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DSM-5 genito-pelvic pain/penetration disorder: Prevalence, comorbidities, and associated factors in university students

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ABSTRACT

Background/objective: Little is known about the prevalence of Genito-Pelvic Pain/Penetration Disorder (GPPPD), a female sexual dysfunction newly introduced in the DSM-5. This study aimed to estimate the 12-month prevalence of clinical and subclinical GPPPD among first-year university students in Germany, examining comorbidities and associated factors.

Method: As part of the WHO World Mental Health International College Student initiative, the 12-month prevalence of GPPPD was assessed in female university students in Germany during 2016/2017 ($N = 521$). Using propensity score weighting, 12-month prevalence rates were determined for clinical and subclinical GPPPD together with associated factors and mental health comorbidities using binary logistic regression.

Results: In the weighted female university student sample, 26.4 % reported experiencing at least one core symptom of GPPPD in the past 12 months. 12-month prevalence of clinical GPPPD was 2.1 % ($n = 11/521$; 95 % CI: 1.1 %-3.8 %), while subclinical GPPPD was 12.9 % ($n = 67/521$; 95 % CI: 10 %-16 %). Among women with clinical GPPPD, 25.8 % ($n = 3/11$) reported a comorbid lifetime mental disorder, compared to 64.6 % ($n = 43/67$) with subclinical GPPPD and 54.7 % ($n = 243/444$) without GPPPD. There were no significant differences in the odds of comorbid mental disorders between women with and without GPPPD symptoms. Subclinical and clinical GPPPD, compared to no GPPPD, were associated with being in a relationship (OR = 2.45, 95 % CI: 1.25–4.82, $p = 0.009$), sexual activity in the past 12 months (OR = 5.05, 95 % CI: 1.52–16.8, $p = 0.008$), severe distress in love life (OR=3.20, 95 % CI 1.44–7.11), and overall good compared to very good or very poor mental health (OR = 4.50, 95 % CI: 1.07–19.00, $p = 0.041$).

Conclusion: One in eight female students displays subclinical GPPPD, and 2 % meet full DSM-5 criteria. Future multinational longitudinal studies with standardized measures are needed to compare prevalence rates across countries and identify risk and protective factors for targeted prevention and treatment of GPPPD.

Introduction

Genito-Pelvic Pain/Penetration Disorder (GPPPD) is among the three sexual dysfunctions specific to females, introduced in the fifth edition of the American Psychiatric Association's Diagnostic and Statistical Manual of Mental Disorders (DSM-5) (American Psychiatric Association, 2013). This diagnosis amalgamates the previous categorizations of vaginismus and dyspareunia due to their substantial clinical overlap and the absence of reliable discriminatory markers (Carvalho et al., 2012; de Kruiff et al., 2000). GPPPD manifests through four core symptom dimensions (Criterion A), encompassing persistent or recurrent difficulties with vaginal penetration during intercourse, genito-pelvic pain during penetration or attempts thereof, marked fear of pain associated with vaginal penetration, and notable tension or tightening of the pelvic floor during attempted vaginal penetration (American Psychiatric Association, 2013). The DSM-5 introduced two new morbidity criteria -

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duration and symptom severity - in addition to the existing distress criterion to establish clinical significance of sexual dysfunction symptoms. To meet diagnostic criteria, at least one of the four primary GPPPD symptoms must persist for approximately six months or longer (Criterion B) and cause clinically significant distress (Criterion C). Additionally, alternative causes such as substance use, medication effects, organic illnesses, severe relationship distress (e.g., intimate partner violence), or exposure to other severe stressors must be excluded (Criterion D).

According to the DSM-5, the prevalence of GPPPD remains unspecified (American Psychiatric Association, 2013). The lack of precise prevalence data can mainly be attributed to the evolving diagnostic criteria over time, the novelty of the diagnosis and variations in prevalence study design (Hayes, 2008, Hayes et al., 2008a, 2008b, 2008c; McCool et al., 2016). The complexity and poor understanding of GPPPD and its etiological factors often result in oversight or inadequate management, thereby exacerbating patient impairment. Previous prevalence studies have primarily concentrated on assessing former diagnoses, such as vaginismus or dyspareunia, or using pain as a proxy measure for DSM-5 problems, without strictly adhering to the diagnostic criteria outlined in the DSM-5.

A systematic review and meta-analysis of observational studies on the prevalence of female sexual dysfunction among premenopausal women revealed a prevalence rate of 20.8 % for pain disorders (95 % CI = 18.3 %−23.5 %), showing considerable variations ranging from 1 % to 72 % (I^2=99.2 %) (McCool et al., 2016). An analysis of 22 studies across 11 countries in Asia, Europe, and South America, utilizing the Female Sexual Function Index (FSFI), revealed prevalence rates ranging from 6 % to 31.6 % for women experiencing sexual pain Koops and Briken (2018). The considerable variability in prevalence data stems from the diverse methodologies utilized in prevalence studies, as well as from country- and culture-specific factors (Hayes et al., 2008b; McCool et al., 2016). Prevalence data from the representative Study on Health and Sexuality in Germany (GeSiD) based on the International Classification of Diseases showed a 12-month prevalence of tension or pain during sexual intercourse of 10.9 % (95 % CI: 9.5 %−12.4 %), with 4.9 % (95 % CI: 4.1 %−5.8 %) of women experiencing high distress and impairment indicating signs of a sexual pain disorder (Briken et al., 2020). The highest rates were observed among women aged 18–25, with a 12-month prevalence of 16.2 % (12.3 %−21.0 %), of whom 8.2 % experienced severe impairment (Briken et al., 2020). The prevalence of GPPPD symptoms, as per the diagnostic guidelines proposed by Binik (2010), which include pain or fear during intercourse, was found to be similar at 16 % in a population-based sample of married women in Iran aged 18–70 (Alizadeh et al., 2019; Binik, 2010). Taking sexual distress into account led to a decrease in prevalence to 10.5 % in the third National Survey of Sexual Attitudes and Lifestyles (Natsal-3) from the United Kingdom, involving 8869 women aged 16–75 years, 7.5 % (95 % CI: 6.7 %−8.3 %) reported painful sex. Among them, 1.9 % experienced frequent symptoms lasting at least six months and causing distress (Mitchell et al., 2017). Comprehensive prevalence data covering all core symptom dimensions of GPPPD is currently scarce.

While GPPPD can emerge early in the sexual trajectories of adult women, little is known about the disorder in younger populations, as is often the case with sexual dysfunctions in general (O'Sullivan et al., 2016). The highest proportion of individuals reporting painful sex was again observed among young women aged 25–34 years, with 2.0 % (95 % CI: 1.4 %−2.8 %), and those in later mid-life aged 55–64 years, with 3.9 % (95 % CI: 2.4 %−6.2 %), although no significant trend with age was identified (Mitchell et al., 2017). Another study involving adolescents found that 20 % of sexually active adolescent girls (N = 251) reported experiencing regular pain during intercourse for at least six months (Landry & Bergeron, 2009). In the 2010 French National Sexual and Reproductive Health Survey, involving a random sample of 842 females aged 15–24, 21 % reported experiencing pain during sexual intercourse often or sometimes, and 16 % stated that this pain hinders their sexuality (Moreau et al., 2016). Given this prevalence, studying GPPPD in young women is crucial, as early intervention can prevent chronic pain, mental health issues, and relational difficulties. Young women are often in formative stages of their sexual and emotional lives, making timely diagnosis and support essential for promoting long-term sexual health and well-being (O'Sullivan & Majerovich, 2008). Understanding the specific impacts on young women can also guide age-appropriate interventions and improve overall quality of life.

In addition to prevalence rates, there remains a significant gap in understanding the associated characteristics of GPPPD, which could enhance our comprehension and ultimately aid in the prevention and treatment of the disorder. GPPPD and associated conditions such as Vulvodynia, which involves chronic genital pain localized to the vulva that can occur with or without sexual contact (Bornstein et al., 2016; Pukall et al., 2016), often co-occur with sexual difficulties such as low desire, arousal issues, and relationship strain Alizadeh et al. (2019), McCool-Myers et al. (2018). Psychosocial factors such as negative body image, catastrophizing, pain hypervigilance, depression, anxiety, and low self-esteem are correlated with it (Alizadeh et al., 2019; McCool-Myers et al., 2018). In a sample of 144 women diagnosed with vaginismus, 79.86 % had at least one comorbid anxiety disorder and/or depression (Yildirim et al., 2019). A study on Spanish women found that those with a history of substance abuse scored higher on sexual pain disorder measures than non-users, with abstinence showing no significant effect on sexual response (del Río et al., 2017). Sociodemographic characteristics associated with GPPPD symptoms include religiousness, low socioeconomic status, and financial hardship (Alizadeh et al., 2019; McCool-Myers et al., 2018). Poor physical and mental health, gynecological diseases, and sexual life factors as well as stress, critical life events, and low stress coping abilities have been linked to general sexual problems (Bodenmann et al., 2006; McCool-Myers et al., 2018). Findings also suggest that GPPPD symptoms such as genito-pelvic pain in adolescence is not transient but may lead to a more persistent form of GPPPD commonly observed in adulthood (Landry & Bergeron, 2009). Therefore, it is crucial to investigate early symptoms of GPPPD and their characteristics as well to identify potential risk factors.

Given the limited data on comorbidities and associated factors of GPPPD, especially in younger female populations in Germany, this study aimed to estimate the 12-month prevalence of both clinical and subclinical GPPPD according to DSM-5 criteria among first-year university students in Germany.

Methods

Study design

This study was conducted as a convenience sample and was part of the WHO World Mental Health International College Student initiative (WMH-ICS) in Germany (Kählke et al., 2019). The WMH-ICS aims to gather data on the prevalence, incidence, and correlates of mental, substance, and behavioral problems among university students globally, as well as to develop and assess internet-based interventions for their

prevention and treatment (Cuijpers et al., 2019). As part of the WMH-ICS study, a descriptive study of populations through cross-sectional research (Montero & León, 2007) was conducted in German among university students at Friedrich-Alexander-University Erlangen-Nürnberg (FAU) in Germany during the 2016/2017 academic year. The survey was conducted in accordance with the Declaration of Helsinki and received approval from the ethics committee and the university's data protection officer (no. 193_16B, 18.07.2016).

Participants

To participate in the survey, university students had to meet the following criteria: (1) be enrolled in their first semester of an undergraduate program at FAU, (2) be at least 18 years old, (3) have internet access to complete the online survey, and (4) provide informed consent. Students with previous study experience in another degree program were also eligible to participate if they were enrolled in a new program.

All enrolled first-year students at FAU received an invitation to a web-based self-report questionnaire hosted on the Qualtrics survey platform via their university email address. Personalized links were distributed by the university's study administration. To increase participation, six reminder emails and conditional incentives (vouchers) were used.

In this study, filter logic was implemented to exclusively assess GPPPD among female participants as identified by the official information from university's administration. Initially, a total of 8368 students were invited to participate in the survey, with 10.8 % of students responding ($n = 886$, female $n = 521$).

Measures

The web-based WMH-ICS survey consisted of validated questionnaires based on self-report which assessed a broad spectrum of mental disorders and their correlates. A more detailed description of the survey instrument can be found in Auerbach et al. (2018). The German survey additionally included the items on GPPPD according to DSM-5 criteria and several risk and influential factors of mental disorders.

GPPPD

Eight items were used to assess the four DSM-5 criteria for GPPPD (Criterion A: 4 items, Criterion B: 1 item, Criterion C: 1 item, Criterion D: 2 items; refer to Table 1 in the appendix). These items closely mirrored the defined criteria in the DSM-5, ensuring content validity with minor linguistic adjustments for clarity, e.g., using "pain in the genital or pelvic area" instead of "marked vulvovaginal or pelvic pain" (Appendix, Table 1). The first questionnaire item established a temporal frame, referencing symptoms over the last 12 months to determine the 12-month prevalence rate. The four core symptom dimensions of GPPPD were each assessed by corresponding items. At least one symptom criterion needed to be positively endorsed for further exploration of DSM-5 criteria B, C, and D. Criterion B was evaluated by a single item measuring duration, requiring a minimum of six months. Criterion C was similarly assessed by one item, with a score of ≥ 4 indicating clinically relevant distress (range: 1–5, where 1=not at all, 2=slightly, 3=somewhat, 4=strongly, 5=very strongly). Criterion D was evaluated by two items, excluding certain reasons as exclusive explanations for the symptomatology: medical and mental causes, severe relationship distress, other stressors, and effects of substance use or medication. A GPPPD diagnosis was assigned when all DSM-5 criteria were met. Additionally, subclinical GPPPD was assigned when at least one GPPPD core symptom was present, not attributable to physical or mental health problems, substances, medication, partnership distress, or other stressful situation, but without lasting $\geq$ 6 months and causing significant distress.

Sociodemographic measures

The following sociodemographic characteristics were assessed with the following standard items: age (mean, age groups: 18–19, 20–21, 22+), nationality (German versus others), student status (first semester versus higher semester), type of degree (Bachelor of Arts, state examination, Bachelor of Science, Bachelor of Education), relationship status (single versus in a relationship), and current financial situation (poor, enough to get by; enough, not many extras; comfortable; well-to-do). The McArthur scale was used to assess subjective social status, with participants asked to indicate their social status by imagining a ladder where the top represents those with the highest reputation/social status and the bottom represents those with the lowest (score range: 1 [unimportant] to 10 [most important]) (Euteneuer et al., 2015; Giatti et al., 2012; Hoebel et al., 2015). Participants also noted whether their parents had a college education (if at least one did) or no college education (if both maternal and paternal education were primary or secondary) (Kählke et al., 2024). Additionally, participants were asked to specify their level of religiousness (not at all, not very, somewhat, very, unknown) based on a standard demographic item from the WMH Survey Initiative Version of the World Health Organization (WHO) Composite International Diagnostic Interview (CIDI) (Kessler & Üstün, 2004). Participants were also asked about their sexual activity in the last 5 years and whether they experienced any incidents of sexual assault or rape within the past 12 months (Gates & Badgett, 2009; Vogt et al., 2008).

Predictors for GPPPD

Overall mental and physical health: Participants rated their overall physical and mental health using two single items adapted from the WMH—CIDI, with responses scored on a 5-point Likert scale from 1 [excellent] to 5 [poor] (Kessler & Üstün, 2004).

Distress in love life: Distress in love life was measured using a single item from a scale adapted from the WMH—CIDI (score range: 1 [none] – 5 [very severe]) (Kessler & Üstün, 2004).

Distress in life: The level of distress experienced in life overall ("How much stress do you currently have in your overall life?") was measured by a scale from the WMH—CIDI (score range: 1 [none] to 5 [very severe]) (Kessler & Üstün, 2004).

Self-esteem: The single-item Self-Esteem Scale (SISE) asks participants to rate the statement "I have high self-esteem" on a 5-point Likert scale, ranging from 1 [not at all true of me] to 5 [very true of me] (Brailovskaia & Margraf, 2020; Robins et al., 2001).

Partnership satisfaction: Overall satisfaction with the partnership was assessed in students in a relationship using a single item from the Partnership Questionnaire Short Form (PFB-K, scale range: 0 [very unhappy] – 5 [very happy]) (Kliem et al., 2012, 2015; Niehuis et al., 2024).

Stress coping skills: This was measured by four items adapted from the Hurricane Katrina Community Advisory Group Survey (Kessler et al., 2006) ["Keep calm and think of the right thing to say in a crisis, manage stress, get along with people when you have to, keep your sense of humor in tense situations"] and one item ["Try new approaches if old ones don't work"] from Ursano (2012). Responses were rated on a 7-point Likert scale from 1 [agree strongly] to 7 [disagree strongly].

Comorbidities of GPPPD

Mental health comorbidities based on self-assessed DSM-IV diagnosis: The 12-month prevalence and lifetime prevalence of common DSM-IV disorders were assessed including mood (major depressive episode, mania/hypomania), anxiety (generalized anxiety disorder, panic disorder) and substance disorders (drug abuse or dependence, e.g., cannabis, cocaine, or any other street or prescription drug). The comorbidities were assessed using the validated self-report Composite International Diagnostic Interview Screening (CIDI-SC) scales, which are in good concordance with blinded clinical diagnoses based on the Structured Clinical Interview for DSM-IV (SCID-IV), with area under the curve (AUC) values ranging from 0.70 to 0.78 (First et al., 1994).

Alcohol abuse or dependence in the past 12 months was assessed using the Alcohol Use Disorders Identification Test (AUDIT), with alcohol use disorder defined as a total score of ≥ 8 and a dependence score of ≥ 4 (Babor et al., 2001). This version of AUDIT aligns with clinical diagnoses, with AUC values ranging from 0.78 to 0.91 (Reinert & Allen, 2002).

Any 12-month or lifetime mental disorder: The presence of any mental disorder in the past 12 months or lifetime was assessed with a binary measure (yes/no) for any of the six mental disorders.

Suicidal thoughts and behaviors: In a modified version, the 12-month suicidal thoughts and behaviors were assessed by the Columbia Suicidal Severity Rating Scale (CSSRS) including questions about death wish ("Over the past 12 months, did you wish you were dead or would go to sleep and never wake up?"), suicide plans ("Over the past 12 months, did you think about how you might kill yourself or work out a plan of how to kill yourself?"), and suicide attempts ("Over the past 12 months, have you made a suicide attempt") (Posner et al., 2011).

Statistical analyses

A total of 521 female students fully completed the survey (i.e., no missing variables at the item level) and were included in the final analyses. The student population characteristics, provided by the administration of Friedrich-Alexander-University Erlangen-Nürnberg, were used to calculate propensity score weights to adjust for non-response. This adjustment accounted for differences between the entire population and the sample obtained. Predictors such as sociodemographic variables (age, sex, nationality) and study-related variables (study program, type of undergraduate degree) were chosen based on their significance in predicting non-response. A dependent variable indicating survey response (1 = yes, 0 = no) was created, and a binary logistic regression model was employed to estimate the propensity score for each participant. The results of the model were converted into predicted values, which served as weights (Groves & Couper, 1998; Hazelwood et al., 2007; Matsuo et al., 2010).

Missing data was minimal, ranging from 0 % to 1.15 % (0 to 6 instances). A single imputation method was used, replacing missing values for each variable with the mode, median, or mean values of that variable. Imputation of missing values and all analyses were conducted using R statistical software (version 4.3.1) with the following packages: tidyverse, mlogit, survey, and gtsummary. Prevalence and descriptive data of GPPPD criteria, mental health comorbidities, sociodemographic characteristics, and associated factors were calculated for the total sample, as well as for subsamples of students with subclinical and clinical GPPPD, and those without either condition.

First, the 12-month weighted prevalence estimates (rates), including 95 % confidence intervals, were calculated for clinical and subclinical GPPPD. Both 12-month and lifetime comorbidities (major depressive episode, mania/hypomania, generalized anxiety disorder, panic disorder, alcohol use disorder, drug abuse/dependency, as well as suicidal plans and attempts) were identified, along with the 12-month and lifetime prevalence of any of those disorders.

Second, weighted sociodemographic characteristics (age, nationality, student status, type of degree, subjective social status, parental education, current financial situation, religiousness, relationship status, sexual assault or rape, sexual activity) and associated factors (overall mental health, overall physical health, distress in love life, distress in life, self-esteem, partnership satisfaction, coping with stress) were calculated. Unweighted sociodemographic characteristics, associated factors, and comorbidities are provided in Tables 2 and 3 in the appendix. Statistical comparisons between women with and without GPPPD symptoms were conducted using Chi-squared tests for categorical variables and independent samples Mann-Whitney *U* test (or continuous variables, with the Holm correction applied to control for family-wise error rate and adjust for multiple testing (Holm, 1979).

Third, the presence of clinical and subclinical GPPPD (coded as 1) versus absence (coded as 0) was predicted based on sociodemographic characteristics (age group, relationship status, current financial situation, subjective social status, religiousness) and associated factors (distress in love life, distress in life, overall mental or physical health, coping with stress, sexually active, sexually assaulted, or raped). The best binary logistic regression model was identified using the "dredge" function in the MuMin package in R, consisting of the average of the best models with $\Delta < 2$ as measured by Akaike's Information Criterion (Bartoń, 2013). The categories "very" or "somewhat" for the variable religiousness were combined due to very few occurrences ($n = 2$) in the total sample and no instances in the subgroup of students in relationship).

Results

Characteristics of the survey sample

A total of 521 women from the entire student sample responded to the GPPPD items. The average age was 21.2 years (SD=5.5), with the majority (49 %) being 20 to 21 years old. Most participants (92 %) were of German nationality. Around two-thirds were first-semester students ($n = 332$, 64 %), and 40 % were enrolled in the Bachelor of Arts program. Approximately half of the women were in a relationship ($n = 285$, 55 %). Most students with clinical and subclinical GPPPD were in a relationship (q-value = 0.003) compared to students without symptoms of GPPPD symptoms. Regarding financial status, 47 % ($n = 245$) considered themselves comfortable, while 6.2 % ($n = 32$) described their situation as poor but sufficient to get by. Additionally, 59 % of the women reported that their parents had no college education ($n = 308$). In terms of religious beliefs, 37 % were not religious at all ($n = 190$), and 30 % were somewhat religious ($n = 154$). Regarding sexual activity, 75 % ($n = 393$) had been sexually active in the past five years. However, more students with clinical or subclinical GPPPD were sexually active compared to those without GPPPD (q-value < 0.001). Of the total sample, 3.3 % ($n = 17$) reported having been sexually assaulted or raped in the past 12 months.

Table 1
Weighted sociodemographic characteristics and associated factors.

Characteristic	Total sample ($N = 521$)	No GPPPD ($n = 444$)	Subclinical GPPPD, ($n = 67$)	Clinical GPPPD ($n = 11$)	*Statistic*	*p*-value[a]	*q*-value[b]
Age (Mean, SD)	21.2 (5.5)	21.3 (5.8)	20.4 (2.2)	21.1 (3.9)	0.675	0.10[c]	>0.99
Age group (n, %)					1.97	0.14[d]	>0.99
18–19	124 (24)	112 (25)	12 (17)	0 (0)			
20–21	255 (49)	210 (47)	35 (53)	9 (88)			
22+	142 (27)	121 (27)	20 (30)	1 (12)			
Nationality (n, %)					0.214	0.64[d]	>0.99
German	482 (92)	409 (92)	62 (93)	11 (100)			
Other	39 (7.6)	35 (7.8)	5 (7.0)	0 (0)			
Student status (n, %)					0.710	0.40[d]	>0.99
First semester	332 (64)	287 (65)	39 (59)	6 (60)			
Higher semester	189 (36)	157 (35)	27 (41)	4 (40)			
Type of degree (n, %)					0.510	0.67[d]	>0.99
Bachelor of Arts	211 (40)	179 (40)	28 (42)	4 (37)			
State examination	86 (17)	76 (17)	8 (12)	3 (24)			
Bachelor of Science	134 (26)	111 (25)	22 (34)	1 (11)			
Bachelor of Education	90 (17)	78 (18)	8 (12)	3 (28)			
Subjective Social Status (Mean, SD)	6.35 (1.87)	6.38 (1.87)	6.13 (1.99)	6.41 (1.26)	−0.859	0.40[c]	>0.99
Missing	1	1	0	0			
Parental Education (n, %)					0.37	0.54[d]	>0.99
No college education	308 (59)	259 (58)	42 (63)	6 (57)			
College education	213 (41)	184 (42)	25 (37)	5 (43)			
Current financial situation (n, %)					1.47	0.22[d]	>0.99
Poor, enough to get by	32 (6.2)	28 (6.3)	3 (5.1)	1 (9.4)			
Enough, not many extras	173 (33)	140 (32)	30 (45)	3 (30)			
Comfortable	245 (47)	211 (48)	30 (44)	4 (35)			
Well to do	71 (14)	64 (15)	3 (5.1)	3 (25)			
Religiousness (n, %)					2.80	0.058[d]	0.94
Not at all	190 (37)	153 (35)	33 (51)	4 (35)			
Not very	120 (23)	102 (23)	13 (20)	4 (39)			
Somewhat	154 (30)	134 (30)	17 (26)	3 (27)			
Very	54 (11)	52 (12)	2 (3.6)	0 (0)			
Missing	3	2	1	0			
Relationship status (n, %)					14.4	<0.001[d]	0.003
Single	236 (45)	217 (49)	18 (27)	1 (14)			
In a relationship	285 (55)	227 (51)	49 (73)	9 (86)			
Sexual assault or rape, past 12 months, (n, %)	17 (3.3)	12 (2.8)	3 (4.1)	2 (16)	1.26	0.26[d]	>0.99
Sexual activity, past 5 years (n, %)	393 (75)	320 (72)	63 (94)	11 (100)	16.8	<0.001[d]	<0.001
Overall mental health (n, %)					0.98	0.44[d]	>0.99
Poor	36 (7.0)	32 (7.1)	4 (5.4)	1 (9.4)			
Fair	123 (24)	106 (24)	15 (22)	2 (16)			
Good	191 (37)	155 (35)	31 (47)	5 (43)			
Very good	124 (24)	110 (25)	12 (18)	2 (15)			
Excellent	47 (8.9)	40 (9.1)	4 (6.7)	2 (16)			
Overall physical health (n, %)					0.778	0.54[d]	>0.99
Poor	17 (3.2)	14 (3.1)	2 (3.7)	1 (6.4)			
Fair	84 (16)	69 (16)	11 (16)	4 (42)			
Good	192 (37)	161 (36)	27 (41)	3 (32)			
Very good	176 (34)	152 (34)	22 (33)	2 (20)			
Excellent	52 (10.0)	48 (11)	4 (5.9)	0 (0)			
Distress in love life (n, %)					3.02	0.012[d]	0.20
None	218 (42)	187 (42)	29 (43)	3 (24)			
Mild	115 (22)	106 (24)	7 (11)	1 (12)			
Moderate	99 (19)	82 (18)	15 (23)	2 (21)			
Severe	66 (13)	48 (11)	15 (22)	3 (26)			
Very severe	23 (4.4)	20 (4.6)	1 (1.0)	2 (17)			
Missing	1	1	0	0			
Distress in life (n, %)					0.95	0.47[d]	>0.99
None	129 (25)	115 (26)	14 (21)	0 (0)			
Mild	160 (31)	138 (31)	17 (25)	6 (54)			
Moderate	125 (24)	103 (23)	18 (27)	3 (30)			
Severe	85 (16)	71 (16)	14 (20)	1 (6.4)			
Very severe	21 (4.0)	16 (3.5)	4 (6.3)	1 (9.4)			
Missing	1	1	0	0			
Self-esteem (n, %)					0.148	0.17[d]	>0.99
Not very true of me	21 (4.1)	14 (3.2)	6 (9.2)	1 (6.4)			
Do not agree	60 (11)	54 (12)	5 (6.9)	1 (9.4)			
Neither nor	96 (19)	84 (19)	9 (14)	3 (29)			
Agree	275 (53)	235 (53)	36 (55)	4 (39)			
Very true of me	66 (13)	55 (12)	10 (15)	2 (16)			
Missing	3	2	1	0			
Partnership satisfaction[e] *(n, %)*					0.130	0.82[d]	>0.99
Very unhappy	16 (5.7)	14 (6.2)	1 (2.9)	1 (7.7)			
Unhappy	2 (0.8)	2 (0.7)	1 (1.6)	0 (0)			

(*continued on next page*)

Table 1 (*continued*)

Characteristic	Total sample ($N = 521$)	No GPPPD ($n = 444$)	Subclinical GPPPD, ($n = 67$)	Clinical GPPPD ($n = 11$)	*Statistic*	*p*-value[a]	*q*-value[b]
Somewhat unhappy	10 (3.4)	8 (3.5)	1 (1.3)	1 (14)			
Somewhat happy	37 (13)	30 (13)	7 (14)	0 (0)			
Happy	96 (34)	73 (32)	19 (40)	4 (46)			
Very happy	123 (43)	101 (44)	20 (40)	3 (33)			
Coping with stress (Mean, SD)	13.0 (10.0 – 16.0)	13.0 (10.0 – 16.0)	14.9 (12.0 – 17.0)	11.5 (7.6 – 18.0)	1.86	0.085[c]	0.94
Missing	8	5	3	0			

Note.
[a] Students without symptoms of GPPPD were compared to students showing subclinical and clinical GPPPD (p-values based on Chi-squared test (categorical data) or Mann-Whitney-*U* test (continuous data)).
[b] False discovery rate correction for multiple testing was applied (Holm correction).
[c] Mann-Withney-*U* test
[d] Chi-squared test with Rao & Scott's second-order correction.
[e] Only persons that were in a relationship, were asked to report on partnership satisfaction.
The variables in the table are weighted, thus percentages may not total 100 % due to rounding;
SD = Standard deviation.

Prevalence of clinical and subclinical GPPPD

Among the female student sample, 26,4 % ($n = 138/521$; 95 % CI: 22.61 %−30.63 %) reported at least one core symptom of GPPPD in the last 12 month (see Table 2). The most reported symptom was genito-pelvic pain ($n = 88/521$, 16.9 %), followed by fear of pain ($n = 67/521$, 12.8 %), difficulties ($n = 59/521$, 11.4 %), and tension ($n = 50/521$, 9.6 %) related to vaginal penetration. When considering distress associated with at least one core symptom of GPPPD, the prevalence was 6.0 % ($n = 31/521$, 95 % CI = 4.1 %−8.7 %).

Clinical GPPPD was identified in 11 women from the student sample, yielding a 12-month prevalence rate of 2.1 % ($n = 11/521$; 95 % CI: 0,84 %−3,29 %). Among these women, 91.3 % ($n = 10/11$, 95 % CI: 56.9 %−98.8 %) reported genito-pelvic pain, 81.6 ($n = 9/11$, 95 % CI: 46.9 %−95.68 %) difficulties with vaginal penetration, 74.9 % ($n = 8/11$, 95 % CI: 37.4 %−93.7 %) fear of genito-pelvic pain, and 61.1 % ($n = 6/11$, 30.2 %−85.1 %) pelvic floor tension. The majority of women with clinical GPPPD exhibited 4 core symptoms ($n = 5$, 44.7 %) followed by 3 symptoms ($n = 3$, 28.2 %), see Table 3.

Subclinical GPPPD was observed in 12.9 % of the female student sample ($n = 67/521$, 12.9 %), with 66.2 % ($n = 44/67$, 95 % CI: 53.6 %−76.9 %) reporting genito-pelvic pain, 47.7 % ($n = 32/67$, 95 % CI: 35.5 %−60.2 %) fear of genito-pelvic pain, 38.6 % ($n = 26/67$, 95 % CI: 27.2 %−51.3 %) pelvic floor tension, and 36.6 % ($n = 24/67$, 95 % CI: 25.44 %−49.32 %) experiencing vaginal penetration difficulties. Around one-third-of women with subclinical GPPPD exhibited one symptom ($n = 31/67$, 31 %) and 12.7 % reported all four core symptoms ($n = 8/67$).

Table 2
Weighted prevalence rates of subclinical and clinical GPPPD criteria.

Characteristic	Total sample ($N = 521$)		No GPPPD ($n = 444$)		Subclinical GPPPD ($n = 67$)		Clinical GPPPD ($n = 11$)	
	N (%)	95 % CI	N (%)	95 % CI	N (%)	95 % CI	N (%)	95 % CI
Prevalence (based on total sample)	–	–	–	–	67 (12.9)	10, 16	11 (2.1)	1.1, 3.8
A.1 Vaginal penetration difficulties	59 (11.4)	8.8, 14.6	26 (5.9)	4.0, 8.8	24 (36.6)	25.4, 49.3	9 (81.56)	46.9, 95.7
A.2 Genito-pelvic pain	88 (16.9)	13.9, 20.6	35 (7.8)	5.6, 10.8	44 (66.2)	53.6, 76.9	10 (91.31)	56.9, 98.8
A.3 Fear of genito-pelvic pain	67 (12.8)	10.1, 16.2	27 (6.1)	4.1, 8.9	32 (47.7)	35.6, 60.2	8 (74.90)	37.4, 93.7
A.4 Pelvic floor tension	50 (9.6)	7.3, 12.6	18 (4.1)	2.6, 6.4	26 (38.6)	27.2, 51.4	6 (61.08)	30.2, 85.1
B.1 Duration for at least 6 months	60 (11.5)	8.9, 14.8	30 (6.7)	4.6, 9.7	20 (29.3)	19.3, 41.8	11 (100.0)	100.0, 100.0
C.1 Clinically significant distress	31 (6.)	4.1, 8.7	17 (3.7)	2.2, 6.3	4 (6.4)	2.3, 16.7	11 (100.0)	100.0, 100.0
D.1 Not due to effect of physical or mental health problems, substance, or medicine	122 (23.4)	19.8, 27.5	45 (10.1)	7.4, 13.5	67 (100.0)	100.0, 100.0	11 (100.0)	100.0, 100.0
D.2 Not due to partnership problems or other stressful situations	89 (17.1)	13.9, 20.8	12 (2.6)	1.4, 4.8	67 (100.0)	100.0 , 100.0	11 (100.0)	100.0 , 100.0

Note.
The variables in the table are weighted.
CI = Confidence Interval.

Table 3
Core symptom frequencies in subclinical and clinical GPPPD.

Symptoms	Total sample (N = 521)		No GPPPD (n = 444)		Subclinical GPPPD (n = 67)		Clinical GPPPD (n = 11)	
	N (%)	95 % CI	N (%)	95 % CI	N (%)	95 % CI	N (%)	95 % CI
At least one symptom (A1-A4)	138 (26.43)	22.61%, 30.63%	60 (13.60)	10.51, 17.40	67 (100.0)	100.0, 100.0	11 (100.0)	100.0, 100.0
At least one symptom (A1-A4) with clinically significant distress	31 (6.02)	4.150%, 8.663%	17 (3.72)	2.186, 6.260	4 (6.45)	2.315, 16.72	11 (100.00)	100.00, 100.00
1 GPPPD symptom (A1-A4)	67 (12.82)	9.976 %, 16.32 %	35 (7.78)	5.381, 11.12	31 (46.9)	34.8, 59.4	1 (8.7)	1.2, 43.1
2 GPPPD symptoms (A1-A4)	35 (6.63)	4.819 %, 9.045 %	13 (2.85)	1.673, 4.831	20 (29.8)	20.1, 41.8	2 (18.4)	4.3, 53.1
3 GPPPD symptoms (A1-A4)	16 (3.13)	1.853 %, 5.238 %	6 (1.41)	0.615, 3.203	7 (10.6)	5.0, 21.1	3 (28.2)	7.6, 65.2
4 GPPPD symptoms (A1-A4)	20 (3.86)	2.466 %, 5.986 %	7 (1.55)	0.764, 3.127	8 (12.7)	6.0, 24.9	5 (44.7)	19., 73.5

Note.
CI = Confidence Interval, N = sample size, n = sample size of subgroup.

Sociodemographic characteristics in clinical and subclinical GPPPD

Women with clinical GPPPD had an average age of 21.1 years (SD=3.9), with 88 % (n = 9/11) being between 20 and 21 years old (see Table 1). All participants were German. Among them, 60 % (n = 6/11) were in their first semester, and 37 % (n = 4/11) were enrolled in the Bachelor of Arts program. Additionally, 86 % (n = 9/11) were in a relationship. Regarding their backgrounds, 57 % (n = 6/11) had parents without a college education. Financially, 35 % (n = 4/11) described their situation as comfortable, while 30 % (n = 3/11) indicated it was sufficient but without many extras. Religiosity varied, with 35 % (n = 4/11) identifying as not at all religious and 39 % (n = 4/11) as not very religious. All participants reported being sexually active in the past five months, and 16 % (n = 2/11) reported having been sexually assaulted or raped within the past 12 months.

Women with subclinical GPPPD had an average age of 20.4 years (SD=2.2), with 53 % (n = 25/67) aged between 20 and 21. The majority were German (93 %, n = 62/67). Of these women, 59 % (n = 39/67) were in their first semester, and 42 % (n = 28/67) were pursuing a Bachelor of Arts degree. Additionally, 73 % (n = 49/67) were in a relationship. Regarding their backgrounds, 63 % (n = 42/67) had parents without a college education. Financially, 44 % (n = 30/67) considered their situation comfortable, while 45 % (n = 30/67) found it sufficient but without many extras. Religiosity varied, with 51 % (n = 33/67) identifying as not at all religious and 26 % (n = 17/67) as somewhat religious. In terms of sexual activity, 94 % (n = 94/67) had been sexually active in the past five years, and 4.1 % (n = 3/67) reported experiencing sexual assault or rape within the past year. There were no discernible differences in sociodemographic and associated factors between women with clinical and subclinical GPPPD. A significant difference was observed between students with and without symptoms of GPPPD in terms of sexual activity (q > 0.001) and relationship status (q = 0.003), with women experiencing GPPPD symptoms being more likely to be in a relationship and sexually active.

Comorbidities

Clinical GPPPD

Among women with clinical GPPPD, 25.8 % (n = 3/11) reported experiencing any mental disorder within both the past 12 months and their lifetime (see Table 4). Specifically, 25.8 % (n = 3/11) reported major depressive episodes within these periods. None of the women met the criteria for mania/hypomania either in their lifetime or the past 12 months. Of the total sample, 16.3 % (n = 2/11) reported generalized anxiety disorder in their lifetime, and 8.69 % (n = 1/11) within the past 12 months. No participants reported having panic disorder. Lifetime and 12-month drug abuse/dependency was reported by 9.4 % (n = 1/11) each, while no participants reported alcohol use disorder in the past 12 months. Suicidal plans, both lifetime and within the past 12 months, were reported by 9.4 % (n = 1/11) of women with GPPPD, but no suicide attempts were reported.

Subclinical GPPPD

Among women with subclinical GPPPD, 57.2 % (n = 38/67) reported experiencing any mental disorder within the past 12 months, and 64.6 % (n = 43/67) reported a lifetime prevalence. Specifically, 48.11 % (n = 32/67) and 45.2 % (n = 30/67) reported a major depressive episode in their lifetime, or in the past 12 months. Mania/hypomania was reported by 7.6 % (n = 5/67) both in their lifetime and within the past 12 months. Of the total sample, 34.2 % (n = 23/67) reported a generalized anxiety disorder in their lifetime, and 22.9 % (n = 15/67) within the past 12 months. Additionally, 10.96 % (n = 7/67) of participants reported having a panic disorder both in their lifetime and within the past 12 months. Lifetime drug abuse/dependency was reported by 7.4 % (n = 5/67) of participants, with 3.8 % (n = 3/67) reporting it within the past 12 months. Furthermore, 5.4 % (n = 4/67) reported alcohol use disorder within the past 12 months. Suicidal plans were reported by 21.5 % (n = 14/67) of women with subclinical GPPPD in their lifetime and by 11.01 % (n = 7/67) within the past 12 months. Suicide attempts were reported by 10.0 % (n = 7/67) in their lifetime and by 2.2 % (n = 1/67) within the

Table 4
Weighted comorbidities of subclinical and clinical GPPPD.

	Total sample (N = 521)		No GPPPD (n = 444)		Subclinical GPPPD (n = 67)		Clinical GPPPD (n = 11)					
	N (%)	95 % CI	N (%)	95 % CI	N (%)	95 % CI	N (%)	95 % CI	OR[a]	95 % OR	p-value	q-value[b]
Mood disorders												
Major Depressive Episode, lifetime	213 (40.8)	36, 45	178 (40.1)	35, 45	32 (48.1)	36, 61	3 (25.8)	8.2, 58	1.03	0.96, 1.10	0.4	>0.9
Major Depressive Episode, 12 months	186 (35.7)	31, 40	153 (34.6)	30, 39	30 (45.2)	33, 58	3 (25.8)	8.2, 58	1.04	0.98, 1.12	0.2	>0.9
Mania/hypomania, lifetime	26 (5.0)	3.4, 7.5	21 (4.8)	3.1, 7.3	5 (7.6)	2.8, 19	0 (0.0)	0.0, 0.0	1.05	0.88, 1.25	0.6	>0.9
Mania/hypomania, 12 months	24 (4.5)	2.9, 6.9	19 (4.2)	2.6, 6.6	5 (7.6)	2.8, 19	0 (0.0)	0.0, 0.0	1.07	0.88, 1.30	0.5	>0.9
Anxiety disorders												
Generalized Anxiety Disorder, lifetime	156 (29.9)	26, 34	131 (29.6)	25, 34	23 (34.2)	23, 47	2 (16.3)	3.9, 48	1.01	0.94, 1.09	0.7	>0.9
Generalized Anxiety Disorder, 12 months	113 (21.6)	18, 26	97 (21.8)	18, 26	15 (22.9)	14, 36	1 (8.7)	1.2, 43	0.99	0.92, 1.08	0.9	>0.9
Panic disorder, lifetime	48 (9.2)	6.8, 12	41 (9.2)	6.6, 13	7 (10.9)	4.9, 23	0 (0.0)	0.0, 0.0	1.00	0.89, 1.13	>0.9	>0.9
Panic disorder, 12 months	41 (7.8)	5.7, 11	33 (7.5)	5.3, 11	7 (10.9)	4.9, 23	0 (0.0)	0.0, 0.0	1.03	0.90, 1.19	0.6	>0.9
Substance use disorders												
Alcohol use disorder, 12 months	16 (3.1)	1.8, 5.3	12 (2.8)	1.5, 5.3	4 (5.4)	1.7, 16	0 (0.0)	0.0, 0.0	1.08	0.86, 1.36	0.5	>0.9
Drug abuse/dependency, lifetime	22 (4.2)	2.7, 6.5	16 (3.6)	2.1, 6.1	5 (7.4)	3.3, 16	1 (9.4)	1.3, 45	1.14	0.94, 1.37	0.2	>0.9
Drug abuse/dependency, 12 months	10 (2.0)	1.1, 3.8	7 (1.6)	0.68, 3.5	3 (3.8)	1.2, 11	1 (9.4)	1.3, 45	1.21	0.90, 1.62	0.2	>0.9
Suicidality												
Suicidal plans, lifetime	129 (24.7)	21, 29	113 (25.5)	21, 30	14 (21.5)	13, 34	1 (9.4)	1.3, 45	0.96	0.90, 1.03	0.3	>0.9
Suicide plans, 12 months	46 (8.9)	6.6, 12	38 (8.5)	6.2, 12	7 (11.0)	4.9, 23	1 (9.4)	1.3, 45	1.04	0.91, 1.18	0.6	>0.9
Suicide attempt, lifetime	19 (3.6)	2.2, 6.0	12 (2.7)	1.5, 5.1	7 (9.9)	4.2, 22	0 (0.0)	0.0, 0.0	1.24	0.96, 1.59	0.10	>0.9
Suicide attempt, 12 months	4 (0.7)	0.22, 2.2	2 (0.5)	0.12, 2.0	1 (2.2)	0.31, 14	0 (0.0)	0.0, 0.0	1.30	0.72, 2.32	0.4	>0.9
Other												
Any disorder, 12 months	238 (45.7)	41, 50	197 (44.4)	40, 49	38 (57.2)	45, 69	3 (25.8)	8.2, 58	1.04	0.98, 1.11	0.2	>0.9
Any disorder, lifetime	289 (55.4)	51, 60	243 (54.7)	50, 60	43 (64.6)	52, 75	3 (25.8)	8.2, 58	1.02	0.96, 1.09	0.5	>0.9

Note.
12-month and life-time prevalence of mental disorders among the total sample, students without any GPPD symptoms and students with symptoms of GPPPD. Data is weighted, so presented Ns and percentages are rounded.

[a] Students with no symptoms of GPPPD were compared to students showing subclinical and clinical GPPPD (p-values based on Chi-squared test (categorical data).

[b] False discovery rate correction for multiple testing was applied (Holm correction).

CI = Confidence Interval, OR = Odds ratio, N = sample size, n = sample size of subgroup.

past 12 months. There were no differences in the odds of experiencing a comorbidity between women with clinical or subclinical GPPPD and those without GPPPD ($q > 0.9$).

Predictors of combined clinical and subclinical GPPPD

Applying the average of the best binary logistic models with $\Delta < 2$, as measured by Akaike's Information Criterion (AIC), resulted in the following final regression model. This model includes a total of 9 variables: age group, subjective social status, relationship status, sexual activity in the past five years, sexual assault in the past 12 months, mental health, any disorder in the past 12 months, distress in love life, and coping with stress (Log-Likelihood Value: −203.92 and AIC of 428.27). Women in a relationship (OR = 2.45, 95 % CI: 1.25–4.82, p = 0.009), those who have been sexually active in the past 12 months (OR = 5.05, 95 % CI: 1.52–16.8, p = 0.008), and students reporting severe distress in their love life (OR = 2.95, 95 % CI: 1.28–6.82, p = 0.012) had higher odds of experiencing subclinical or clinical GPPPD. Additionally, women reporting overall good mental health, as opposed to poor, fair, very good, or excellent mental health, showed higher odds of clinical or subclinical GPPPD (OR = 4.50, 95 % CI: 1.07–19.00, p = 0.041) in comparison to women without GPPPD (see Table 5).

Table 5
Weighted results of the binary logistic regression model with predicted probability of subclinical and clinical GPPPD versus no GPPPD.

Characteristic	OR[1]	95 % CI[1]	p-value
Age group			
18–19	—	—	
20–21	2.01	0.92, 4.40	0.081
22+	0.95	0.40, 2.30	>0.9
Subjective Social Status	0.90	0.77, 1.05	0.2
Relationship status			
Single	—	—	
In a relationship	2.45	1.25, 4.82	0.009
Sexual activity, past 5 years			
No	—	—	
Yes	5.05	1.52, 16.8	0.008
Sexual assault or rape, past 12 months			
No	—	—	
Yes	3.18	0.88, 11.5	0.077
Mental Health			
Poor	—	—	
Fair	1.54	0.40, 5.86	0.5
Good	4.50	1.07, 19.0	0.041
Very good	2.58	0.50, 13.4	0.3
Excellent	3.99	0.62, 25.8	0.15
Any disorder, 12M			
No disorder	—	—	
At least one disorder	1.44	0.75, 2.75	0.3
Distress in love life			
None	—	—	
Mild	0.54	0.23, 1.27	0.2
Moderate	1.95	0.89, 4.29	0.10
Severe	2.95	1.28, 6.82	0.012
Very severe	1.08	0.23, 5.02	>0.9
Coping with Stress	1.05	0.98, 1.12	0.14

Note.
OR = Odds Ratio, CI = Confidence Interval
[a]Students with no symptoms of GPPPD were compared to students showing subclinical and clinical GPPPD (p-values based on Chi-squared test (categorical data) or *t*-test (continuous data)).
[b]False discovery rate correction for multiple testing was applied (Holm correction).

Discussion

This study aimed to estimate the 12-month prevalence of clinical and subclinical GPPPD among first-year university students in Germany, based on DSM-5 criteria. In the weighted female university student sample, approximately one in four women reported experiencing at least one core symptom of GPPPD in the past 12 months. These symptoms include persistent or recurrent difficulties with vaginal penetration during intercourse, genito-pelvic pain during penetration or attempts thereof, marked fear of pain associated with vaginal penetration, and notable tension or tightening of the pelvic floor during attempted vaginal penetration. The 12-month prevalence rate for clinical GPPPD, meeting all criteria outlined in DSM-5, was 2.1 % in a weighted sample of university students. Subclinical symptoms were identified in 12.9 % of the women, who reported experiencing at least one core symptom without meeting the exclusion criteria, irrespective of symptom duration and clinical distress. Notably, approximately one in four individuals with clinical GPPPD and over half of those with subclinical GPPPD reported experiencing at least one comorbid mental disorder within the past 12 months or in their lifetime. Women in a relationship, those who were sexually active in the past 12 months, those experiencing severe distress in their love life, and those reporting overall good mental health compared to those reporting very good or poor mental health had significantly higher odds of experiencing clinical or subclinical GPPPD.

The finding that a quarter of female students experienced at least one GPPPD symptom in the past twelve months aligns with the meta-analytic prevalence rate of 21 % for pain disorders in premenopausal women, despite high heterogeneity due to varying assessment specifics (McCool et al., 2016). This result is also consistent with a 20 % prevalence rate of pain during intercourse among sexually active adolescent girls (Landry & Bergeron, 2009) and a 16 % prevalence rate of sexually hindering pain in young females (Moreau et al., 2016). Additionally, this study's findings fall within the upper range of pooled prevalence data for sexual pain in women assessed with the FSFI, which spans from 6 % to 31.6 % (Koops & Briken, 2018). The 12.9 % prevalence of subclinical GPPPD identified in this study aligns with the middle of these rates.

The 12-month prevalence of clinical GPPPD in this female university sample, found to be at 2.1 %, is comparable to the 1.9 % found in the Natsal-3 survey for painful sex, specifically the 2.0 % rate among young women aged 25–34, although it is slightly higher than the 1.7 % rate in the 16–24 age group (Mitchell et al., 2017). However, this study's prevalence is lower than the 12-month prevalence of 4.9 % for tension or pain during sexual intercourse reported in the nationwide German GeSiD study according to ICD-11 (Briken et al., 2020) and the 11 % prevalence among Iranian women (Alizadeh et al., 2019).

In this sample of women with subclinical and clinical GPPPD, comorbidity rates for at least one comorbid mental disorder ranged from 25.76 % to 64.64 %, which are lower than the 79.86 % comorbidity rate found in women with lifelong vaginismus (Yildirim et al., 2019). Moreover, there were no increased odds of experiencing comorbidities in clinical or subclinical GPPPD compared to women without GPPPD. This may be explained by the overall small samples of clinical and subclinical GPPPD in the study, as well as the high rates of 12-month or lifetime mental disorders observed in this university sample.

The identified characteristics predicting subclinical and clinical GPPPD align with previous literature, which recognizes that distress in one's love life is also linked to GPPPD, although it remains unclear whether this distress is a cause or a consequence of the symptoms. Being in a relationship and being sexually active is associated with subclinical or clinical GPPPD, likely because this is the most common context for

penetrative intercourse. Additionally, research indicates that dyadic emotion regulation and the sexual partner's reaction to GPPPD symptoms significantly influence the condition's symptomatology (Rosen & Bergeron, 2019). The finding that overall good mental health, as opposed to very good or poor mental health, is associated with GPPPD is surprising, given that GPPPD often co-occurs with other mental disorders and is linked to severe distress. In this sample, good mental health appears to represent a middle ground in overall well-being, indicating that women are still capable of maintaining relationships and being sexually active. This capability is crucial for diagnosing GPPPD according to DSM-5 criteria, which focus on sexual intercourse and may not adequately consider those avoiding sexual intimacy due to GPPPD symptoms and potentially more pronounced negative mental health. However, it could also indicate that students view their sexual health, particularly pain, more as a physical rather than a mental issue, and distinguish between the two. In this study, subclinical GPPPD was found to coincide with 12-month or lifetime mental disorders in at least 50 % of the sample, which exhibited higher rates compared to women both with and without GPPPD. Interpretations should be made with caution due to the small occurrence rates of GPPPD.

Strengths and limitations

One significant strength of this study is the meticulous application of DSM-5 criteria, ensuring precise diagnostic accuracy. Moreover, by extending invitations to the entire university community rather than employing selective sampling, the study achieved a more comprehensive representation of the student body, enhancing the generalizability of findings. Additionally, the implementation of a robust weighting procedure to encompass the characteristics of the entire potential sample further bolsters the validity of prevalence rates and associated factors. Furthermore, the consideration of multiple variables in the analysis facilitated a comprehensive exploration of the factors influencing GPPPD and its comorbidities within this student population.

When interpreting the results, several limitations should be considered. First, the prevalence data was collected from young female first-year university students at a single university in Germany, with notable self-selection among participants that may limit the generalizability of the findings. Additionally, the study experienced a high dropout rate leading to a relatively small sample size, commonly seen in survey studies, further compromising the reliability of the results. Second, the cross-sectional nature of the data prohibits drawing conclusions about the causal relationships between factors associated with GPPPD. Moreover, the survey did not cover other sexual dysfunctions or aspects of sexual life. Third, although we report on sexual activity over the past five years, it was not used as a filter variable. The GPPPD assessment included all women, regardless of their sexual activity, to avoid excluding those who might abstain due to symptoms. Future research could investigate the reasons for abstaining from sexual activity, including avoidance due to GPPPD symptoms, and incorporate this information into their prevalence data. Fourth, although GPPPD was assessed according to DSM-5 criteria, the evaluation of other mental disorders was based on DSM-IV criteria due to the framework of the WMH-ICS initiative at that time, potentially introducing inconsistencies in diagnosis and interpretation with respect to DSM-5 criteria. Fifth, due to the small number of participants in the GPPPD diagnosis category, we refrained from conducting comparative statistical analyses between clinical and subclinical GPPPD.

Future research

While the prevalence findings of this study align with previous prevalence research, comparability across studies and countries remains challenging. Standardized multinational surveys and longitudinal studies could aid in determining comparable prevalence rates. Future research should prioritize the development of a comprehensive questionnaire to accurately identify GPPPD and identifying risk factors, thereby improving comparability in assessment methods across studies. These surveys could also assess relevant sexuality-specific factors such as relationship dynamics, sexual knowledge, or medical history. Moreover, the limited specific treatment options for GPPPD, coupled with delayed treatment-seeking behavior (Zarski et al., 2021), underscores the need for prevention programs tailored to GPPPD and sexual dysfunctions. Data from adolescent samples further emphasizes the potential for early onset and chronicity of GPPPD (Landry & Bergeron, 2009), highlighting the importance of developing and evaluating prevention programs specifically targeting GPPPD and sexual dysfunctions.

Conclusion

GPPPD symptoms are prevalent yet often overlooked in female health. In this university student sample, one in four women experiences at least one GPPPD criterion, with one in eight exhibiting subclinical GPPPD and 2 % meeting the full DSM-5 diagnostic criteria. Future multinational longitudinal studies, utilizing standardized measures of GPPPD based on recent diagnostic criteria, are warranted to accurately assess incidence and prevalence rates and identify risk and protective factors, thus enabling targeted prevention and treatment for GPPPD.

Ethics approval

Medical ethical committee of the Friedrich-Alexander-University Erlangen-Nürnberg, 18.07.2016, 193_16 B.

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CRediT authorship contribution statement

Anna-Carlotta Zarski: Writing – original draft, Writing – review & editing. **Harald Baumeister:** Funding acquisition, Writing – review & editing. **Fanny Kählke:** Data curation, Formal analysis, Project administration, Writing – review & editing.

Declaration of competing interest

Dr. Zarski receives royalties for a digital health application (DiGA) for sexual dysfunction implemented in routine care in Germany. She reports having received fees for delivering presentations at scientific conferences and for producing expert videos for a digital health application (DiGA).

Dr. Baumeister reports having received consultancy fees and fees for lectures/workshops from chambers of psychotherapists and training institutes for psychotherapists in the e-mental health context.

Dr. Kählke has received fees for lectures/workshops on (student) mental health.

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Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.ijchp.2024.100529.

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