity and proceptivity in female rats. Nonetheless, two more recent studies document opposing results. Ferrari and colleagues (2000) found that a powerful cannabinoid agonist, HU210, decreased both lordosis and proceptive behaviors in estrous female rats. In a more recent study, Lopez and colleagues (2009), in addition to recording lordosis and proceptive displays, utilized a runway methodology that they deemed to be more representative of women's sexual desire. Using this methodology, Lopez and colleagues (2009) reported that the administration of AM251, a CB_1 antagonist/inverse agonist significantly stimulated sexual motivation in receptive female rats primed with both estradiol and progesterone. The same antagonist/inverse agonist also elevated lordosis and proceptivity in females given low doses of estradiol. These results are in stark contrast to those of Mani and colleagues (2001), who found that the cannabinoid antagonist, SR141716A, diminished receptivity. This discrepancy may partially be the result of several methodological differences. First, the rats in the study of Mani and colleagues (2001) were administered 2 μg of estradiol benzoate and 2 μg of progesterone (intracerebroventricularly, 30 min prior to testing), whereas those in the study of Lopez and colleagues (2009) were administered higher doses of estradiol benzoate and progesterone systemically. Perhaps more importantly, Lopez's team delivered the cannabinoid antagonist AM251 in their study whereas Mani and colleagues (2001) administered SR141716A. This is an especially notable methodological difference given that some physiological effects have been shown to be elicited by SR141716A and not AM251, such as the blocking of negative ionotropic responses to anandamide (Ford et al., 2002). Finally, Lopez and colleagues (2009) chose to assess female receptivity by using a paced mating paradigm, while Mani and colleagues (2001) utilized a non-paced mating procedure and ended their tests after the male had mounted the female ten times.

The current state of findings on the effects of cannabinoids on non-human female sexual functioning is far from reaching consensus. Previous results widely fluctuated and demonstrated both deleterious and beneficial effects of THC. Future studies in this area are certainly needed to produce a more coherent picture. Prospective studies may need to pay especially close attention to its methodological details as past conflicting results may be partially attributable to methodological differences, such as the specific antagonist used.

Gonadotropins

Studies across nonhuman species suggest that cannabinoids suppress gonadotropin release through hypothalamic blockade of gonadotropin releasing hormone (GnRH). Treatment with THC produces a reduction in LH levels in rats (Marks, 1973; Tyrey, 1978), mice (Dalterio et al., 1983), and monkeys (Smith et al., 1979). In rhesus monkeys the effect lasted up to 12 h, but could be reversed by the administration of GnRH (Smith et al., 1979). Therefore endocannabinoids may act at the hypothalamus to suppress GnRH secretion. Murphy and colleagues (1990) found that cannabinoids did not block basal GnRH secretion from hypothalami *in vitro*. This suggests that cannabinoids suppress GnRH secretion by modulating the activity of neurotransmitters involved in regulating GnRH secretion.

As a result of its effect on GnRH levels, THC has disruptive effects on cyclicity. In rats, THC was shown to block ovulation and the LH surge (Nir et al., 1973) and decrease progesterone levels during the luteal phase (Kostellow et al., 1980). In rhesus monkeys, THC administration in the follicular phase blocked ovulation and decreased levels of estrogens and gonadotropins, but co-administration of exogenous gonadotropins preserved ovulation (Asch et al., 1981). This supports the hypothesis that cannabinoids are acting at the hypothalamus to suppress GnRH. Sassenrath and Chapman (1975) found that monkeys treated with THC for 1 year had normal menstrual cycles, suggesting tolerance can develop to the disruptive effects of THC on menstruation.

Males

Sexual functioning

While some human studies have described aphrodisiac-like properties of marijuana, animal studies have typically reported inhibitory effects of cannabinoids on male sexual behavior. This discrepancy may arise because most of the human data is based on subjective self-reports rather than objective measures. Alternatively, inhibition of male sexual behavior in other species may be the result of the relatively high drug doses commonly administered to nonhuman subjects. Consistent with the dosage hypothesis, Martinez-Gonzalez and colleagues (2004) gave male rats high and low dose intraperitoneal injections of the endocannabinoid, AEA, and found that the high dose of AEA increased mount, intromission, and ejaculation latencies, but the relatively low dose of AEA had the opposite effect, slightly increasing ejaculation frequency. Although there is currently no evidence for exogenous cannabinoids facilitating male sexual behavior in nonhuman species, this study suggests that the endocannabinoid system may have both facilitatory and inhibitory functions in regulating sexual behavior.

In an early study of the effects of cannabis on sexual behavior, Merari and colleagues (1973) monitored male rats presented with receptive females and found that an intraperitoneal injection of THC interfered with copulatory behavior, increasing latency to first mount, latency to ejaculation, and latency to mount following ejaculation. This study used THC doses of 2 and 3 mg/kg. A dose as low as 0.5 mg/kg was shown to inhibit the sexual behavior of male rats, with a significant reduction in mounting and ejaculation frequency compared to vehicle-treated animals (Uyeno, 1976). Cannabinoids have also been shown to decrease the sexual behavior of mice (Cutler and Mackintosh, 1984). Male mice receiving a high dose of THC or CBN 3 times a week for 3 or 7 weeks exhibited impaired sexual motivation, with treated males taking longer to initiate sexual intercourse with receptive females (Dalterio, 1979). Although high doses of THC also suppress motor activity in mice, Frischknecht and colleagues (1982) found that repeated exposure induced tolerance to motor impairment, but not sexual impairment. This suggests that the cannabinoid-induced reduction in male sexual behavior was a result of reduced motivation for sex rather than a nonspecific effect of impaired motor function. In rats, Dhawan and Sharma (2003) showed that a high dose of THC (10 mg/kg) impaired sexual motivation and no tolerance developed following repeated administration. Thus, unlike many of the behavioral effects of cannabis, tolerance does not develop to the inhibitory effects of exogenous cannabinoids on male sexual behavior.

Studies utilizing cannabinoid receptor agonists and antagonists support an inhibitory role for cannabinoids in male sexual behavior. Ferrari and colleagues (2000) found that treatment with the potent CB1 receptor agonist, HU-210, led to a dose-dependent reduction in male rat copulation at doses that did not affect motor function. Furthermore, chronic treatment with HU-210 impaired sexual behavior at doses that had no effect when administered acutely. In line with this, Gorzalka et al., (2008b) found that administration of the CB1 receptor antagonist, AM251, led to a dose-dependent facilitation of ejaculation in male rats. Male rats given a single intraperitoneal injection of AM251 required less time and fewer intromissions to achieve ejaculation. Utilizing both agonists and antagonists, these data suggest that the endocannabinoid system negatively regulates male sexual behavior at a range of doses.

The mechanism through which cannabinoids impair male rat, mouse, or human motivation for copulation has yet to be determined. There is evidence that cannabis can decrease testosterone levels in men (Kolodny et al., 1974), but this is likely not mediating the cannabinoid-induced decreases in sexual response, as Shrenker and Bartke (1985) found that THC still led to deficits of copulation in testosterone-treated castrated mice. It is known that male rats exposed to sexually receptive females exhibit a rapid increase in noradrenergic activity in the medial basal hypothalamus and median eminence, as well as in dopaminergic activity in the medial basal hypothalamus. Murphy and colleagues (1994) showed that oral administration of THC blocked both of these responses. This suggests that reductions in hypothalamic noradrenergic and dopaminergic levels may mediate the inhibitory effects of cannabinoids on male sexual behavior, but further research is needed before solid conclusions can be drawn.

The presence of the endocannabinoid system in stress-responsive neural circuits suggests that it may play a critical role in regulating neuroendocrine and behavioral responses to stress (Gorzalka et al., 2008a). There is mounting evidence that the endocannabinoid system is involved in the stress-induced suppression of sexual behavior. Perhaps cannabinoid effects on sexual behavior and reward arise from activation of the stress system, which subsequently interferes with sexual motivation, performance, and/or arousal. Although researchers have found ways to deal with the motor-inhibitory effects of cannabinoids, it is much more difficult, but may be equally important to control for the effects of cannabinoids on anxiety and stress. Coddington and colleagues (2007) showed that blockade of the CB1 receptor blocked stress-induced suppression of male sexual behavior in *Taricha granulose*, a rough-skinned newt. Normally, exposure to acute stress or injection of corticosterone suppresses courtship clasping behaviors of male *Taricha*, but administration of the CB1 receptor antagonist, AM281, was shown to block this suppression by blocking the inhibition of spontaneous neuronal activity and sensory responsiveness in the neural circuit for clasping. In rats, chronic stress or chronic treatment with corticosterone inhibits male sexual behavior, an effect likely mediated by increased serotonergic 5-HT2A receptor activity (Gorzalka et al., 1990, 1998, 2001). Hill and colleagues (2006) showed that chronic treatment with the CB1 receptor agonist, HU-210, increased 5-HT2A receptor activity. This suggests that stress and subsequent corticosterone release leads to activation of endocannabinoid signaling, which results in increased 5-HT2A receptor activity and a suppression of male sexual activity. Involvement of 5-HT receptors may explain some of the sex differences in the effects of THC on sexual functioning, as activation of 5-HT receptor subtypes has been shown to have differential effects on the sexual behavior of male and female rats.

There are considerable data on the role of the endocannabinoid system in the inhibition of penile erections. It is well established that a group of oxytocinergic neurons in the paraventricular nucleus of the hypothalamus (PVN) regulate erectile function and copulatory behavior of males (Argiolas and Melis, 1995, 2004, 2005; Giuliano and Rampin, 2000; McKenna, 2000; Andersson, 2001; Melis and Argiolas, 2003). CB1 receptors are known to be expressed here (Herkenham et al., 1991) and Melis and colleagues (2004) demonstrated that erections could be induced in male rats by injecting the cannabinoid CB1 receptor antagonist, SR 141716A, into the PVN. Although PVN injection of CB1 receptor agonists, WIN 55,212-2 or CP 55,940, had no effect on erection, they were capable of reducing the erection-inducing effect of SR 141716A. Recently, Castelli and colleagues (2007) demonstrated that chronic intraperitoneal injection of SR 141716A actually increased the density of CB1 receptors in the PVN and that this increase correlated with an increase in the pro-erectile effect of SR 141716A injected into the PVN. Blockade of CB1 in the PVN is thought to increase penile erection by decreasing GABA release (Castelli, et al., 2007). This would increase glutamatergic neurotransmission in the PVN, signaling the oxytocinergic neurons to produce more nitric oxide (NO) via NO synthase. Increased NO would facilitate the release of oxytocin, which leads to penile erection. Consistent with this hypothesis, intra-cerebral microdialysis revealed that the pro-erectile effect of SR 141716A in the PVN occurred concomitantly with an increase in the concentration of glutamic acid, NO^{2-} and NO^{3-} in the paraventricular dialysate (Succu et al., 2006; Melis et al., 2006) and PVN injection of the glutamate receptor

antagonist, MK-801, or the NO synthase inhibitor, L-NAME, reduced the erection-inducing effect of SR 141716A. Furthermore, injection of the oxytocin receptor antagonist, $d(CH_2)_5Tyr(Me)^2$-Orn^8-vasotocin, into the lateral ventricles almost completely eliminated SR 141716A-induced penile erections (Melis et al., 2004). In summary, CB1 receptors appear to influence erectile function and sexual activity centrally by modulating paraventricular oxytocinergic neurons. There is also emerging evidence for peripheral effects of cannabinoids on penile erection.

Relaxation of cavernous smooth muscle in the corpus cavernosum is critical for inducing and maintaining penile erections. CB1 receptors have been shown to be expressed in the corpus cavernosum of the rat (Ghasemi et al., 2006) and CB1 and CB2 receptors have been shown to be expressed in the corpus cavernosum of rhesus monkeys and humans (Gratzke et al., 2009). *In vitro* studies utilizing rat and rabbit preparations reveal that relaxation of corpus cavernosum tissue is enhanced in the presence of the endocannabinoid AEA (Ghasemi et al., 2006; Vural et al., 2009). In rat tissue, CB1 and not CB2 receptor antagonists inhibited relaxation (Ghasemi et al., 2006), but in rabbits both CB1 and CB2 receptor antagonists inhibited relaxation (Vural et al., 2009). In tissue isolated from rhesus monkeys, AEA actually had the opposite effect—antagonizing relaxations of the corpus cavernosum (Gratzke et al., 2009). These *in vitro* studies suggest a peripheral role for cannabinoid signalling in sexual behavior, but highlight potential species differences in the functioning of the endocannabinoid system.

The majority of animal evidence points to an inhibitory role for the endocannabinoid system in the regulation of male sexual behavior. The aphrodisiac-like properties of cannabis described by some users is likely the result of altered perceptual processing of the sexual encounter. This effect is not readily measurable in animal models, but the role of the endocannabinoid system in physiological processes involved in the sexual response, such as erection and ejaculation, is a prospect for drug development for sexual dysfunctions.

Testosterone

Unlike human data, data from other species reveal a reduction in testosterone following cannabis exposure. In the first such study, Dalterio and colleagues (1977a) demonstrated *in vitro* that application of an exogenous cannabinoid, THC or CBN, led to a dose-dependent suppression of gonadotropin-stimulated testicular production of testosterone in tissue from mature and immature mice. Burstein and colleagues (1979) showed that THC did not interfere with the binding of gonadotropins to their receptors in the testes, but affected testosterone biosynthesis by inhibiting cholesterol esterase. Cholesterol is the precursor to all steroids and as one might expect, THC was also shown to inhibit the production of progesterone in mouse testis (Dalterio et al., 1977b). In a rat preparation, administration of CBN, CBD, and THC were all shown to inhibit testosterone production in Leydig cells, but CBN and CBD were more potent inhibitors than THC (Jakubovic et al., 1979). In addition to reducing testosterone biosynthesis, cannabinoids have also been shown to accelerate its hydroxylation by liver microsomes (List et al., 1977). These studies suggest that cannabinoids act peripherally to decrease testosterone levels by inhibiting its biosynthesis and accelerating its metabolism. Furthermore, there is evidence that cannabinoids can inhibit testosterone activity by impairing androgen binding to receptors (Dixit and Lohiya, 1975; Ghosh et al., 1981; Purohit et al., 1980).

Evidence from early *in vivo* studies suggested that THC also acts centrally to affect testosterone levels. Acute or chronic treatment of THC in male rats not only resulted in reduced levels of testosterone, but also reduced levels of luteinizing hormone (Symons et al., 1976; Kumar and Chen, 1983). More recently, Wenger and colleagues (2001) showed that AEA suppressed LH and testosterone levels in wild-type, but not CB1 knockout mice, providing evidence that the endocannabinoid system acts to suppress testosterone levels. Cannabinoid-induced reductions in testosterone are also observed in non-human primates. Rosencrantz and Esber (1980) observed reduced serum testosterone in male monkeys following either inhalation of cannabis smoke or oral ingestion of THC. Following THC injections in rhesus monkeys, Smith and colleagues (1976) observed a 65% reduction in testosterone levels that returned to baseline in only 3-days. Fujimoto and colleagues (1982) found that chronic oral administration of either THC or a crude marijuana extract (CME) to rats for 71–78 days resulted in reduced serum testosterone levels for 2–6 h after drug cessation, but this effect was gone 24 h later. Inconsistencies in the human data on testosterone and cannabis likely arise because of the relatively short time-course of the effect.

Conclusions and future directions

Findings on the effects of cannabinoids on sexuality have been accumulating for more than three decades and many aspects of this relationship have been clarified by the discovery of endocannabinoids and their receptors. In terms of women's sexual function, cannabis use has generally been reported to facilitate various aspects of sexual functioning, such as arousal and desire. Furthermore, this influence may be dose-dependent, as there is evidence suggesting that cannabis is beneficial to sexual functioning only at low doses, beyond which it can become debilitating. A similar dose-dependent relationship has also been found in the literature on cannabis consumption and male functioning. Moreover, there appears to be more conflict among the results in this research area as men report both facilitatory and incapacitating effects of their cannabis use, ranging from accounts of increased sexual desire to erectile dysfunction. Results on the influence of cannabis intake on testosterone levels in men are also mixed, revealing either a statistically significant decrease or no change in testosterone levels after cannabis consumption. A likely explanation for this inconsistency is that the reduction in testosterone levels from cannabis use is transient and too fleeting to be detected in studies that have a long temporal lag between cannabis intake and testosterone measurement. Overall, these studies do converge on one conclusion: if cannabis intake does lower testosterone levels, the magnitude of its influence is not likely to be of behavioral significance, as documented testosterone decreases still fall within the normal range in all studies to date.

Given the inherent flaws of self-report data, studies using model organisms are an important complement to findings on humans. Data using non-human species suggest that cannabinoids affect sexual behavior by acting centrally, specifically in the hypothalamus. In the area of female sexuality and THC, rodent studies have revealed both detrimental and beneficial effects on sexual receptivity and proceptivity. On the other hand, the majority of findings on male sexuality have found an inhibitory effect on sexual motivation and erectile functioning. Animal studies are also fairly consistent in reporting reductions in hormonal levels as a result of THC administration. Moreover, parallel to the human data, the THC-induced testosterone decrease was also observed to be temporary in model organisms.

Collectively, the current body of research on cannabinoids and sexual functioning has resulted in a clearer picture of their relationship. At the same time, it also points out what is missing from this picture. To date, objective measurement of the effects of cannabis on human sexual functioning has not been reported. In view of this, our laboratory is currently using the vaginal photoplethysmograph to examine empirically the relationship between marijuana use and sexual arousal, as well as the relationship between endocannabinoid levels and sexual functioning in women. Our techniques are described in Brotto and colleagues (2009).

There is practical value in understanding the endocannabinoid system's role in the sexual psychophysiology of men and women. This knowledge can lead to further advances in developing drugs for

treating sexual dysfunctions, such as arousal and desire disorders. It is also crucial for recognizing potential sexual side-effects of pharmaceutical agents that induce their effects by facilitating or antagonizing the endocannabinoid system. Given that such drugs are already being developed for treating various nonsexual disorders, insight into the endocannabinoid system is imperative.

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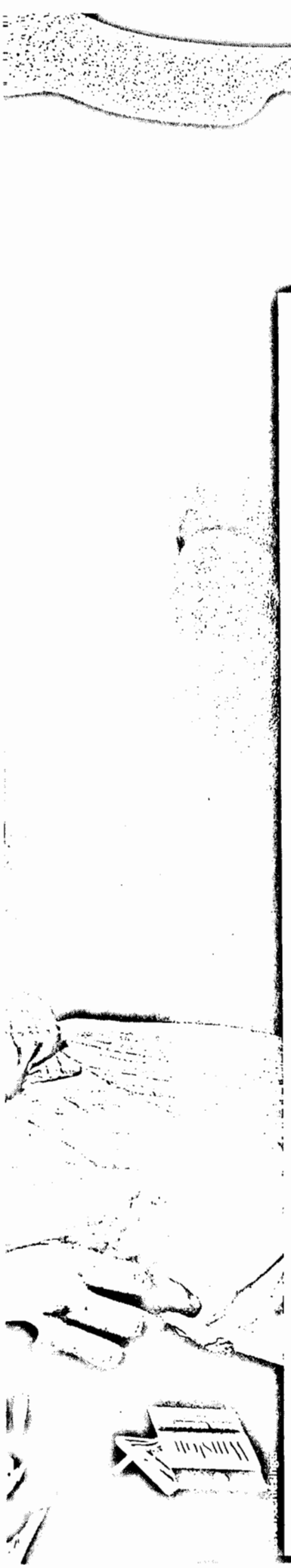

Marijuana and Sex

by Erich Goode

Does pot stimulate or dull sexual enjoyment? Do women respond to it more readily than men? A social scientist from Stony Brook surveyed 200 users and reports the surprising results.

It makes you a better seducer . . . you are more successful. You get a greater sense of confidence to seduce.

—Thirty-one-year-old filmmaker

Since I know sex is so much nicer high, it makes it more attractive beforehand, and I'm more likely to do it. You become more relaxed, less worried. —Anonymous coed

I'm willing to fuck almost anyone, any time, anywhere. Pot's not an aphrodisiac for me.

—Thirty-year-old Wall St. lawyer

AT THE TURN OF the sixties, Sex and Marijuana made their first appearance as liberated members of society. It was a joint debut. Now, as the decade draws to a close, they seem to have settled down and formed an enduring relationship. But, as with most modern relationships, it's ambiguous who is turning on whom, and how much of this love affair is merely a pipe dream.

In an informal survey of about 200 users, I asked some basic questions about the relationship of marijuana to both sexual desire and sexual activity. First I asked: "Do you think being high on marijuana stimulates your sex interest, or not?"

I got an intriguing variety of responses.

More than a third of the respondents said that marijuana has no effect on their sexual desire. Five per cent said that marijuana has a negative effect—that it turns them off sexually. Thirteen per cent said that the effect depends on their mood or on their sexual partner. In this group, a common response among the women was that marijuana acts as a sexual stimulant when they're with someone with whom they're already intimate, when they smoke with a stranger, the prospect of sex becomes even more distasteful than ordinarily. For these women, marijuana seems to polarize sexual desire. But 44 per cent—a strong plurality—replied that marijuana definitely increases their sexual desire.

Next, I asked: "Is your enjoyment of sex any different high, or not?"

The respondents were less divided on this question. An overwhelming majority—68 per cent—

replied that marijuana increases their sexual enjoyment; that their orgasmic pleasure is heightened by the drug.

Yet most scientists claim that in physiological terms marijuana lacks an aphrodisiac effect. If anything, it tends to reduce desire and to dull the sexual areas. Norman Taylor, a botanist, writes: "As to being a sex-excitant, marijuana appears to be just the opposite." Constantinos Miras, a Greek pharmacologist and one of the drug's severest critics, disclosed to a seminar at the UCLA Department of Pharmacology that marijuana actually impairs sexuality, and that when administered to rats, their rate of "reproductive activity" declined 90 per cent.

If, in physiological fact, marijuana is neutral—or even negative—to sexuality, why are so many people sexually turned on by it? Why, as after smoking the faddish banana, don't its users descend from a trial high to discover that it is more put-on than turn-on?

Well, consider the mythology.

Its use has traditionally been associated with the dramatic loss of sexual inhibition, and with what were thought to be the inevitable consequences: depravity, degradation, shame. "Marijuana," according to an historic description, "completely inflames the erotic impulses," and "leads to revolting sex crimes." For years, propaganda from the press assisted the Federal Bureau of Narcotics' campaign to nurture an evil image of the weed. An account written in the 1930's chronicles the degradation of a young girl lured into smoking the noxious stuff:

> Her will power dropped away from her like a rent garment, leaving her a tractable, pliant creature, as exposed to chance suggestion as if her soul had been naked to the wind.

The unfortunate girl so discarded her inhibitions that she accepted sexual proposals from passing strangers. When she came to her senses, she was so mortified that she committed suicide. Another tale from this era:

> An eighteen-year-old boy, from a respected family in a Midwestern city, smoked two reefers and an hour later choked his sweetheart to death because she refused his shocking, lustful advances born in a marijuana-crazed brain.

And although the warnings we receive today pretend to be couched in more clinical terms, the moral message is still only clumsily concealed. Said a recent article: "Once inhibitions are released, promiscuity often results."

THE SEX-LOADED diatribes of the anti-marijuana campaign may have been a tactical blunder. They seem to have attracted more recruits than they've discouraged. Sociologists and psychologists stress the power of mood, expectation, social conditioning, setting, and myth in shaping the nature of the drug experience. And our mood, expectations, social conditioning, setting, and myths have long associated marijuana with sex. We have *learned* to associate it with sensuousness and carnality, with hedonism and physical gratification. And so it stimulates those very reactions—called debauchery by its critics and rapture by its adherents.

The human, unlike the caged rat, has a broad latitude in shaping the nature of his environment, even of his own body chemistry. Man's somatic responses are often influenced more by what he thinks than by biological and chemical imperatives; in fact, it can happen that what he thinks actually becomes his biological and chemical imperative. Thus the user's attitude toward marijuana may determine what happens to his body when he smokes it. If you believe that sex and marijuana are compatible bedmates, then, for you, they probably will be.

It is only in the narrowest sense that the drug is not a sexual stimulant; that is, in the sense that it will not excite mindless, laboratory-located animal tissue. But most human marijuana users report an actual increase in sexual desire and sexual pleasure. It would be strange indeed to label the impact of the drug imaginary.

Part of the reality may be analyzed in terms of a "self-fulfilling prophecy." With marijuana's reputation, even a placebo could carry a sexual stimulus. Furthermore, the drug is under pressure, so to speak, to live up to its reputation. How can a man who uses marijuana as an aid to seduction afford to fail? And how can a woman, after consenting to that "potent aphrodisiac," remain unaroused?

After all, a man and a woman, together, alone, smoking pot—what else could possibly be on their minds? A twenty-seven-year-old graduate student I interviewed said, "Sex is more taken for granted high."

A thirty-four-year-old research sociologist agreed. "The social situation in which marijuana smoking takes place acts as an aphrodisiac." This gentleman had recently engaged in group sex for the first time at a pot party. He said the drug acted as a social catalyst. And the act of smoking served as a sort of tacit agreement to expect something unusual—no one was disappointed.

Women seem to respond more strongly than do men to the power of pot as an aphrodisiac. Exactly half the women said that the drug increased their sexual desire, as opposed to only 39 per cent of the men. Two related explanations come to mind: 1) Marijuana is an aphrodisiac for more women because of its cultural association with sex: women are more likely to *think* themselves into becoming excited; and 2) Women need an excuse to justify their desire. A hundred years ago it was fainting, forty years ago it was drinking, today it's smoking.

When it comes to who gets the greater enjoyment from the act itself, women lose their lead. Almost three-fourths (74 per cent) of the men said that turning on turned them on sexually, but less than two-thirds (62 per cent) of the women felt the same.

The explanation for this discrepancy probably lies not in the properties of the drug, but in the characteristic sexual attitudes of men and women in our society. A woman is more concerned with the ritual of sex, and with what the textbooks refer to as "foreplay." For her,

these aspects of the sexual act are often more meaningful than the immediate physical gratification it gives her. Because a woman is more preoccupied than a man with the path to sex, marijuana is more active for her during the overture.

For a man, seduction (the overture) is often only instrumental. He is much more localized in both body and temperament. His penis is what wants stimulation, and his concentration is on orgasm. So more often it's he that receives the most pleasure from marijuana during the act itself.

But it should be noted that this is only a difference of relative emphasis: for *both sexes*, marijuana is more stimulating during the act itself than as an aphrodisiac.

The survey also indicated that both sexual stimulation and sexual enjoyment were directly correlated with frequency of smoking. The heavier smokers were the ones who most often answered "yes" to my two basic questions. I divided the sample into frequent users (at least three times a week) and infrequent users (less than once a week). Over half (52 per cent) of the frequent users said that marijuana stimulates their sexual desire. Less than a third (30 per cent) of the infrequent users agreed. Likewise, more than three-quarters (77 per cent) of the frequent users claimed that marijuana increased their sexual enjoyment, while less than half (49 per cent) of the infrequent users agreed.

HEREIN LIES A chicken-and-egg question. Do the frequent users smoke more frequently because smoking makes them sexual, or does smoking make them sexual because they smoke more frequently? Do some people have minds and bodies which are naturally more receptive to the marijuana high, and therefore smoke more frequently? Or, on the other hand, have those who smoke more already explored the psychic and bodily experiences available to them—have they had more exposure to the sex-enhancing properties of the drug? It may be a case of familiarity breeding content.

Another variable, of course, is strength of dosage: both the quality of the marijuana and the number of cigarettes smoked. But these are almost impossible to calculate. I don't know, and neither do my subjects, how potent their marijuana was. Most agree, however, that when they get very high, marijuana becomes soporific. After two or three good joints, the only erotic experience the pot head will have will be in his dreams.

A twenty-one-year-old coed said, "When you're straight, sex is great. When you're high, *everything* is great. You're more aware of the difference between sex and everything else straight. When you're high, since everything is like that, it's still great, but there's not that much difference between having sex and not having sex."

To many marijuana users, the question of whether pot is a sexual excitant misses the point. Sex is just one example—though perhaps the example *par excellence*—of the

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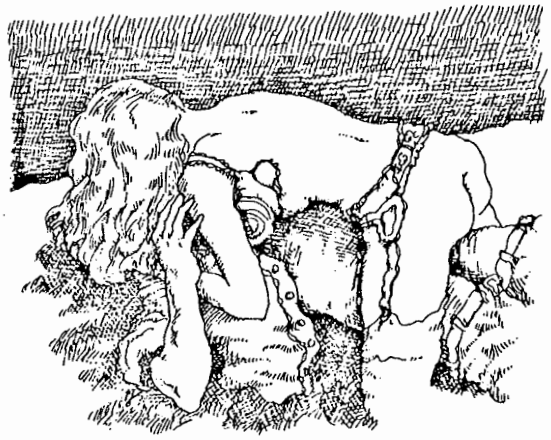

Illustration: Larry Ross

Aux Anges

A Play in One Act by Robert Austin

"Why do you want to get laid all the time? " she said.

"Laid? " he said.

"All the time," she said.

"Practice," he said.

"Practice? " she said.

"For that long lay after life," he said.

"Help me with my blouse," she said.

(curtain)

MARIJUANA AND SEX

CONTINUED FROM PAGE 21

kind of activity the drug enhances. Three-quarters of the sample said that they had eaten food at least once while high and, of these, 90 per cent reported that it was a more gratifying experience than ordinarily. Also, about three-quarters of those who had listened to music reported that it was a richer, more satisfying sound. But they were discriminate in their praise of the drug's power. Whereas it was recommended as an adjunct, collaborator, and stimulus to physical and sensual activity, it was found to be an impediment to cerebral activity. Only about a third of the sample had read anything during their high and, of these, about two-thirds said that reading was actually impaired by the high. Most material, particularly if it was logical, rational, traditional, and "linear," was rendered stuffy, incomprehensible, and impenetrable.

MARIJUANA SEEMS TO allow detours from the customary channels of experience and permit transcendence of some of our peculiar social inhibitions. The middle-class American is taught to be uncomfortable about his body and its gratification. The process of toilet training has made him uneasy about defecation. The taboos surrounding sex and sex education continue to cling to him. He has learned to respect the ritual surrounding food. He may not simply fill his stomach: he must not become too fat, nor stay too thin, nor eat at the wrong time or under inappropriate circumstances. He is warned against belching, flatulating, sweating. Every one of his bodily functions is ringed about by prohibitions and restrictions. Marijuana may unhook some of the rigid associations acquired from a culture ambivalent about bodily things. It loosens the apron strings to the past. "Sex-evil," "sex-dirty," "sex-forbidden" is a class of linkages which, under the influence of the drug, is sometimes replaced by "sex-fun," "sex-nice." This enables a kind of involvement in the act itself which sometimes approaches Total Human Experience. "You can put yourself into it more," a thirty-year-old, twice-divorced artist said. "You're more involved. You're doing nothing but just balling high."

Another artist backed up this sentiment: "There's less interference from distractions. It's a more complete experience. There's more sensual concentration, an increased capacity for receptivity." The sexual act becomes the cosmos. In the users' descriptions, it was likened to a physical entity.

One individual stated: "I *become* the orgasm."

Many of those I questioned talked about the sudden release of their tactile sensitivity. There was a new awareness of the body as a pleasure-receiving vessel. "You are more concerned with the texture of your lover's skin," said a twenty-eight-year-old bisexual female. "With surfaces, sensations, particularly with touch."

The attitude of play, of novel and unusual roles and activities, is also part of the sex-marijuana calculus. A twenty-year-old waitress said, "You do a lot of weird things in bed."

A graduate student in psychology said, "I come up with new sex ideas."

Alexander Trocchi, novelist and drug addict, puts it this way:

> Experts agree that marijuana has no aphrodisiac effect, and in this as in a large percentage of their judgments they are entirely wrong. If one is sexually bent, if it occurs to one that it would be pleasant to make love, the judicious use of the drug will stimulate the desire and heighten the pleasure immeasurably, for it is perhaps the principal effect of marijuana to take one more intensely into whatever the experience. I should recommend its use in schools to make the pleasures of poetry, art and music available to pupils who . . . are . . . insensitive to symbolic expression. It provokes a more sensual (or aesthetic) kind of concentration, a detailed articulation of minute areas, an ability to adopt play postures. What can be more relevant in the act of love?

It does something similar for food: "I eat freaky combinations high." It makes the conventional, the habitual, less imposing, and presents the fresh, the novel, the outré, and bizarre as likely and possible. (We are often told that liquor does the same thing. But the two share only one major trait: the release of inhibitions. Because it's a depressant, liquor does allow the uptight body to relax and enjoy some of what it is entitled to. But it desensitizes the body to both pain and pleasure, and is therefore anti-sexual in its thrust. It tends to blunt the drive, destroy competence, deaden pleasure, and scatter focus. However, to the generation over forty, much the same aura of sexuality clings to liquor as to marijuana.)

MARIJUANA CANNOT CREATE a new mentality, a conscienceless, superego-free psyche. It does endorse some of our more whimsical and carnal tendencies. The person who condemns marijuana because of its bestial and violent effects probably does so because in his subterranean self he actually regards sex itself as bestial and violent. The person who claims that marijuana's culture-unhooking effects will ultimately cause destruction and brutality probably has a destructive and brutal image of man's inner being. He who in his inner self condemns sex will, under the influence of marijuana, have basically anti-sexual experiences. Marijuana does not create anew, it only activates what's latent.

A young woman described it this way:

> A boy smoked it with me so that I'd enjoy the sex more—but it would backfire. Every time he touched me, I'd get an electric shock, but if he would move away, I'd get very cold. At another time, it made me aware of the sex so that I'd become self-conscious of my sexual aggressiveness and realize that I wasn't worthy of the sex. Often it would be like a psychodrama: I'd act out my problems, and become aware of what was bothering me—and become upset by it. I often became aware that I didn't want to have sex, and my body would freeze up. It brings out what your subconscious holds at the time . . .

Marijuana is much more than a mere chemical. The nature of its social reality, how it is defined, regarded, and treated, how its users shape their lives around it, will determine how it will treat them.

One woman, a twenty-seven-year-old divorcée, was able to achieve orgasm only under the influence of marijuana. Another girl experienced her only unpleasant sexual episodes when she was high. In the midst of being seduced, she saw little green men coming through the windows to attack her. The factors of "set" and "setting" clearly helped determine these responses.

WILL MARIJUANA TURN you on sexually? Impossible to predict. It depends on what you've heard about the drug's sexual power. On how you feel about its illegality. On the alliances, uneasy and otherwise, which you've made with your sexual nature. On how you react to letting go. On where your head is at. If you seek in it a tonic for your sexual hangups, your release may be long in coming. The drug reality is not out there in the stars, but in here, in us, in all of us together, in you. The marijuana experience is a reflection of yourself.

William Blake said, "No bird soars too high, if he soars with his own wings."

Right, reply the anti-pot forces. Then we don't need aids to stimulate a natural experience. But no, wait a minute, its fans chime in. Whatever you are, you are *even more so* on pot, so you really are *you* when you're high—"your own wings"—dig?

What is curious about pot and sex is: right they are—if you think they are. □

POLANSKI INTERVIEW
CONTINUED FROM PAGE 31

an interview with Roman Polanski, conducted by Michel Delahaye and Jean Narboni of Cahiers du Cinema.

QUESTION: The Vampire Killers, *which seems to us to be your most important film, is a film you had in mind for quite a while . . .*

ANSWER: I didn't have any precise idea of the film other than that it would be a comedy on vampires with a fairy-tale side to it, and would be made in the snow. And when I think of this idea today, I think of snow first of all. It was there from the beginning, and I spoke about it to friends as we were skiing: it would be great to have a sleigh going over the mountain . . . and I also thought of all the things that you can slide over snow . . .

Q: *That corresponds quite well with the impression people probably get when they see one of your films. They emerge from a background, but at the same time, when the story is there, a background can be called for by an idea in the film. For example, it seems to us that the whole chase scene in* The Vampire Killers *(where the young assistant is chased by the pederast vampire) is built on a gag that goes back to primitive burlesque, and that the whole background was set up on the basis of this one gag.*

A: That's true. The idea came first and the whole set was built on this idea. It also determined the topography of the ground floor, the courtyard, the whole thing. When I write a scenario, I always think of the layout of the place, but that time it was essential. A clear idea of the place had to be provided. Brach and I did our best, but despite everything we got a little lost, for there were lots of difficulties. It's really hard to design sets. The set designer finally had to cheat in certain places.

Q: *Many people have taken this film as a parody on vampire stories. We found the film very funny, but also very serious as to the "genre"*

Marijuana and Sexual Activity

Author(s): Wayne C. Koff

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Marijuana and Sexual Activity

WAYNE C. KOFF

Abstract

This research was intended to discern any correlations between marijuana and human sexual activity. I was specifically interested in exploring the concept that the drug might produce different effects on males and females in regard to their sexual activity. Finally, I was concerned with the dosage of the drug which would produce the most pronounced effect on the majority of the users in regard to their sexual activity.

The controversy over a possible aphrodisiac effects of marijuana has lingered ever since introduction to the drug. Our research was limited to a study of marijuana and heterosexual activity.

In researching the connection between marijuana and various aspects of sexual activity, several methods were utilized. Questionnaires were distributed at eight major universities in the United States. The colleges involved were Washington University; Michigan State University; SUNY at Albany; University of Miami; University of Denver; Massachusetts Institute of Technology; Boston University; George Washington University. The method of distribution was via the campus mail of the colleges, to insure confidentiality. The participants were chosen at random, and of the 640 questionnaires 345 were returned, a ratio of 53.9%. Figure 1 is a sample of the questionnaire distributed.

The second method consisted of interviews with known marijuana users. The questions were directed towards the comparison between sexual activity with and without the use of marijuana. The final method of research was aimed at eliminating a variable in marijuana use, that of dosage. Several marijuana users were asked to roll certain weeds (including marijuana) into cigarettes which were then weighed to determine the "average" constitution of a joint. The results of these tests will be discussed extensively in a later section.

One must bear in mind that the majority of cannabis users (in the U.S.) are youths between the ages 14—25. Bloomquist (1968) notes, "The age span 14—25 needs no aphrodisiac to stimulate either interest or capacity to perform. If young men have the sex act in mind when they use the drug, they will probably move toward a

The following questionnaire is a segment of a research project concerning the connections between sexual activity and marijuana. You have been chosen in a random sampling and we wish that you will answer the questions truthfully and to the best of your ability. When you have completed this form please return it to:

RESEARCH STUDY
Box 4375 Washington University
6515 Wydown Blvd.
Clayton, Missouri 63105

One final note, the questionnaire is designed to be anonymous, so please *do not* include your name. Thank You.

1. Sex: M F (circle one)
2. Age: a) less than 17 b) 17—24 c) 25—30 d) over 30 (circle one)
3. Use of Marijuana:
   a) never
   b) occasionally—at parties etc.
   c) daily (circle one)
   d) other—Please comment
4. Method of using Marijuana:
   a) smoking
   b) eating—in brownies, cookies, etc. (circle one or more)
   c) other—Please comment
5. Amount of marijuana used each time you take the drug:
   a) one "joint" or less
   b) 2—4 "joints" (circle one)
   c) more than 4 "joints"
6. Following the use of marijuana, was *sexual desire:*
   a) increased
   b) decreased (circle one)
   c) remained the same
7. As compared to sexual activity without the use of marijuana, was sexual activity following the use of marijuana:
   a) more enjoyable
   b) less enjoyable (circle one)
   c) the same
8. As compared to sexual activity without the use of marijuana, would you say *your partner* following the use of marijuana found sexual activity:
   a) more satisfying
   b) less satisfying (circle one)
   c) the same
9. Realizing that marijuana affects different people in different ways due to such factors as personality and atmosphere, please comment on the way in which the drug affects *you,* and what effect it has on *your* sexual activity. Please feel free to add any additional comments concerning marijuana and sexual activity on both the remainder of this side and on the back of this page.

FIG. 1. *RESEARCH STUDY: Marijuana and human sexual activity*

selected partner. The woman for her part will find it easier to acquiesce . . . "

Medical opinion as to the capacity of marijuana to act as an aphrodisiac is extremely varied. Some physicians undoubtedly are convinced that the drug is specifically associated with sensuousness and carnality, while others claim that the aphrodisiac effect of marijuana is purely a wild notion. It is a known fact that the Orientals in the 19th century took the drug to prolong coitus. Doria, in Brazil, reports instances of women becoming unusually aggressive in sexual affairs while under the influence of the drug. Considering this wide diversity of opinion, the questionnaire (fig. 1) and interviews were conducted as an attempt to clear up this controversy. Table 1 gives the numerical results of the questionnaire. It must be noted that of the 345 replies, 93 never smoked marijuana and so are not included in the results.

As shown in Table 1, #6, following the use of marijuana sexual desire was said to increase by 48.5% of those questioned. The significant plurality of this result may be attributed to various factors. First of all, the mysticism surrounding the drug plays an integral part in its effect. Psychologists stress the importance of mood, expectation, and setting as shaping the nature of the drug experience. With marijuana, all of the ideas concerning its inhibition releasing and sexual stimulating tendencies may result in the increase of sexual desire. It seems conclusive now that the drug itself is not a sexual stimulant. However, one cannot separate the drug from its surroundings. The social conditions of marijuana use make it act as an aphrodisiac.

Ms. A is between the ages 17—24. She smokes marijuana two to three times per week, averaging two joints per sitting. Her comment concerning the issue of sexual desire was, "Marijuana itself does not in any way increase sexual desire. It is merely the atmosphere in which the drug is used combined with the drug . . . a darkened room with candlelight, incense burning possibly, often just the two alone, which actually promotes sexual desire."

Mr. B smokes marijuana occasionally one joint or less and is also between the ages 17—24. He comments, "I find that after using marijuana, I experience a period of intense sexual arousal and suggestibility for about 40 minutes after which the effect seems to diminish . . . closely related to this phenomenon is the increase of

TABLE 1

1. Sex: Male 123 Female 128 Total 251

2. Age: 98% of sample between ages 17—24; 2% were 25—29

3. Use of marijuana:

a) occasionally—	Male 65.3%	Female 81.2%
b) daily—	Male 22.2%	Female 8.5%
c) other—	Male 12.4%	Female 10.2%

4. Method of using marijuana:

a) smoking—	Male	85.4%	Female	79.8%	Total	82.6%
b) eating—	Male	14.5%	Female	20.1%	Total	17.3%

c) other—two replies of snorting the drug

5. Average dosage each time drug is taken:

a) 0—1 joints	Male	25.0%	Female	22.6%	Total	23.8%
b) 2—4 joints	Male	68.8%	Female	71.4%	Total	70.1%
c) More than 4	Male	6.2%	Female	5.9%	Total	6.1%

6. Sexual Desire:	Increased	Decreased	Remains the Same
a) Male	39.1%	10.9%	50.0%
b) Female	57.8%	4.8%	37.4%
c) Total	48.5%	7.9%	43.6%

7. Sexual Enjoyment:	Increased	Decreased	Remains the Same
a) Male	59.8%	6.5%	34.7%
b) Female	42.9%	6.5%	50.6%
c) Total	51.3%	6.5%	42.2%

8. Partner Satisfaction—from sexual activity following use of marijuana.

	Increased	Decreased	Remains the Same
a) Male	59.5%	4.1%	36.4%
b) Female	47.4%	8.8%	43.7%
c) Total	53.5%	6.5%	40.0%

fantasies, and the relaxation of the body. I strongly suspect that part of the excitement generated by pot is a result of psychological suggestion, one expects to be aroused after its use."

Though 48.5% of all the people replying noted that sexual desire was increased, the proportions were extremely varied between males and females. While only 39.1% of males noted an increase, a remarkable 57.8% of the females said that their desire was increased. Performing a chi-square probability test on these results, we obtained a P value equal to .048 which is equivalent to saying that the results were significant and not dependent on chance alone. How then may

this 18.7% difference between males and females be explained? Erich Goode, a sociologist at SUNY Stony Brook, interviewed 200 marijuana users in 1969 and recorded a 50% increase in sexual desire among women following marijuana use as compared to a 39.0% increase among men. Goode (1969) notes, "First, because of their cultural association with sex, women are more likely to think themselves into becoming excited; second, women need an excuse to justify their desire; third, men are less concerned with the ritual of sex and with what textbooks refer to as foreplay, than are women. For women, these aspects of the sexual act are often more meaningful than the immediate physical gratification it gives her . . . . a woman is more preoccupied with the path to sex, whereas for the man, the overture is often only instrumental." In addition one may say that man's cultural role permits him to freely express his desires. The woman has been taught to repress sexual desires more than man. They have been taught the sex-evil, sex-dirty, sex-forbidden notions more than the sex-fun, sex-enjoyable ones. The lessening of tensions and of inhibitions allows the woman to overcome these concepts and to express her desires. Therefore, as an inhibition releaser and body-relaxer, one may group these effects of marijuana under the heading of "stimulant to human sexual activity."

The next area of interest is the connection between marijuana and sexual enjoyment. It was shown that 51.3% of those questioned said that following the use of marijuana, sexual enjoyment increases. This result may be accounted for in different ways. First of all, many of those replying noted that sex while "high" was a completely different experience than sex while straight. It seems probable that the effects of the drug cloud the mental scope of human sexual activity and allow the physical sensation to become more pronounced. To many, this pronouncement of the physical sensation seemed exciting, vibrant, and fantastic.

Ms. C replying to the question concerning sexual enjoyment said, "Although I seemed to get more physically involved, I was much less mentally involved . . . . it kind of feels like you're in a weird, dream-like world with the person you're with, and sex can be more exciting because it's a new and different experience."

Ms. D, a 19 year old marijuana user who averages smoking two joints per day notes, " . . . sex is different since some sensations are seemingly heightened by the drug. However, sex is neither worse nor

better. Sexual activity seems to take on a bit more variety or bizarreness when you are under the influence of pot."

From the male point of view, Mr. E eats the equivalent of one joint of marijuana in brownies and cookies every other day. He replies, "Any effects of the drug would tend to make the user less inhibited under situations where you would worry if someone walked in on you or fear pregnancy. The effect of the drug seems more noticeable during orgasm, there appeared to be more sensation in the genital organs and the rest of the body seems to be placed in a void. While I find a relaxed mood after sexual intercourse, I found that marijuana seemed to take a lot out of me, leaving me very tired while still being sexually aroused. While the physical sensation may be better, I find the mental sensation not as pleasing as when straight."

Dividing the males and females up for the question of sexual enjoyment, our results show the converse of sexual desire. While 59.8% of the males seemed to enjoy sexual activity more when stoned, only 42.9% of the females were in accord with this concept of increased enjoyment. At first glance, these results seem unexplainable in light of the sexual desire figures. However, by taking into account the cultural and sociological factors, one arrives at a definite correlation between the results on sexual desire and sexual enjoyment. Referring to the culture scheme once again, the physical sensation of sexual activity is more predominant than the mental response from the males' standpoint. In contrast, the female views the foreplay as a more gratifying precursor to the actual climax than the male. When marijuana is smoked (or ingested), the drug tends to relay a feeling of unreality while also making tactile stimulation seem more distinct. In other words, physical sensations seem more real, and mental reactions more oblique. For the female, her inability to have complete control of the mental feelings lessens her enjoyment. For the male, the increased physical sensation results in a more enjoyable sexual experience.

Another factor closely related to sexual enjoyment concerns partner satisfaction. In our sample, 59.5% of the males believe that their partners' satisfaction of sexual activity was greater while stoned, while 47.4% of the females believe that their partners found sexual activity more satisfying while "high." When the male is enjoying sexual activity, it seems reasonable for him to assume that his partner is also enjoying it. The same is true for females. Thus, there should

be a positive correlation between the questions of sexual enjoyment and partner satisfaction. We verify this by comparing the results of #7 and #8 in Table 1 and noting that they are nearly identical. Upon questioning Mr. F concerning sexual enjoyment and partner satisfaction, he replied "We had made love just before getting stoned, not expecting to want to afterwards. My girlfriend was turned on sexually and I got aroused; we made love and I climaxed much sooner after the last time than I would normally have been able to. My girlfriend's desire and satisfaction were probably heightened judging from the number of her orgasms."

From the female standpoint: Ms. G smokes daily and believes that both sexual desire and sexual enjoyment are increased from the drug, as well as her partner's satisfaction. She is between the ages 25—30 and comments, " . . . the closeness of someone's body while stoned gives me a sense of security and uniqueness. Weed decreases my inhibitions allowing me to express more affection and give more to my partner's enjoyment."

Realizing that partner satisfaction is undoubtedly more subjective than replies concerning desire and enjoyment, conclusions reached from the area of partner satisfaction are considered less relevant than others. However, it is interesting to note that the majority of those people claiming that sexual enjoyment was decreased following the use of marijuana, also stated that they believed that their partner's satisfaction was also decreased.

Upon obtaining results for such concepts as sexual desire and enjoyment following marijuana use, one must not overlook the variable factor of dosage. Dosage can be divided into two categories, those being quality and quantity. For our purposes, the quality of the marijuana used was impossible to be accurately judged since those interviewed and questioned used different types of marijuana at different times. It is learned that the strength of the drug is dependent on its content of both 9—THC and 6—THC. (THC is abbreviation of tetrahydrocannabinol; 9 and 6 are the two most active constituents of marijuana, distinguished by their chemical formulas.) The quality of the marijuana is dependent on the quality of the resin found in the plant. The most potent marijuana known originates in Thailand and consists of 4.1% THC. Most marijuana used in the United States originates in Mexico and its THC content ranges from 0.8%—1.4%. For the sake of simplicity, we assume that

the THC content of marijuana from Mexico has the average value of 1.0%. Having ascertained a value for the quality of the drug, the final aspect of dosage is the quantity. To find the average constitution of a joint of marijuana by weight, twenty users of the drug volunteered to roll into cigarettes four leafy, grainy substances (one of which was marijuana). Upon averaging the weights of the rolled marijuana cigarettes, the value of .73 gm was found for the constitution of a joint by weight. The weights of the rolled cigarettes ranged from .49—1.8 gms. By simple mathematics, it is shown that a joint smoked and shared by two people places between 3.75 and 5.00 mg of THC into the bloodstreams of the users. One marijuana cigarette is usually sufficient to produce an adequate intoxication of two people.

Having determined the dosage, one is now able to make a comparison of the effects of one joint of marijuana on sexual desire and enjoyment of sexual activity, as opposed to using two or more joints of the drug. Specifically, in regard to sexual desire, 61% of those individuals who smoked one joint or less noted an increase. Separating this percentage by the sexes of the individuals involved, 50.5% of the males and 70.9% of the females noted an increase in sexual desire. For the people who smoked two or more joints per sitting, males recorded a 34.5% increase while 49.5% of the females concurred that their sexual desire had increased. Thus, it is evident that as dosage increases, the tendency for an increase in sexual desire decreases.

Concerning enjoyment of sexual activity following the use of marijuana, males who smoked one joint or less noted more of an increase in enjoyment than those who smoked two or more joints per sitting. The same quantitative conclusions were recorded by the females. This result further substantiates the idea that as the dosage is increased past a peak concentration point, the positive effects of increased sexual desire and enjoyment of sexual activity will not be as noticeable. The quantitative results of the question concerning dosage are summarized in Table 2.

From the results in Table 2, it seems evident that over-intoxication of marijuana does not enhance either sexual desire or enjoyment of sexual activity as much as mild dosage. Once again it must be noted that the varied quality of the marijuana has a definite effect on these results. For instance, one cigarette of 2% THC quality is equivalent to two cigarettes of 1% THC quality. For our purposes however,

assuming the use of a consistent quality of the drug upholds the validity of our data and subsequent conclusions.

Finally, a comparison may be made between the effects of smoking the marijuana through cigarette or pipe, or ingesting it through brownies, cookies, etc. The different methods of use are known to cause different types of "highs." Smoking yields a shorter, more potent intoxication, while eating results in a milder, longer intoxication. From our survey, 82.6% of those questioned smoked their marijuana while 17.3% ingested the drug to obtain a "high." With regard to sexual desire and enjoyment of sexual activity, the results indicate that there is no appreciable difference in the effect of the different methods of use. The quantitative results of this question are compiled in Table 3. Thus, although the type of "high" obtained from the two methods is different, both affect sexual desire and enjoyment is a similar fashion. This may be explained by noting that although the type of "high" differs, a person who eats marijuana is more likely to use a larger dose than one who smokes, assuring himself of an adequate supply of THC in his bloodstream. Overcoming the digestion process (in which some of the THC is not absorbed into the bloodstream) by using larger doses, the ingester matches the THC content of the smoker and thus shows the same effects to sexual stimuli.

TABLE 2

1. Sexual Desire	Increased	Decreased	No Change
a) 1 joint or less			
1) Male	50.5%	8.6%	40.9%
2) Female	70.9%	5.4%	23.7%
3) Total	61.0%	6.9%	32.1%
b) 2 or more joints			
1) Male	34.5%	14.6%	50.9%
2) Female	49.5%	4.6%	45.9%
3) Total	42.1%	9.6%	48.3%
2. Enjoyment of Sexual Activity	Increased	Decreased	No Change
a) 1 joint or less			
1) Male	67.0%	2.5%	30.5%
2) Female	51.0%	5.1%	43.9%
3) Total	59.0%	3.8%	37.2%
b) 2 or more joints			
1) Male	45.2%	10.7%	44.1%
2) Female	32.5%	8.4%	59.1%
3) Total	38.9%	9.5%	51.6%

TABLE 3

1. Sexual Desire	Increased	Decreased	No Change
a) Smoking	48.1%	8.5%	43.4%
b) Eating	48.8%	7.8%	43.4%
2. Enjoyment of Sexual Activity	Increased	Decreased	No Change
a) Smoking	52.7%	6.9%	40.4%
b) Eating	50.1%	6.2%	43.7%

Totals given without respect to sex. Insufficient numbers of individuals who ingested marijuana made a division by sex invalid for our purposes. There were 44 individuals who noted ingesting marijuana, of which 27 were female and only 17 male.

In summary, the study of the effects of marijuana on human sexual activity is a field in need of more research. One must consider the psychological and sociological factors of both the drug and human sexual activity when attempting to draw the connective lines. The physiological effects of marijuana may also affect the sexual response of the human being. Our survey revealed cases of secondary impotence among males, and cases of situationally nonorgasmic females following marijuana use. On the other hand, there were also cases of multi-orgasm (from two different girls who both stated that they never had more than one orgasm when engaged in intercourse while not under the influence of marijuana). Three males noted that orgasm was reached at a faster rate after using marijuana as against not using it. It seems conceivable that marijuana, with suitable psychological and sociological conditions, and taken in a light to moderate dose releases inhibitions to the extent of being termed "aphrodisiac." Perhaps a certain level of THC content in the blood is needed for these effects to be manifest. Our results have shown that the most active dose (the one in which sexual desire and enjoyment is increased to the greatest extent) is between 1—2 cigarettes containing 1% of THC. To verify these results, laboratory tests on THC content in the blood, absorbtion rates of THC into the bloodstream, and THC content of the resin of Cannabis sativa should be undertaken. Our study has tried to reveal some of the mysteries of marijuana in connection with human sexual activity and to offer highly qualitative and semi-quantitative conclusions. Quantitative laboratory data are now needed to confirm our hypotheses and conclusions.

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BRIEF REPORTS

MARIJUANA USE AND SEXUAL BEHAVIOR

Ronald A. Weller and James A. Halikas

In several anonymous questionnaire studies of college students, marijuana use has been reported to affect sexual behavior. In general, these studies show that marijuana smoking enhances sexual pleasure and increases sexual desire. Marijuana use has also been associated with more frequent sexual activity and an increased number of sexual partners. The purpose of this study was to determine the perceived effects of marijuana use on the sexual behavior and sexual practices of a sample of regular marijuana users. In contrast to other studies, subjects were not drawn exclusively from college student populations and were interviewed rather than given a questionnaire. Results, in general, confirm results of previous studies. Subjects were primarily heterosexual and sexually active. Men were more likely than women to have had multiple sexual partners. Over two thirds reported increased sexual pleasure and satisfaction with marijuana. Increased desire for a familiar sexual partner was reported by about one half. The sensations of touch and taste were particularly enhanced by marijuana. Many felt marijuana was an aphrodisiac. Marijuana use in relation to initiation of sexual activity was also assessed. Although drug use occurred prior to first intercourse for about one third of the men and women, alcohol, not marijuana, was most frequently used in this context. Most had used marijuana as a preparation for intercourse on occasion, and 20% did this on a regular basis. Possible explanations for these effects are briefly discussed.

Marijuana has the reputation of being an aphrodisiac. Jarvik and Brecher (1977) identified several possible explanations for marijuana's aphrodisiac-like effect: it (a) loosens inhibition, (b) enhances sensate focus, (c) causes a generalized increase in enjoyment (hedonism), (d) slows perception of time thus causing an enjoyable activity seemingly to last longer, (e) has a reputation for sexual enhancement (placebo effect), and (f) its use occurs under relaxed circumstances conducive to sexual activity.

Results of many studies tend to support the belief that marijuana has aphrodisiac-like effects. In one experiment, cannabis administration caused

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sexual arousal of subjects (Mayor's Committee, 1944). In another study, THC (delta-9-tetrahydrocannabinol) given under experimental conditions caused sexual thoughts to occur (Hollister, Richards, & Gillespie, 1968). North Africans believed marijuana stimulates the sexual faculties (Bouquet, 1951) and, of 1200 Indian marijuana users studied, 10% believed cannabis increases sexual excitement during intercourse (Chopra, 1969).

More recent survey studies of U.S. college students also reported a positive relationship between marijuana use and sexual behavior. For example, Robbins and Tanck (1973) found sexual desire to be more frequent among a sample of graduate psychology students on days when they used marijuana than on days they did not. Goode (1972) reported marijuana users were more likely than nonusers to engage in intercourse, engage in it earlier in life, engage in it more regularly, and have a greater variety of partners. Sensations were intensified and sex was desired more during marijuana intoxication (Tart, 1971). Sex was more pleasurable when smoking marijuana (Traub, 1977). Sexual desire and sexual enjoyment or pleasure with marijuana use were also reported by Arafat and Yorburg (1973); Dawley, Winstead, Baxter, and Kay (1974); and Koff (1974). Other researchers reporting similar findings include Brill and Christie (1974), Chopra and Jandu (1976), and Fisher and Steckler (1974).

However, most of these studies have used samples drawn only from college student populations. Moreover, respondents were not interviewed but filled out questionnaires anonymously, making the reliability and validity of responses difficult to assess. These factors limit the ability to generalize to larger populations. This investigation was conducted in an attempt to replicate the results of previous studies, with a sample not drawn exclusively from college students. In addition an interview format was used instead of an anonymous questionnaire. Different aspects of sexual behavior were also studied to give a more complete picture of sexual functioning. Effects of marijuana use on sexual performance, sexual pleasure, and sensations during sexual activity were assessed in detail. More general areas such as sexual preference, sexual practices, and sexual partners were also evaluated.

Method

Subjects

Subjects were 97 of an original sample of 100 adults from a large midwestern city, initially interviewed in 1969-1970 and reinterviewed in 1976-1977 as a part of clinical study of marijuana use. These individuals were "regular" marijuana users by self-report, not experimenters or casual users, had averaged over 2 years of marijuana use, and had used marijuana at least 50 times in a 6-month period preceding the initial study. All subjects were white and came mainly from middle-class backgrounds. Sixty (62%) were male; 37 (38%) were female. At follow-up, average age was 27.5 years. Virtually all had completed high school, and many had attended college. Over 80% were working full-time in occupations ranging from physicians to ditch-diggers. All but one (who had had discontinued use after joining a religious group that forbade its use) continued to regard themselves as marijuana users.

During the 12 months prior to follow-up, 86% had used marijuana. All but one had intentions of using it in the future. Although 14% had not used it in the past year, all had used it extensively in the past and were knowledgeable about marijuana's effect on their sexual activity. Since the responses of this group of 14% showed no significant differences from remaining subjects, they were included in the analysis. None of the subjects had gone longer than 24 months without using marijuana. Overall, these 97 users averaged 6-8 years of use. Marijuana use for the most part continued to be frequent—23% were daily users and about half were using marijuana weekly.

At the time of the original data collection, marijuana use was less common than now, and laws restricting its use were more strictly enforced. As a result some effort was required to locate subjects who were willing to be interviewed. To obtain as broad-based a sample as possible, three source individuals with access to different groups of marijuana users were asked to refer subjects. When interviewed, subjects were asked to refer additional subjects. Although not ideal, this sample was broader-based than a sample consisting only of college students. Results and detailed description of the methodology of this initial study have been published (Halikas, Goodwin, & Guze, 1971, 1972).

Interview Schedule

A structured interview was used, composed of closed-ended questions. Some answers required a yes or no response, whereas others required the subject to quantify or rate a particular phenomenon which was coded by the interviewer. Thus, interviewer interpretation was minimized, resulting in more standardized responses. The interview contained questions to allow cross-validation and to assess the reliability of the interview. Questions addressed the effect of marijuana on sexual performance, sexual enjoyment, and the senses; sexual orientation, sexual practice, and sexual partners; the role of marijuana, alcohol, and other drugs in initiation of sexual activity and in preparation for sexual activity. After the study was about one third completed, additional questions on sexual matters were added. Thus, for these variables, information was available from only 65 subjects. In addition to information on marijuana use and sexuality, general demographic information was elicited from all subjects. Preliminary work indicated interview questions were understandable to subjects. Response consistency was excellent in trial interviews.[1]

Procedure

All subjects gave informed consent and were paid $20.00 for participation. Interviews were conducted using the interview schedule described above. Interview format allowed for the establishment of rapport, clarification of study objectives, and explanation of questions as they arose, thus minimizing ambiguous or invalid results. In general rapport was good, and subjects cooperated well with the interviewer. Cross-validation of certain interview items indicated that reliable responses were obtained. Responses corresponded well with information obtained in a previous interview study of these

[1] A copy of the interview schedule is available from the first author.

subjects. These facts also indicate that the information obtained in this study was valid.

Results

A summary of marital and several sexual behavior characteristics is contained in Table 1. These marijuana users were sexually active, with 70% reporting more than one sexual partner in the past year. Sexual orientation was primarily heterosexual. A number of users reported postpubertal homosexual experiences, but most did not consider these of consequence. Only 12% considered themselves homosexual or bisexual. There was only one significant difference between males and females: Men were significantly more likely to have had more than five sexual partners in the past year (49% vs. 25%).

Table 1

Sexual Background of Subjects

	User Males ($n = 60$) %	User Females ($n = 37$) %	Users Total ($N = 97$) %
Ever married	48	56	52
Currently married	32	35	33
Extramarital sexual experience	11	23	17
First heterosexual intercourse prior to age 18	50	46	49
More than one sexual partner in past year	78	75	77
Five or more sexual partners in past year	49	25[a]	40
Partner swapping or group sex ever	5	5	5
Post-pubertal homosexual experience	22	32	26
Bisexual or homosexual preference	12	13	12

[a] $\chi^2(1\ N = 97) = 4.4, p < .05$.

In Table 2 marijuana's reported enhancement of sexual activities is summarized. Over two thirds reported increased sexual pleasure and satisfaction with marijuana use. Other parameters of sexual enjoyment, such as emotional closeness, physical closeness, and increased enjoyment of snuggling were all enhanced. Quality of orgasm and duration of intercourse were also enhanced by marijuana, with men significantly more likely than women to report this. Increased number of orgasms and ability to repeat orgasms were reported, but not frequently. Approximately one half felt marijuana had an aphrodisiac effect on them.

About half of both sexes reported increased desire for sexual relations with a familiar partner while using marijuana. However, 43% of the men reported an increased desire for an unfamiliar partner, whereas only 13% of the women reported such a desire while using marijuana, $p < .001$. Desire for multiple partners or homosexual partners as an effect of marijuana was not reported by most users. All those reporting a desire for partners of the same sex while using marijuana were homosexuals or bisexuals. Marijuana also affected the

Table 2

Reported Marijuana Enhancement of Sexual Activities

	Men (n = 60) %	Women (n = 37) %
Physiologic		
Quality of orgasm	58	32[a]
Duration of intercourse	27	8[b]
Number or orgasms	12	16
Ability to repeat	14	3
Partner Preference		
Desire for familiar partner	50	60
Desire for unfamiliar partner	43	13[c]
Desire for multiple partners	12	3
Desire for homosexual partner[d]	7	3
Sexual Enjoyment	(n = 40)	(n = 25)
Sexual pleasure and satisfaction	70	76
Emotional closeness and intimacy	46	63
Feeling of physical closeness	51	56
More snuggling	34	56
Marijuana is an aphrodisiac	44	50
Sensual Effects		
Touching	59	57
Taste	23	33
Smell	23	7
Hearing	17	11
Sight	11	7

[a] $\chi^2(1\ N = 97) = 6.1; p$ .025.
[b] $\chi^2(1\ N = 97) = 5.0; p$ .05.
[c] $\chi^2(1\ N = 97) = 9.4; p$ .001.
[d] All those reporting increased desire for partner of same sex were either homosexual or bisexual.

senses during sexual activity, with touch and taste being most often reported as enhanced.

The effects of alcohol, marijuana, and other drugs (a category that combined stimulants, sedatives, hallucinogens, and narcotics) on the initiation of sexual activity were compared and are summarized in Table 3. One third had used some drug immediately prior to their first sexual experience. Alcohol was more frequently used than both marijuana and other drugs. One half felt drug use had made them more willing to have intercourse the first time. About one half of both men and women had had unwanted intercourse (intercourse they did not seek and later regretted) at some time following drug use. Other drugs—not alcohol or marijuana—preceded unwanted intercourse most frequently. Many (32%) had never used drugs prior to intercourse other than alcohol and marijuana. Currently, they were more likely to use marijuana before intercourse than alcohol or other drugs. In fact, 76% had used marijuana as a preparation for intercourse, and 20% used it regularly for this purpose.

Table 3

Reported Effect of Marijuana, Alcohol, and Other Drugs on Initiation of Sexual Activity

	Male Users (n = 60) %	Female Users (n = 37) %	Total Users (N = 97) %
Marijuana prior to first intercourse	7	8	7
Alcohol prior to first intercourse	22	24	23
Other drugs prior to first intercourse	3	3	3
Any drug prior to first intercourse	32	35	33
Intoxicant made more willing on first intercourse[a]	50	50	50
Marijuana led to unwanted intercourse	11	5	9
Alcohol led to unwanted intercourse	13	16	14
Other drugs led to unwanted intercourse	22	27	24
Unwanted intercourse secondary to drugs	46	48	47
Never marijuana prior to intercourse	3	0	2
Never alcohol prior to intercourse	7	3	5
Never other drugs prior to intercourse	29	38	32
Alcohol prior to intercourse > 25%	9	17	12
Marijuana prior to intercourse > 25%	24	24	24
Other drugs prior to intercourse > 25%	0	3	1
Marijuana part of preparation for intercourse ever[b]	80	71	76
Marijuana as part of preparation for intercourse > 25%[b]	20	21	20

[a]Includes only those using intoxicants before first intercourse, n = 32.
[b]Includes reduced number of users answering question, n = 65.

Discussion

In general, these regular marijuana users report that marijuana use enhanced their sexual lives. Almost all had used marijuana prior to intercourse, and many had incorporated marijuana use into part of their preparation for intercourse on a routine basis. There were some significant sex-related differences in the extent various parameters were enhanced. This may correspond to underlying male/female differences in sexual response or differences in sexual expectations between the sexes. There was not a significant increase in the reported number of orgasms experienced or ability to repeat intercourse. Despite reported enhancement of sexual experience and early use of marijuana by many of these subjects, marijuana did not play a large role in initiating first sexual activity.

Explanations for the apparent aphrodisiac-like effects of marijuana have been previously discussed. However, there may be other explanations as well. For example, some constituent of marijuana may have a direct stimulating effect on centers in the brain that control sexual activity. Marijuana has been shown to alter plasma testosterone in mice (Dalterio, Bartke, & Mayfield, 1981) and men (Kolodny, Masters, Kolodner, & Toro, 1974). Further research

is needed to determine what effects such altered testosterone levels may have on sexual pleasure and behavior in humans.

The sample for this study consisted of young, white, middle-class adults who had used marijuana regularly. Results should be generalizable to similar groups. This study is not directly comparable to previous studies because of design differences. In this study, subjects were not exclusively college students. Also an interview format was used instead of anonymous questionnaires. However, results of questionnaire studies of college students are compatible with the current study; that is, individuals who use marijuana report a positive effect on sexual activity. However, to date there has been little work studying marijuana's effect on the sexual behavior of other groups, such as older marijuana users, lower-class marijuana users, or marijuana users in various minority groups. The results of this study may not be generalizable to such groups. Further work is needed to determine if the effects of marijuana on sexual behavior reported here are seen in broader populations.

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Issue Consultants

The following individuals, in addition to members of the Editorial Board, have recently served as reviewers. Their advice is greatly appreciated.

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Editor's Comment

I also want to thank Rebecca L. Sargent for her many contributions to the *Journal* during the past 4 years. She was hired as a part-time typist at the beginning of her freshman year at Syracuse University. Although her title never changed (and the remuneration improved very little), she became an errand runner, proofreader, copy editor, editorial assistant, co-worker, and friend, not to mention a student member of SSSS. Her independence, initiative, and sense of responsibility have been of inestimable value to me over the years. I shall miss her greatly as she moves on to graduate school next year. I, personally and on behalf of SSSS, wish her happiness and success in her endeavors.

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ORIGINAL RESEARCH Open Access

The influence of cannabis on sexual functioning and satisfaction

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Abstract

Background The purpose of this study was to examine the perceived influence of cannabis on sexual functioning and satisfaction. This study used Kaplan's and Masters and Johnson's sexual response cycle (desire, excitement, orgasm, plateau, resolution) and included satisfaction to complete the sexual response cycle. Given increased attention in the research literature to the potential benefits of cannabis and the lack of research on the sexual benefits of cannabis use, the current study was completed.

Methods Data were collected using the online survey tool "Qualtrics" from a self-selected, convenience sample of adults over the age of 18 who reported previous cannabis use. The survey, developed by the researchers based on previous literature, included demographic questions followed by a scale to measure sexual functioning and satisfaction in relation to cannabis use ($\alpha = 0.897$).

Results The final sample was 811 participants ranging in age from 18 to 85 years old ($M = 32.11$). The majority of participants were identified as female ($n = 536$, 64.9%), White/Caucasian ($n = 640$, 78.9%), and college educated ($n = 650$, 80.1%). Almost 25% of the participants were identified as LGBTQIA+ ($n = 187$, 23.1%). Most of the participants reported being in a monogamous sexual relationship ($n = 598$, 73.7%). Data were analyzed using descriptive statistics, *t*-tests, one-way ANOVA, and multiple regression. Age and gender were not found to have significant effects on cannabis use and sexual functioning and satisfaction. Over 70% of participants reported increased desire ($M = 4.05$, $SD = 0.962$) and orgasm intensity ($M = 4.05$, $SD = 0.884$). Participants who reported masturbating indicated that cannabis enhanced their pleasure while masturbating ($n = 620$, 62.5%). Participants also stated that cannabis enhanced their sense of taste ($n = 583$, 71.9%) and touch ($n = 576$, 71.0%).

Discussion The results of this study contrast and establish new evidence within the literature. Demographic results indicate that the people who use cannabis are of a wide range of ages, from a variety of occupations, and have differing cannabis use preferences. The inclusion of LGBTQIA + respondents is a strength of this study. Overall, results indicated that both men and women perceived that cannabis use increased their sexual functioning and satisfaction, particularly increased desire and orgasm intensity.

Conclusion This study updates the current literature on cannabis and sexuality and provides implications for improving sexual quality. Medical implications of this study include the possible use of cannabis for treating sexual dysfunctions, especially within women.

Keywords Sex, Cannabis, Sensuality, Weed, Marijuana, Sexual pleasure

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Introduction

"*Cannabis sativa* L.," also known as "cannabis" or "marijuana", encompasses different varieties based on cannabinoid profiles (Small 2017). Cannabis has been historically used as a multi-functional crop including use as a medicine (Mechoulam et al. 2014; Mikuriya 1969; Russo, 2005), an aphrodisiac (Touw 1981), and as a potential treatment for sexual dysfunctions, such as low sexual desire or sexual pain (Dawley et al. 1979; Lynn et al. 2019). There has been increased attention given to the benefits of cannabis in recent years as it has become legal in many states (Han et al. 2018). Despite its many uses and the increased attention, there is a lack of research on the sexual benefits of using cannabis. Therefore, the purpose of this study is to examine the influences of cannabis on sexual functioning and satisfaction. This paper uses the term "cannabis" in reference to all forms of *Cannabis sativa* L., except within data collection where the term "marijuana" is used as a more recognizable term for all audiences.

Sexual functioning is physiological responses associated with the sexual response cycle that includes desire, excitement, plateau, orgasm, and resolution (Kaplan 1974; Masters and Johnson 1966). Sexual satisfaction encompasses both emotional and physical satisfaction (Basson 2001). Sensuality involves the different sensual effects (touch, taste, smell, sound, and sight) that are associated with sex. While sexual satisfaction has been shown to be influenced by sexual functioning and sensuality (Basson 2001), there is support for sexual satisfaction to be considered as a component of the sexual response cycle (Kontula and Miettinen 2016; Pascoal et al. 2018). The sexual response cycle provides a framework for this study to be organized by each phase (desire, excitement, plateau, orgasm, resolution, satisfaction).

This study compliments gender equality and may have implications for closing the orgasm inequality gap in our society (Mintz 2018). The orgasm inequality gap refers to the fact that orgasms are less consistent for women (Mintz 2018), yet research shows that orgasm is important to sexual satisfaction (Kontula and Miettinen 2016; Pascoal et al. 2018). The current research study emphasizes an individual's sexual functioning and sexual satisfaction and addresses the need to explore options to help women have more regular orgasms. One possibility for increased orgasm frequency is cannabis (Balon 2017). Using cannabis before sex has possibilities for social change by increasing sexual pleasure within our society as previous research indicates beneficial sexual implications, especially for women (Sun and Eisenberg 2017).

Background

The literature reviewed will be organized by sexual functioning (specifically using the sexual response cycle as a framework), sexual satisfaction, cannabis, and finally cannabis' influence on sexual functioning and satisfaction.

Sexual functioning and satisfaction

Masters and Johnson (1966) established the sexual response cycle that includes four phases: excitement, plateau, orgasm, and resolution. Each phase is identified by physiological responses of the body during sex; however, each phase may not be distinguishable from the next and may differ extensively each time and by each individual. Kaplan's (1979) Triphasic Concept of sexual response included desire as the first stage of the sexual response cycle and Basson (2001) considered sexual satisfaction to be an important component of the sexual response cycle.

Newer research has expanded the sexual response cycle and adds to the original work of Masters and Johnson and Kaplan. Rather than being linear, the sexual response cycle is circular with overlapping phases that follow a variable order and incorporates mental and emotional components, not just physiological responses (Basson, 2005; Cherkasskaya and Rosario 2018).

Sexual desire, also known as libido, is characterized as a sexual drive or interest in sex that lasts throughout the sexual encounter until orgasm or satisfaction is reached (Kaplan 1979). Cherkasskaya and Rosario (2018) found that sexual desire is on a spectrum that varies between absent or diminished to high desire. Without desire, one may not experience the excitement phase or any following stages of the sexual response cycle because one's mental state has greater implications than one's physical desire and arousal (Basson 2008) Toates (2009) created the incentive motivation model that considers the "intertwined progression of desire and arousal" that reinforces the idea that desire and arousal are reciprocally reinforcing.

Excitement is characterized by an increase in sexual tension from an unaroused state and occurs as a result of physical and/or psychological sexual stimulation (Masters et al. 1995). Physiological responses that occur during the excitement phase for both sexes include myotonia (increased neuromuscular tension that occurs throughout the entire body, not just the genital region) and vasocongestion (the swelling of bodily tissues in the genital region due to increased blood flow). Vasocongestion can lead to lubrication in women and an erection in men; however, vaginal lubrication alone is not an accurate measurement of arousal. Women may have genital responses such as lubrication or vasocongestion while not experiencing desire (Chivers and Bailey 2005).

During the plateau phase, sexual arousal is increased while sexual tension levels off prior to reaching the threshold levels required to trigger an orgasm (Masters et al. 1979). During orgasm, there is a release of accumulated sexual tension, and the body induces involuntary rhythmic contractions within the genital region. However, an orgasm is a total body response and is not strictly localized to the pelvic region (Masters et al. 1979).

After orgasm, the body enters the resolution phase and returns to its unaroused state. Yet, if a woman maintains sexual arousal, she is physiologically capable of being multi-orgasmic, meaning having more than one orgasm before returning to her pre-aroused state. Men are typically unable to be multi-orgasmic because of the inevitable phase of the refractory period (i.e., the recovery period required for men to orgasm again after orgasm and ejaculation, which typically gets longer with age).

Sexual satisfaction can be defined as an individual's subjective evaluation of the positive and negative aspects of one's sexual relationships (Lawrance and Byers 1995) and may be influenced by many factors such as relationship quality, physical health, and overall well-being (Pascoal et al. 2018). Multiple and consistent orgasms and frequent sex were found to be correlated with higher sexual satisfaction (Kontula 2009; Kontula and Miettinen 2016).

While more than 90% of men report usually experiencing orgasm during sex, less than 50% of women regularly experience orgasm during intercourse and only 6% reported always experiencing an orgasm during sex (Kontula 2009; Koontula and Miettinen 2016). Mintz (2018) in her book *Becoming Cliterate* coined the term "orgasm inequality" to describe the phenomenon of men having routine and consistent orgasms, while women do not. Orgasm consistency is significantly related to sexual satisfaction in women. Women who experience orgasm infrequently or not at all report, on average, lower levels of sexual satisfaction (Kontula, 2009; Kontula and Miettinen 2016). This implies that orgasms during sex are expected for men, but a bonus if accomplished for women (Kontula 2009).

Sex and cannabis

Cannabis has been identified to have sexually stimulating effects and can intensify sexual experiences (Cohen 1982). The cannabinoid profile in cannabis influences sexual functioning and satisfaction as too much tetrahydrocannabinol (THC) may cause more inhibiting effects (Palamar et al. 2018). Due to its muscle relaxant properties (Small 2017), cannabis use may be inhibitory to men's sexual functioning, yet, does not impair and may be beneficial for women's sexual functioning (Sun and Eisenberg 2017). Cannabis may indirectly enhance sexual functioning by decreasing anxiety and increasing relaxation and sensory focus (Klein et al. 2012). It also has been found to be independently associated with increased sexual frequency with daily and weekly users having significantly higher sexual frequency compared to never-users (Sun and Eisenberg 2017).

Historically, and among different cultures, cannabis has been suspected to have an aphrodisiac effect increasing desire and sexual arousal among individuals (Chopra and Jandu 1976; Dawley et al. 1979; Halikas et al. 1982; Mayor's Committee, 1944). Recent studies support this early research with reports of increased receptivity to and interest in sexual activity after using cannabis with women reporting higher rates of increased desire from cannabis use as compared to men (Androvicova et al. 2017; Lynn et al. 2019). Research has also found that cannabis users intentionally used cannabis for increased sexual desire as well as to decrease pain associated with sex (Green et al. 2003; Lynn et al. 2019).

Cannabis may also have implications during the excitement phase of the sexual response cycle which is characterized by the attainment of an erection in men and vaginal lubrication in women (Masters and Johnson 1966). Using cannabis has been reported to cause the inability to achieve and maintain an erection among men (Chopra and Jandu 1976; Masters et al. 1979) with a higher likelihood of developing erectile dysfunction among habitual users (Aversa et al. 2008). Foreplay could be considered an important part of the excitement stage and Palamar et al. (2018) found that cannabis use can increase the chances and duration of foreplay. Cannabis is also a vasodilator and because there are cannabinoid receptors in the genital region (Small 2017), cannabis may cause vasocongestion (i.e., lubrication) within female users. However, there is contradictory evidence on the influence of cannabis on female lubrication (Masters et al. 1979; Palamar et al. 2018).

During the plateau stage, which occurs after excitement but before orgasm, the vasocongestion response is at its peak in both men and women and the man's penis is at its full-potential erection (Masters and Johnson 1966). Men are more likely to report increased duration of intercourse when using cannabis compared to women (Palamar et al. 2018; Weller and Halikas 1984). However, time may be *perceived* to last longer when using cannabis due to the altered time effect of cannabis use (Chopra and Jandu 1976; Kaplan, 1974; Palamar et al. 2018) or this may be due to increased time spent during foreplay when couples may engage in sexual exploration and try new behaviors while using cannabis (Palamar et al. 2018).

Orgasm is the release of sexual tension and cannabis use may contribute to more prolonged and pleasurable orgasms (Androvicova et al. 2017; Halikas et al. 1982).

However, men's daily cannabis use has been associated with inability to reach orgasm and reaching orgasm too quickly or too slowly (Smith et al. 2010). Those who are able to orgasm when using cannabis have also reported an increase in the quality and intensity of the orgasm, which was found to be especially apparent for men (Weller and Halikas 1984; Halikas et al. 1982; Palamar et al. 2018).

Cannabis use before sex has been reported to enhance sexual enjoyment and pleasure for individuals, including oral sex (Dawley et al.1979; Halikas et al. 1982; Traub 1977). Sensuality involves the senses (taste, touch, smell, sound, and sight) and, for the purpose of this study, is incorporated as an aspect of sexual satisfaction. Cannabis has continuously been reported to enhance taste and touch but seems to have less of an effect on hearing, smell, and sight (Koff 1974; Masters et al. 1979; Halikas et al. 1982; Weller and Halikas 1984). Increased sensation and sensuality have been found to be related to cannabis use which may be related to length and intensity of intercourse (Palamar et al. 2018). Cannabis use before sex has been associated with more tender, slower, and compassionate sexual acts while also feeling more relaxed with their partner (Palamar et al. 2018).

There is a need for updated research as cannabis use is becoming more prevalent due to legalization (Substance Abuse and Mental Health Services Administration 2018). The majority of existing literature is outdated and some of it is contradictory, such as the physiological effects of cannabis on sexual functioning and satisfaction.

Research questions

The following exploratory research questions were proposed based on findings from previous literature as well as variables that have not been reported in previous literature: (a) Are there differences between men and women who use cannabis and their perceptions of sexual desire, orgasm intensity, and sexual satisfaction? (b) Does cannabis affect men's ability to achieve and maintain an erection? (c) Does cannabis use affect women's orgasm frequency? (d) How does cannabis use affect pleasure while masturbating? (e) What effect does gender, age, duration of cannabis use, intentionality, frequency of cannabis use, and cannabis form have on predicting sexual functioning and satisfaction?

Methods

This study was approved through the East Carolina University Institutional Review Board and was a self-report survey administered through the online software Qualtrics. Recruitment was purposeful and used snowball sampling. A brief description of the research and the survey were posted on the lead investigator's personal social media pages (Facebook, Twitter, Instagram, and Tumblr) with encouragement to share with others to increase the sample size. It was also shared on various Facebook groups related to cannabis, cannabidiol (CBD), alternative medicine, and related groups and emailed various cannabis organizations (e.g., medical and legal advocacy organizations) asking members to share the study information on their webpages or through email listservs. The study was voluntary and consent was obtained from all participants. Age and previous cannabis use were the first two questions on the survey to verify inclusion criteria (over 18 years old and have used cannabis in the past). Data collection was open for approximately 5 weeks in January 2019.

Measures

Study recruitment materials and questions in the survey used the term "marijuana" to refer to all forms of cannabis because it is a widely recognized term. The survey included demographic questions followed by a comprehensive scale developed by the researchers to measure sexual functioning and satisfaction in relation to cannabis use in a manner that used easy to understand format and phrasing.

Cannabis use

The questions regarding cannabis measured intentionality of use, benefits of use, where cannabis was obtained, forms used (e.g., flower, wax, etc.), frequency, and duration of use. Sensuality is a construct composed of the five senses. The question measuring cannabis forms asked participants to "check all that apply." To analyze how each form (flower, wax, oil, edible, topical) varied by scale score, each form selected was treated as a separate variable. A dichotomous variable for each of the five forms was created with 1 indicating that form was used by the participant and 0 indicating that it was not used. The frequency of cannabis use question was re-coded to be in the same direction as the other questions with a higher score indicating greater frequency.

Sensuality

Previous literature suggests that relaxation enhances sensuality so one item was included to measure relaxation during sex when using cannabis (Palamar et al. 2018). Sensuality was measured with five items with Likert scale response options ranging from *significantly decrease* to *significantly increase*.

Masturbation

Masturbation was included to measure sexual functioning and satisfaction with participants who use cannabis for self-pleasure purposes or may not have a sexual

partner. Three questions were asked about masturbation: whether or not participants masturbate, if participants use cannabis before masturbating, and if so, how cannabis affects their pleasure while masturbating.

Sexual functioning and satisfaction

A scale was developed to measure the participants' sexual functioning and satisfaction based on the incorporated framework (desire, arousal, orgasm, resolution, satisfaction) to analyze how cannabis influences each stage. This scale was developed as a direct and complete measure to analyze how cannabis specifically influences one's sexual functioning and satisfaction through each sexual response phase and overall satisfaction in a clear and concise format. The scale consisted of 14 items using the response options ranging from *significantly decrease* to *significantly increase*. These items were influenced by the following empirical studies: Dawley et al. (1974); Koff (1974); and Weller and Halikas (1984). Following development of the scale, all authors reviewed it for accuracy and clarity and to ensure that it adequately reflected current theory and research on sexual response, functioning, and satisfaction.

Arousal was measured with two questions for men (achieving and maintaining an erection) and one question for women (lubrication). In order to have a consistent number of items for both men and women, a new variable was created to measure arousal using one item measuring the ability to achieve an erection for men and one item measuring lubrication for women. The item on maintaining an erection was not used since lubrication and achieving an erection are analogous. The final scale included twelve items (see Table 1) with an internal reliability of 0.897.

Covariates

Basic demographic information collected included sex/gender, race, LGBTQIA + status, state of residency, education level, relationship status, and socioeconomic status. Participants indicated sex/gender by choosing one of three response options: male, female, or other. Eight response options were provided to measure race: White/Caucasian, Black/African American, Hispanic, Asian, Native American, Pacific Islander, Biracial, and Other. LGBTQ + status was measured by asking participants if they identified as LGBTQ + by choosing yes, no, or prefer not to answer. A drop-down menu was provided for state of residency. Education level was measured in a single item with seven response options ranging from "less than high school diploma or GED" to "Ph.D/Doctorate." Relationship status was measured with a single item with the following four response items: (a) In a monogamous relationship with one person, (b) In an open relationship, (c) Casually hooking up, (d) Not engaging in sexual activity with anybody. Socioeconomic status was measured using the participants' occupation and annual income which were open-ended questions.

Analysis plan

Descriptive statistics were used to determine the effect of cannabis use on pleasure during masturbation.

Table 1 Independent-samples *t*-tests of individual items of the sexual functioning and satisfaction scale

Item	Men *M* (*SD*)	Women *M* (*SD*)	Overall *M* (*SD*)
How does using marijuana affect your *relaxation* during sex?*	4.30 (0.830)	4.45 (0.778)	4.39 (0.801)
How does using marijuana influence your *desire* to have sex (libido, sex drive)?*	3.95 (0.963)	4.10 (0.952)	4.05 (0.962)
How does using marijuana influence your *intimacy/emotional closeness* during sex?	4.06 (0.844)	4.08 (0.930)	4.07 (0.898)
How does using marijuana influence your *physical pleasure*?	4.36 (0.803)	4.31 (0.844)	4.33 (0.830)
How does using marijuana influence your *frequency of sex* (how often you engage in sex)?	3.55 (0.865)	3.54 (0.862)	3.54 (0.860)
How does using marijuana influence your *variety of sexual activities* (i.e. locations, positions, times)?	3.63 (0.813)	3.56 (0.877)	3.58 (0.859)
How does using marijuana influence your *ability to orgasm*?*	3.48 (1.00)	3.86 (0.978)	3.72 (1.00)
How does using marijuana influence your *intensity of orgasm* (how strong the orgasm is)?	4.12 (0.822)	4.01 (0.914)	4.05 (0.884)
How does using marijuana influence your ability to have *more than one orgasm* per sexual encounter (multi-orgasmic)?*	3.45 (0.819)	3.67 (0.901)	3.59 (0.879)
How does using marijuana influence the *duration of sex* (how long sex lasts)?*	3.89 (0.928)	3.59 (0.856)	3.69 (0.894)
How does using marijuana influence your *ability to repeat sex* after orgasm?	3.48 (0.837)	3.43 (0.873)	3.45 (0.858)
Arousal			3.45 (1.01)
Males – How does cannabis influence your ability to *achieve* an erection (boner)?	3.57 (0.892)		
Females – How does using marijuana influence your *vaginal lubrication* (wetness of vagina)?		3.39 (1.05)	

Means range from 1 (significantly decreases) to 5 (significantly increases) with 3 being"does not change"

*$p < .05$

Descriptive statistics and independent-samples *t*-tests using individual items from the sexual functioning and sexual satisfaction scale were used to address the first four research questions. Prior to conducting the regression analysis, a Pearson Correlation was performed to examine associations between variables (age, gender, duration of cannabis use, form of cannabis, intentionality of using cannabis prior to sex, and frequency of cannabis use). The results of these preliminary analyses informed the inclusion of variables in the multiple regression. A multiple linear regression was then calculated predicting participants' scores on the sexual functioning and satisfaction scale based on age, gender, duration of cannabis use, form (flower, wax, oil, edible, topical), and frequency of cannabis use.

A one-way ANOVA was conducted to compare the effect of intentionality on and the sexual functioning and satisfaction scale. Intentionality was measured using one item asking if participants intentionally used cannabis before having sex which had two response options, "yes" or "no". All statistical analyses were performed using SPSS Statistics V28 (IBM Corporation).

Results

Sample description

The original sample size was 1299 participants. Participants ($n=133$) were removed from the study if they were under the age of 18 or indicated that they had never used cannabis. Another 355 participants did not answer the sexual functioning and satisfaction scale questions resulting in a final sample size of 811 for this study. Analyses were conducted to compare those who had not answered the dependent variable questions and thus excluded from this study ($n=355$) with those who answered dependent variable questions and were included in the study ($n=811$). These analyses revealed no significant association between race or ethnicity with inclusion in the study, X2 (7, 1165) = 9.974, $p=.190$, or between sex or gender with inclusion in the study, X2 (2, 1165) = 2.024, $p=.364$. However, a *t*-test revealed that there was a significant difference in age between those included and those who were not included, t (1159) = 1.898, $p=.029$. Those included in the study (m = 32.09 years) were older than those excluded (m = 29.27 years) which may have reflected greater comfort in responding to sensitive questions regarding sexual behavior and cannabis use.

Participant ages ranged from 18 to 85 years old ($M=32.11$). The majority of the participants stated their sex/gender as female ($n=536$, 64.9%), but the sample also included men ($n=277$, 34.2%) and those that identified as other ($n=8$, 1.0%). Most of the participants stated being White/Caucasian ($n=640$, 78.9%) had at least some college education ($n=650$, 80.1%) and almost 25% of the participants identified as LGBTQIA+ ($n=187$, 23.1%). A variety of occupations were represented in this study, including police officers, professors, and stay at home moms. The sample included at least one individual from each state, except South Dakota and Wyoming, and also included individuals from D.C., Puerto Rico, and participants ($n=104$) that resided outside the USA. Most of the participants reported being in a monogamous sexual relationship ($n=598$, 73.7%).

Cannabis use

Over half of the participants reported using cannabis daily ($n=509$, 62.8%), for recreational and medicinal purposes ($n=468$, 57.7%), and intentionally using before engaging in sex ($n=485$, 59.8%). A majority of participants have used cannabis at least a few years (88%; $n=714$). Almost all participants indicated using cannabis in the form of flower (i.e., pot, weed) (95.9%; $n=778$). Other forms used by participants included edible (59.2%; $n=480$), oil (48.0%; $n=389$), wax (36.5%, $n=296$), and topical (18.0%; $n=146$). The majority of participants (78.8%) stated that cannabis does not affect their sexual decision making ($n=639$) and that cannabis *slightly increases* or *significantly increases* relaxation during sex (87.7%; $n=711$). Results of the Pearson correlation indicated that there was a strong positive association between age and duration of cannabis use ($r=.457$, $p=.000$), age and frequency of cannabis use ($r=.167$, $p=.000$), and frequency of cannabis use and duration of cannabis use ($r=.239$, $p=.000$).

Sensuality

Many participants stated that cannabis *slightly increases* or *significantly increases* enhancement of sense of taste ($n=583$, 71.9%) and 71.0% stated that cannabis *slightly increases* or *significantly increases* their sense of touch ($n=576$). The majority of participants stated that the enhancement of the following senses does not change with cannabis use: smell (53.3%; $n=432$), sight (57.2%; $n=464$), and hearing (56.7%; $n=460$). Over 70% of participants ($n=583$) reported that taste was slightly or significantly enhanced when using cannabis ($M=3.96$, $SD=0.943$). Similarly, over 70% ($n=576$) reported that touch was slightly or significantly enhanced when using cannabis ($M=4.02$, $SD=0.906$). Table 2 provides mean scores for enhancement of the five senses.

Masturbation

In examining the effects of cannabis use while masturbating, the majority of the participants stated that they masturbate (88.3%; $n=716$). Of the participants who stated that they masturbate, 76.4% reported using cannabis before masturbating ($n=620$) and 62.5% indicated

Table 2 Mean scores of cannabis use and effect on sensuality by gender

Sense	Men *M* (*SD*)	Women *M* (*SD*)	Overall *M* (*SD*)
Taste	4.02 (0.928)	3.93 (0.949)	3.96 (0.943)
Touch	4.00 (0.905)	4.03 (0.911)	4.02 (0.906)
Smell	3.33 (0.895)	3.28 (0.849)	3.30 (0.865)
Sight*	3.12 (0.817)	2.97 (0.791)	3.02 (0.803)
Hearing*	3.42 (0.889)	3.22 (0.797)	3.29 (0.832)

Means range from 1 (significantly decreases) to 5 (significantly increases) with 3 being "does not change"

*$p < .05$

that cannabis slightly increases or significantly increases pleasure while masturbating ($n = 507$).

Sexual functioning and satisfaction

Over 70% of men and women ($n = 601$) reported that cannabis slightly or significantly increases desire ($M = 4.05$, $SD = 0.962$). An independent-samples *t*-test was conducted to compare desire in men and women. The perceived influence of cannabis on sexual desire was significantly higher for women ($M = 4.10$, $SD = 0.952$) as compared to men ($M = 3.95$, $SD = 0.963$); $t(799) = -2.187$, $p = .029$.

Men perceived either no effect or an increased ability to achieve and maintain an erection when using cannabis. Specifically 255 men (93.4%) reported no change or an increased ability to achieve an erection ($M = 3.57$, $SD = 0.892$) and 254 (92.4%) men reported no change or an increase in maintaining an erection ($M = 3.60$, $SD = 0.928$).

Over 70% of men and women ($n = 582$) reported that cannabis slightly or significantly increased orgasm intensity ($M = 4.05$, $SD = 0.884$). An independent-samples *t*-test was conducted to compare cannabis use and orgasm intensity in men and women. There was not a significant difference in the scores comparing men ($M = 4.12$, $SD = 0.822$) and women ($M = 4.01$, $SD = 0.914$); $t\ (798) = 1.586$, $p = .113$. However there was some support for orgasm frequency among women with over 40% of women ($n = 356$) reporting increased ability to have more than one orgasm per sexual encounter ($M = 3.67$, $SD = 0.901$).

Using descriptive statistics of the scale, men and women reported increased sexual satisfaction ($M = 3.825$, $SD = 0.613$). *T*-test analysis indicated that there was no significant effect based on gender, $t(801) = -0.187$, $p = .852$. However, because there were significant gender differences in other individual items, gender was included in the regression analyses. A multiple linear regression was calculated predicting participants' scores on the sexual functioning and satisfaction scale based on age, gender, duration of cannabis use, form (flower, wax, oil, edible, topical), and frequency of cannabis use. The regression equation was significant ($F(9,789) = 2.582$, $p = .006$) with a R^2 of 0.029. The forms wax and flower were significant predictors with topical forms approaching significance (Table 3). A one-way ANOVA was conducted to compare the effect of intentionality of cannabis use prior to sex on the sexual functioning and satisfaction scale. There was a significant effect of intentionality on the scale at the $p < .05$ level [$F(1,806) = 4.938$, $p = .000$] with those intentionally using cannabis before sex having higher scores on the sexual functioning and satisfaction scale.

Table 3 Results from linear regression model predicting effects of cannabis use on sexual functioning and satisfaction

Predictor	B	SE	*β*	*t*	*P*
Constant	3.518	0.144		24.503	0.000
Gender	0.021	0.046	0.016	0.451	0.652
Age	0.003	0.002	0.061	1.462	0.144
Duration of cannabis use	−0.027	0.022	−0.050	-1.229	0.219
Frequency of cannabis use	−0.001	0.016	−0.003	−0.083	0.934
Form—flower	0.235	0.111	0.077*	2.126	0.034
Form—wax	0.131	0.053	0.103*	2.484	0.013
Form—oil	−0.013	0.049	−0.010	−0.261	0.794
Form—edible	0.050	0.048	0.040	1.039	0.299
Form—topical	0.107	0.061	0.067	1.767	0.078
R^2		0.029			
F		2.582*			

*$p < .05$

Discussion

This nationwide study had a large sample size with the majority of participants being White college educated women. The inclusion of LGBTQIA + individuals is a strength of this study with almost 25% of the sample identifying as LGBTQIA+. Over half the sample ($n = 485$) reported intentional use of cannabis prior to engaging in sexual activities. Results indicate that the people who use cannabis are of a wide range of ages, from a variety of occupations, and have differing cannabis use preferences. This demographic profile of our sample aligns with previous research that indicates cannabis users vary in age and tend to be non-Hispanic White (Han et al. 2017; Mauro et al. 2017; O'Connell and Bou-Matar 2007). However, our sample differs from recent research regarding sex/gender and relationship status. Although approximately two thirds of our sample were women, Carliner et al. (2017) found that men continue to use at higher

rates than women despite the fact that cannabis use has increased for both men and women. Almost 74% of our sample reported being in a monogamous relationship which does not align with recent research that found that regular cannabis users were less likely to be in a relationship (Chan et al. 2021). These differences in our sample as compared to previous research on the sex/gender and relationship status of cannabis users suggest that caution should be used when generalizing results in regard to these demographic characteristics.

Sexual functioning and satisfaction

An important contribution of this study is the high reliability ($\alpha = 0.897$) for an expanded sexual functioning and satisfaction scale which incorporated Kaplan's phase of desire, Masters and Johnson's model (excitement, plateau, orgasm, resolution), and sexual satisfaction as the final stage. This comprehensive scale moves beyond the physiological effects (e.g., achieving an erection) and incorporates overall sexual functioning and satisfaction. The creation of the scale was crucial to gain a comprehensive oversight on aspects of sexual functioning and satisfaction with the ability to analyze and report how cannabis affects various sexual responses. The scale also incorporates the influence of cannabis on sexual functioning and satisfaction, as opposed to a scale that only measures sexual functioning and/or satisfaction.

In contrast to early literature (Koff 1974; Weller and Halikas 1984), no gender differences were found in regard to cannabis use and overall sexual functioning and satisfaction. Results from this study indicated that both men and women see benefits from using cannabis before sexual intercourse or masturbation. However, *t*-tests reveal that there were gender differences with the specific scale items of desire, relaxation during sex, and ability to orgasm. Decreased ability to orgasm could be influenced by both reduced desire and difficulty relaxing during sex. Therefore, if cannabis use allows women to relax and increases desire, they may then have improved orgasm capacity.

Many of the results were consistent with existing literature. One notable exception is men's ability to achieve and maintain an erection due to cannabis. Previous literature stated that men would have a more difficult time achieving and maintaining an erection when using cannabis, possibly due to the muscle relaxation properties of cannabis (Masters et al. 1979). The current study found that men did not report a decreased ability to achieve and maintain an erection. However, due to the self-report nature of this survey, social desirability may have prevented them from reporting erectile issues.

Similar to existing literature (Androvicova et al. 2017; Lynn et al. 2019), both men and women perceived increased desire and orgasm intensity when using cannabis. Women reported increased ability to have more than one orgasm per sexual encounter, which is similar to previous findings (Weller and Halikas 1984). These results align with the increased relaxation when using cannabis; those who use cannabis report being more relaxed, whether mental or physical, which would improve overall sexual functioning and pleasure. There was no difference in sexual functioning and satisfaction scale scores by age. This indicates that despite age, individuals still report sexual benefits from using cannabis. The age of the sample ranged from 18 to 85, suggesting that cannabis use may have benefits across the lifespan. The positive correlations between age and duration of cannabis use and between age and frequency of cannabis use further support the idea of regular use throughout the lifespan. Additionally, the positive correlation between individuals who have used cannabis for a longer amount of time (duration) and frequency of use means that those who use more cannabis more often were more likely to have been using cannabis for a longer period of time. However, neither duration or frequency of use influenced sexual functioning and satisfaction. People that identify as LGBTQIA + did not differ with cannabis use as one's sexual functioning and satisfaction is not generally impacted by sexual orientation.

Those who reported intentionally using cannabis before sex had significantly higher scale scores than those who reported not intentionally using cannabis before sex. This can be interpreted as those who intentionally used cannabis before sex perceived a greater benefit to their sexual functioning and satisfaction compared to those who do not intentionally use cannabis before sex. These results may be because of the mental mindset that using cannabis will increase pleasure due to the aphrodisiac notions of cannabis rather than a true physiological effect. However, the relaxation effects of cannabis may contribute to increased desire or reduced inhibitions that might contribute to increased sexual functioning and satisfaction. This also aligns with Palamar et al. (2018) who found that cannabis use can result in more and longer foreplay which can also contribute to positive sexual functioning and seuxual satisfaction. Individuals may also intentionally use cannabis before sex thinking that cannabis use helps with any sexual issues that they have, therefore increasing their sexual functioning and satisfaction.

While dosage could not be measured, forms of cannabis can give an indication of dosage, which has been found to have an impact on sexual functioning (Palamar et al. 2018). Although duration and frequency of cannabis use were not significant predictors, the forms of wax and flower predicted increased sexual functioning and satisfaction. While there is no literature on specific

cannabinoid profiles regarding sexual functioning and satisfaction, some products may have a greater influence on the physiological effects and overall satisfaction of sex due to the THC potency and cannabinoid profile.

Sensuality is an important aspect of sexual intercourse as it relates to the five senses. During sex, one uses many, if not all, of their senses. Men and women reported increased enhancement to touch and taste when using cannabis, which is consistent with previous literature (Weller and Halikas 1984). The enhancement of taste and touch could increase overall sexual functioning and satisfaction because these are two senses that are heavily used during sexual intercourse.

Implications

This study has the potential to impact policy, medicine, and practice by providing support for policy change and legalization advances for cannabis use. Increased access to cannabis may facilitate more research on its effects. Medical implications of this study include the possible use of cannabis for treating sexual dysfunctions, especially with women. Women with vaginismus (i.e., painful intercourse) may benefit from the muscular relaxation and increased sexual functioning that results from cannabis use, while women with decreased desire could also see possible benefits (Lynn et al. 2019).

Finally, regarding practice, results from this study suggest that cannabis can potentially close the orgasm inequality gap (Mintz 2018). The orgasm inequality gap states that men statistically are more likely to orgasm per sexual encounter compared to women (Kontula, 2009). Women may be more likely to orgasm when using cannabis before sexual encounters, which could contribute to equity in the amount of sexual pleasure and satisfaction experienced by both women and men. Sex therapists could incorporate use of cannabis in states where it is currently legal.

Limitations

While this study had a large sample size and was able to report evidence that has not been found in the literature, there were some limitations. Although the survey was internally reviewed multiple times by all members of the research team, it was not pilot-tested or externally validated. The sample was a convenience sample of individuals who self-selected to participate in the study which may cause selection bias. Additionally, participants were asked to retrospectively self-report based on many years which could result in recall bias. The collection of data by self-report rather than direct observation results in self-report bias in that results are measuring participants' perceptions of the effects of cannabis rather than the collection of physiological data. Respondents were largely college educated White women, so this study does not represent the majority of US cannabis users.

Dosage was not measured and many individuals are unaware of the amount and potency of cannabis that they are consuming. This is especially true for individuals who do not live in a state where cannabis has been legalized and where all products bought from a regulated dispensary are labeled. Social desirability may be another limitation to this study because of the sensitive nature of the survey questions. Participants may have answered in a desirable manner, particularly related to questions related to erection. This study did not measure medications, mental health status, and other predictors of sexual functioning (Basson 2001; Cherkasskaya and Rosario 2018). Chronic cannabis use has been found to have possible effects (Aversa et al. 2008; Hall, 2014), which this study did not extensively evaluate. Also, several variables were measured using single items and although the scale created had high reliability, it does not have established validity.

Future research

Cannabis has not been studied extensively, partly because of legalization barriers. This is especially true regarding the intersection of cannabis and sexual functioning and satisfaction. This study found that duration of cannabis use or frequency of cannabis use does not predict sexual functioning. However, previous literature indicates that daily and habitual users reported erectile difficulties in men (Aversa et al. 2008). Future research should focus on men's frequency and duration of cannabis use in regard to their sexual functioning. Additionally, age was positively correlated with both duration of cannabis use and frequency of cannabis use and the interaction between these three variables should be researched further.

Future cannabis research should focus on specific cannabinoid profiles, methods, and forms to indicate which has greatest sexual impact and implications. Clinical research to study this would be most accurate due to the social desirability effect of self-report surveys. Future research would also benefit from reviewing the endocannabinoid system and its impact on sexual functioning and satisfaction.

Conclusion

This study extended the limited literature regarding the influence of cannabis on sexual functioning and satisfaction. Results help to update the literature on cannabis and sexuality and contribute to implications for advancing policy, medicine, and practice. Expanding the sexual response cycle to include desire and sexual satisfaction

provided a useful framework for this study and results supported this expanded model. Overall, cannabis use tends to have a positive influence on perceived sexual functioning and satisfaction for individuals despite gender or age and cannabis might help to decrease gender disparities in sexual pleasure.

Abbreviations

THC	Tetrahydrocannabinol
CBD	Cannabidiol
LGBTQIA+	Lesbian/gay/bisexual/transgender/queer or questioning/other

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Not applicable.

Authors' contributions
AM—conceived the topic of study, collected the data, data entry and processing, manuscript writing. SMB—responsible supervisor of AM, data entry and processing, manuscript writing; JJ—contributed substantially to the conception and design of the study, the acquisition of data, or the analysis and interpretation; contributed data and analysis tools; data analysis; manuscript review; and editing of final copy. PA—contributed substantially to the conception and design of the study, the acquisition of data, or the analysis and interpretation; manuscript review; and editing of final copy. All authors consent for publication. The authors read and approved the final manuscript.

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Availability of data and materials
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Declarations

Ethics approval and consent to participate
This study was approved by the Institutional Review Board and all participation was voluntary and anonymous.

Consent for publication
Consent was obtained from all participants.

Competing interests
The authors declare that they have no competing interests.

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Publisher's Note

WOMEN'S SEXUAL HEALTH

The Relationship between Marijuana Use Prior to Sex and Sexual Function in Women

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ABSTRACT

Introduction: Scientific research on the effects of marijuana on sexual functioning in women, including libido, arousal, orgasm, and satisfaction, is limited.

Aim: To evaluate women's perceptions of the effect of marijuana use before sexual activity.

Methods: A cross-sectional design, from March 2016—February 2017, within a single, academic, obstetrics and gynecology practice, was performed. Patients were given a questionnaire at their visit and asked to complete it anonymously and place it in a locked box after their visit.

Main Outcome Measures: The primary outcome was satisfaction in the sexual domains of drive, orgasm, lubrication, dyspareunia, and overall sexual experience. The secondary outcome was the effect of the frequency of marijuana use on satisfaction.

Results: Of the 373 participants, 34.0% (n = 127) reported having used marijuana before sexual activity. Most women reported increases in sex drive, improvement in orgasm, decrease in pain, but no change in lubrication. After adjusting for race, women who reported marijuana use before sexual activity had 2.13 higher odds of reporting satisfactory orgasms (adjusted odds ratio = 2.13; 95% CI = 1.05, 4.35) than women who reported no marijuana use. After adjusting for race and age, women with frequent marijuana use, regardless of use before sex or not, had 2.10 times higher odds of reporting satisfactory orgasms than those with infrequent marijuana use (adjusted odds ratio = 2.10; 95% CI = 1.01—4.44).

Conclusion: Marijuana appears to improve satisfaction with orgasm. A better understanding of the role of the endocannabinoid system in women is important, because there is a paucity of literature, and it could help lead to development of treatments for female sexual dysfunction. **Lynn BK, López JD, Miller C, et al. The Relationship between Marijuana Use Prior to Sex and Sexual Function in Women. Sex Med 2019;7:192—197.**

Key Words: Female Sexual Response; Epidemiology; Health Behavior and Attitudes; Women's Sexuality

INTRODUCTION

Over the last decade, marijuana use and the legalization of marijuana, medically and recreationally, has continued to increase in the United States.[1] The internet is rife with claims of the beneficial effects of marijuana on several aspects of sexual function including libido, arousal, and orgasm. However, our scientific research on the effects of marijuana on sexual functioning is limited. Recently Palamar et al[2] evaluated self-reported sexual effects of marijuana, ecstasy, and alcohol use in a small cohort of men and women aged 18—25. They found that the majority of marijuana users reported an increase in sexual enjoyment and orgasm intensity, as well as either an increase or no change in desire.[2]

Endocannabinoids, which are structurally similar to marijuana, are known to help regulate sexual function.[3] The cannabinoid

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Table 1. Demographics of study population

Characteristics	Non-marijuana users (n = 197)	Marijuana users who don't use before sex (n = 49)	Marijuana users who use before sex (n = 127)	*P* value*
Age, years	36.3 ± 13.1	37.4 ± 13.1	34.0 ± 11.3	.17
Race†				.03
African American/other minorities	79 (40.7)	13 (26.5)	62 (48.8)	
Caucasian	115 (59.3)	36 (73.5)	65 (51.2)	
Sexual orientation‡				.02
Heterosexual	180 (91.4)	46 (93.9)	111 (87.4)	
Lesbian	3 (1.5)	0 (0.0)	4 (2.7)	
Bisexual	1 (0.5)	0 (0.0)	7 (5.5)	
Marital status§				.18
Married	95 (49.0)	24 (49.0)	46 (36.2)	
Living with a partner	62 (32.0)	18 (36.7)	55 (43.3)	
Single	37 (19.1)	7 (14.3)	25 (19.7)	
Cigarette smoker	17 (8.6)	10 (20.4)	30 (23.6)	<.01

Table values are frequencies (%) or means ± SD.
*χ^2, Fisher's exact test, and 1-way ANOVA. Significant at the $P < .05$ level.
†3 participants were missing for race and quality of life.
‡21 participants were missing for sexual orientation.
§4 participants were missing for marital status.

receptor, discovered in the 1990s, has been mapped to several areas of the brain that play a role in sexual function.[3] Cannabinoids and endocannabinoids interact with the hormones and neurotransmitters that affect sexual behavior. Although these interactions have not been clearly illuminated, some studies in rodents have helped to clarify the relationship between cannabinoids and the hormones and neurotransmitters that affect sexual behavior.[4] Although there is less data on human subjects, some studies have measured patient's perceptions of the effects of marijuana on sexual function. Studies have reported an increase in desire and improvement in the quality of orgasm.[5] Most recently, Klein et al[6] evaluated the correlation between serum levels of 2 endogenous endocannabinoids and found a significant negative correlation between endocannabinoids and both physiological and subjective arousal in women. Sumnall et al[7] reported that drugs such as cannabis and ecstasy were more frequently taken to improve the sexual experience than was alcohol.

The primary aim of this study was to determine how women perceive the sexual experience, specifically overall sexual satisfaction, sex drive, orgasm, dyspareunia, and lubrication, when using marijuana before sex. The magnitude of the change was also evaluated. The secondary aim sought to understand the effect of the frequency of marijuana use, regardless of marijuana use before sex, on satisfaction across the different sexual function domains.

MATERIAL AND METHODS

Women were enrolled prospectively from a single, academic, obstetrics and gynecology practice from March 2016—February 2017, and their data were retrospectively reviewed. The protocol was approved by the Institutional Review Board. Eligibility criteria consisted of being a female, ≥18 years of age, and presenting for gynecologic care irrespective of the reason. Each participant completed a confidential survey, including demographic data without unique identifiers after their visit, which was placed in a sealed envelope and dropped in a lock box at the clinic. The Sexual Health Survey was developed for the purpose of this study based on the aims of the study. There are several validated tools for evaluation of sexual function. The Female Sexual Function Index (FSFI)[8] assesses several domains of sexual function, but it does not address specifically marijuana or other substance usage. The Golombok Rust Inventory of Sexual Satisfaction[9] specifically relates to vaginal intercourse, but, for purposes of this study, sexual activity was deliberately left open-ended and not restricted to vaginal penetration. In addition, the goal was not to measure whether women had sexual dysfunction, which the FSFI addresses, but to assess basic questions regarding overall sexual activity. To limit bias, the authors embedded the questions about marijuana deeper into the questionnaire. If these specific questions had been added to the standard FSFI, there was concern that the questionnaire would have been too long and that the patients would get questionnaire fatigue and not finish or answer thoughtfully.

Measurement of marijuana use before sex was dichotomized as yes or no. The exact timing of marijuana use in relation to sex was not defined, and the majority of users were smokers of marijuana. For purposes of the study, groups consisted of non-marijuana users, marijuana users before sex, and marijuana users who didn't use before sex. Patients reported their usage as

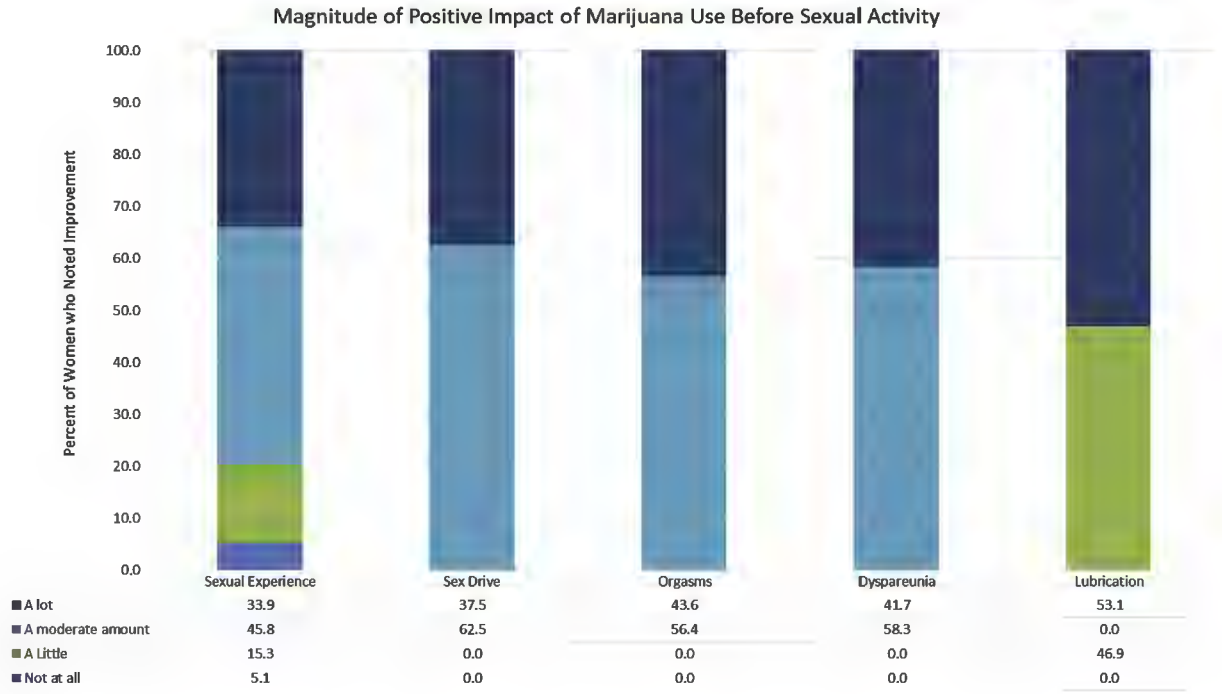

Figure 1. Magnitude of positive impact of marijuana use before sexual activity.

several times a day or week or year, once a day, week or year and less than once a year. For purpose of analysis, frequency of marijuana use was measured by dichotomizing into frequent (once a week—several times a day) and infrequent (several times a year—<once a year).

"Sex" was not specifically defined in the questionnaire, so each respondent used her own definition of sex. Initial questions assessed their perception of their overall sexual health, including satisfaction or dissatisfaction with current sex life, sex drive, orgasms, lubrication, and dyspareunia. An example survey question was, "How satisfied are you with your ability to maintain lubrication during sexual activity or intercourse?" This was followed by questions regarding marijuana usage, the frequency of use, and whether participants perceived any positive or negative effect of this on the above sexual domains. The magnitude of change was measured on a Likert scale of always, sometimes, rarely, or never, and then dichotomized as always—sometimes vs rarely—never. For example, if patients reported that marijuana use before sex increased their sexual desire, they were then asked, "How often did/does marijuana use before sex increase your sex drive?" If they reported a decrease in sex drive, they then answered the same question within the context of by how much.

Bivariate analyses were conducted to measure the sample characteristics. The Shapiro-Wilk test was conducted to test for normality of the data. 1-way ANOVA, χ and Fisher's exact tests were used to assess for comparisons among the groups. Multivariate logistic regressions identified the independent predictors in the sample and included all covariates with $P < .05$ established in the bivariate correlations. Then, covariates were retained in the final regression model if they changed the effect size between exposure and outcome by more than 10%, indicating a confounding effect. Final models were adjusted for race and tested using Hosmer-Lemeshow for goodness of fit. Data were analyzed using SAS Version 9.4 for Windows (SAS Institute Inc, Cary, NC, USA).

Table 2. Differences in sexual function domains between those who use before sexual activity and those who do not

Sexual function	Marijuana before sex (n = 127)	Marijuana users don't use before sex (n = 49)	*P* value*	aOR (95% CI)
Sexual life satisfaction	89 (70.1)	30 (61.2)	.11	1.85 (0.86, 3.99)
Satisfying sex drive	91 (71.7)	29 (59.2)	.10	1.84 (0.89, 3.82)
Satisfying orgasm	86 (67.7)	26 (53.1)	.04	2.13 (1.05, 4.35)
Increased lubrication	94 (74.0)	34 (69.4)	.50	1.32 (0.58, 3.00)
Reduced dyspareunia	20 (15.7)	10 (20.4)	.40	0.69 (0.30, 1.63)

aOR = adjusted odds ratio.
Table values are frequencies (%). Adjusted for race and age.
*χ^2, significant at $P < .05$ level.

Table 3. Overall satisfaction of sexual health based on frequency of use

	Frequent marijuana users n = 84	Infrequent marijuana users n = 86	*P* value*	aOR (95% CI)
Sexual life satisfaction	61 (72.6)	56 (65.1)	0.12	1.50 (0.64, 3.48)
Satisfying sex drive	57 (67.9)	61 (70.9)	0.94	0.77 (0.35, 1.71)
Satisfying orgasm	60 (71.4)	50 (58.1)	0.02	2.10 (1.01, 4.44)
Increased lubrication	63 (75.0)	60 (69.8)	0.23	1.41 (0.60, 3.31)
Reduced dyspareunia	12 (14.3)	18 (20.9)	0.29	0.68 (0.29, 1.59)

aOR = adjusted odds ratio.
Table values are frequencies (%). Adjusted for race and age.
*χ^2, Significant at $P < .05$ level.

RESULTS

A total of 373 patients completed the sexual health survey during the study period. Non-marijuana users constituted 52.8% (n = 197) of the sample. Of the 176 users, 34.1% (n = 127) used before sex and 13.1% (n = 49) did not. The mean age of the groups was not significantly different. The majority of women were white and identified as heterosexual (Table 1).

Among those who reported using marijuana before sex, 68.5% (n = 87) stated that the overall sexual experience was more pleasurable, 60.6% (n = 77) noted an increase in sex drive, and 52.8% (n = 67) reported an increase in satisfying orgasms. The majority reported no change in lubrication. Participants reported their sexual experiences as "always to sometimes" positive related to all the domains of sexual function, except for lubrication (Figure 1). After adjusting for race, women who reported marijuana use before sex had 2.13 higher odds of reporting satisfactory orgasms during sexual activity (adjusted odds ratio = 2.13; 95% CI = 1.05−4.35) than women who reported no marijuana use before sex (Table 2). There was no statistically significant difference in the other domains between these groups. Women with frequent marijuana use, regardless of use before sex or not, had 2.10 times higher odds of reporting satisfactory orgasms than those with infrequent marijuana use (adjusted odds ratio = 2.10; 95% CI = 1.01−4.44) (Table 3). There was no significant difference in the other domains.

DISCUSSION

In our study, the majority of women who used marijuana before sex reported positive sexual effects in the domains of overall sexual satisfaction, desire, orgasm, and improvement in sexual pain but not in lubrication. Women who used marijuana before sex and those who used more frequently were more than twice as likely to report satisfactory orgasms as those who did not use marijuana before sex or used infrequently.

Our study is consistent with past studies of the effects of marijuana on sexual behavior in women. In the above-mentioned study by Palamar et al,[2] 38.6% of respondents were women. Participants were asked questions similar to this study's questions regarding sexual domains, including sexual enjoyment, desire, and orgasm intensity and how these were affected by being under the influence of marijuana. The majority of respondents noted an increase in sexual enjoyment (53.5%) and orgasm intensity (44.9%), whereas 31.6% noted an increase in desire, and 51.6% noted no difference.[2] Our data showed a higher percentage of participants reporting improvements in each domain across the board. However, their data included both men's and women's responses, and their questions were worded differently.

Dawley et al[10] evaluated a group of marijuana using students (men and women) and found that marijuana smokers reported increased sexual pleasure, increased sensations, and increased intensity of orgasm. Only more-frequent users felt that marijuana was an "aphrodisiac," a surrogate measure of desire. This study included only 22% women.[10] Finally, Koff[11] evaluated sexual desire and sexual enjoyment after marijuana use in women via a questionnaire. The majority of the female respondents reported that sexual desire was increased (57.8% vs 60.6% in our study). Sexual enjoyment increased 42.9% of the time.[11] Interestingly, Sun and Eisenberg[12] reported a higher frequency of sexual activity in marijuana users, even when controlling for multiple variables (ie, age, socioeconomic status). The authors surmise from their data that marijuana use does not seem to impair sexual function. However, it is important to note that marijuana use may be harmful.

Our study provides an interesting insight into women's perceptions of the effect of marijuana on the sexual experience. It differs from other studies in that it is one of the largest series to date and has a wider range of ages. It also differed in that it was a cross-section of healthy women presenting for routine gynecologic care, where most studies target younger patients and include both sexes. For this reason, it is difficult to directly compare the studies, because the sexual activity, frequency, and expectation of these groups may be very different. However, we believe it is important to understand the potential effect in this patient population.

The question of how marijuana leads to these positive changes in sexual function is unknown. It has been postulated that it leads to improvement in sexual function simply by lowering stress and anxiety.[13] It may slow the temporal perception of time and prolong the feelings of pleasurable sensations.[5,14] It may lower sexual inhibitions and increase confidence and a willingness to experiment.[7] Marijuana is also known to heighten

sensations such as touch, smell, sight, taste, and hearing.[15] Although this was not specifically addressed in this article, according to Halikas et al,[5] the regular female marijuana user reported a heightened sensation of touch and increased physical closeness when using marijuana before sex.

It is postulated that marijuana works through a variety of mechanisms. It is recognized that marijuana and the hypothalamic-pituitary-gonadal axis, which controls the sex hormones, interact with each other. There are cannabinoid receptors in the hypothalamus that regulate gonadotrophin-releasing hormone and oxytocin release, both of which play a role in normal sexual functioning.[16] In addition, marijuana has been shown to affect testosterone levels, which play a role in sex drive, but how and in which direction in women is unclear.[17,18]

Female sexual function is not only regulated by hormones, but also by centrally acting neurotransmitters, such as dopamine and serotonin. Dopamine is a key pro-sexual modulator in normal excitatory female sexual function.[19,20] Activation of cannabinoid receptors has been shown to enhance dopamine,[19] which may be another pathway by which marijuana affects sexual function. Cannabinoid receptors have also been localized to other areas of the brain that control sexual function, including the hypothalamus, prefrontal cortex, amygdala, and hippocampus.[21,22] Serum levels of endocannabinoids have been correlated with both subjective and objective measures of arousal.[6]

The strength and weakness of this study is that it is a single-center study, which allows consistency of patient recruitment but does not allow for assessment of generalizability. It relied on women's memory and perceptions of the sexual experience; however, it is real life, and all questionnaires rely on recall. It did not address the context of the relationship, co-use with other drugs, or the timing and quantity of marijuana use before sex, all of which contribute to the memory of the sexual experience. It does not specifically ask whether the marijuana was taken because the patient had the perception that it would enhance performance, which would be an inherent bias. This may be less likely because women who were frequent users (that is not specifically timed with intercourse) had the same positive relationship with improvement in satisfying orgasm. A further study could address the specific timing of marijuana use on the sexual domains though this would be difficult unless patients were enrolled in a study that required certain timing (a very challenging study to get though the Institutional Review Board).

CONCLUSIONS

This study adds to our knowledge and understanding of the effect of marijuana use on female sexual functioning. Timing appears to be important with those who use before sex reporting a positive effect on orgasm. However, with any use, the majority of women perceived improvement in in overall experience, sex drive, orgasm and pain.

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Assessment of the effect of cannabis use before partnered sex on women with and without orgasm difficulty

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Abstract

Background: Up to 41% of women face challenges achieving orgasm, a statistic unchanged for 50 years.

Aim: To evaluate the effect of cannabis use before partnered sex on women with and without difficulty achieving orgasm.

Methods: This observational study evaluated responses from female study participants relating to their demographics, sexual activities, mental well-being, cannabis usage, and orgasm-related questions from the Female Sexual Function Index (FSFI).

Outcomes: Outcomes included orgasm frequency, difficulty, and satisfaction related to cannabis use or lack of use before partnered sex, largely based on the FSFI orgasm subscale.

Results: Of the 1037 survey responses, 410 were valid and complete. Twenty-three surveys (5.6% returned) were excluded due to failure to meet the study's criteria. Of the valid surveys, most women (52%, n = 202) reported difficulty achieving orgasm during sexual activity with a partner. These women were primarily between 25 and 34 years of age (45%, n = 91); 75% identified their race as White (n = 152/202); 52% (n = 105) identified as LGBTQI+ (lesbian, gay, bisexual, transgender, queer/questioning, intersex, or other); and 82% (n = 165) were married or in a relationship. Among participants who experienced challenges in achieving orgasm, 72.8% (n = 147, $P < .001$) reported that cannabis use before partnered sex increased orgasm frequency, 67% stated that it improved orgasm satisfaction (n = 136, $P < .001$), and 71% indicated that cannabis use made orgasm easier (n = 143, $P < .001$). The frequency of cannabis use before partnered sex correlated with increased orgasm frequency for women who experienced difficulties achieving orgasm (n = 202, $P < .001$). The reasons for cannabis use before partnered sex resulted in a more positive orgasm response (n = 202, $P = .22$).

Clinical implications: Cannabis may be a treatment for women with difficulty achieving orgasm during partnered sex.

Strengths and limitations: The researchers examined the challenge of achieving orgasm and considered the covariates reported in the literature, including the FSFI orgasm subscale. The findings may not be generalizable to women who rarely or never use cannabis before sex, women who have never experienced an orgasm, or women who do not have female genitalia. Additionally, the specific type of cannabis used, its chemical composition, the quantity used, and whether or not the partner used cannabis were not assessed in this study.

Conclusion: Cannabis-related treatment appears to provide benefit to women who have female orgasm difficulties or dysfunction.

Keywords: cannabis and female orgasm; cannabis and sex; female orgasm difficulty; female orgasmic disorder; female orgasmic dysfunction; female sexual dysfunction; orgasmic dysfunction.

Figures

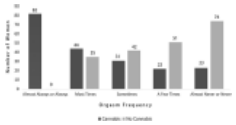

Figure 1 Measures for orgasm frequency during...

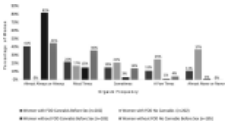

Figure 2 Measures for orgasm frequency during...

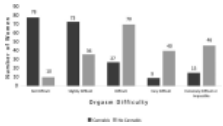

Figure 3 Measures for orgasm difficulty during...

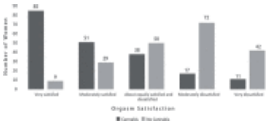

Figure 4 Orgasm satisfaction for women with...

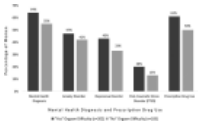

Figure 5 Measures for mental health diagnosis,...

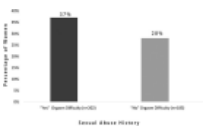

Figure 6 Measures for sexual abuse history...

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