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RESEARCH REPORT

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Problematic pornography use across countries, genders, and sexual orientations: Insights from the International Sex Survey and comparison of different assessment tools

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Abstract

Background and aims: Problematic pornography use (PPU) is a common manifestation of the newly introduced Compulsive Sexual Behavior Disorder diagnosis in the 11th edition of the International Statistical Classification of Diseases and Related Health Problems. Although cultural, gender- and sexual orientation-related differences in sexual behaviors are well documented, there is a relative absence of data on PPU outside Western countries and among women as well as gender- and sexually-diverse individuals. We addressed these gaps by (a) validating the long and short versions of the Problematic Pornography Consumption Scale (PPCS and PPCS-6, respectively) and the Brief Pornography Screen (BPS) and (b) measuring PPU risk across diverse populations.

Methods: Using data from the pre-registered International Sex Survey [*n* = 82 243; mean age (M_{age}) = 32.4 years, standard deviation = 12.5], a study across 42 countries from five continents, we evaluated the psychometric properties (i.e. factor structure, measurement invariance, and reliability) of the PPCS, PPCS-6, and BPS and examined their associations with relevant correlates (e.g. treatment-seeking). We also compared PPU risk among diverse groups (e.g. three genders).

Results: The PPCS, PPCS-6, and BPS demonstrated excellent psychometric properties [for example, comparative fit index = 0.985, Tucker–Lewis Index = 0.981, root mean square error of approximation = 0.060 (90% confidence interval = 0.059–0.060)] in the confirmatory factor analysis, with all PPCS' inter-factor correlations positive and strong (*rs* = 0.72–0.96). A total of 3.2% of participants were at risk of experiencing PPU (PPU+) based on the PPCS, with significant country- and gender-based differences (e.g. men reported the highest levels of PPU). No sexual orientation-based differences were observed. Only 4–10% of individuals in the PPU+ group had ever sought treatment for PPU, while an additional 21–37% wanted to, but did not do so for specific reasons (e.g. unaffordability).

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Conclusions: This study validated three measures to assess the severity of problematic pornography use across languages, countries, genders, and sexual orientations in 26 languages: the Problematic Pornography Consumption Scale (PPCS, and PPCS-6, respectively), and the Brief Pornography Screen (BPS). The problematic pornography use risk is estimated to be 3.2–16.6% of the population of 42 countries, and varies among different groups (e.g. genders) and based on the measure used.

KEYWORDS
Addictive behavior, compulsive behavior, compulsive sexual behavior, impulsive behavior, International Sex Survey (ISS), problematic pornography use

INTRODUCTION

Problematic pornography use (PPU) is a common manifestation of the newly introduced diagnosis of Compulsive Sexual Behavior Disorder (CSBD) in the 11th edition of the International Statistical Classification of Diseases and Related Health Problems (ICD-11) [1, 2]. Following the CSBD diagnostic guidelines, PPU may be defined as uncontrollable and repetitive persistent pornography use accompanied by clinically significant distress and functional impairment (e.g. job loss) [1, 3]. Notably, distress that is entirely due to moral disapproval of pornography is not sufficient to diagnose PPU, even though individuals with such disapproval may regard themselves as addicted to pornography [4–6]. Despite more than two decades of scientific attention to PPU, crucial questions have yet to be addressed [7–11]. Although culture-specific, gender- and sexual orientation-related differences in sexual behaviors are well documented [12, 13], there is a relative absence of data regarding PPU among people of the global majority (i.e. those of African, Asian, Latin American, and Arab descent; PGM) [14, 15] and among women as well as gender- and sexually diverse individuals [7, 10, 16, 17]. Therefore, it is essential to consider PPU assessment among diverse populations using reliable and valid measures to more clearly identify potential unmet sexual health needs and disparities.

Pornography use is prevalent in the general population in Australia, North America, and Europe, where approximately 70–94% of adults report lifetime pornography use in large-scale and national probability-based studies [18–22]. Approximately 1–38% of participants reported PPU in these studies, with prevalence estimates ranging between 3–38% among men and 1–23% among women, while no data were available on gender-diverse individuals' PPU [18, 20, 21, 23, 24]. Most studies have not reported participants' sexual orientation, collapsed different sexual orientations into one category, or focused solely on heterosexual or gay men [7, 10]. Only one nationally representative study documented PPU across sexual orientations, with bisexual individuals reporting the highest frequency of PPU (5%), followed by heterosexual (3%) and gay and lesbian individuals (2%) [21]. Thus, knowledge is limited regarding PPU among individuals identifying with sexual orientations other than lesbian, gay, and bisexual, despite observed mental health disparities between monosexual (e.g. lesbian) and plurisexual (e.g. pansexual, reporting attraction to more than one gender) individuals [25–28]. The variation in PPU prevalence may stem from real differences between cultural, gender- and sexual orientation-related groups [29].

However, they may also derive from measurement differences (e.g. asking about PPU within a specific time-frame versus in general) and the use of different measures (e.g. screening versus more comprehensive tools, measures based on the addiction model versus atheoretical measures) [30]. This highlights the importance of assessing PPU with standardized, valid, and reliable measures, which would enable researchers to provide accurate and comparable estimates across studies. Based on the findings of recent systematic reviews, this is hindered by the fact that more than 20 measures are available to assess PPU, resulting in a lack of standardized assessment and challenges in comparing findings across studies [7, 30]. Considering the strengths and limitations of available PPU measures, the Problematic Pornography Consumption Scale (PPCS) [31], its short version (PPCS-6) [32], and the Brief Pornography Screen (BPS) [33] have been recommended for research and clinical use [7, 30, 34]. However, these measures' psychometric properties and efficacy in assessing PPU throughout countries, genders, and sexually diverse populations have yet to be systematically examined, which is the primary aim of the current study.

PPU measures

The 18-item PPCS was developed based on the well-established six-component model of addiction [35] to assess PPU [31]. These components include salience (i.e. the importance of pornography use in one's life), mood modification (i.e. using pornography to reduce negative emotions), tolerance (i.e. gradual increase in pornography use to reach similar satisfaction as before), conflict (i.e. intra- and interpersonal problems due to pornography use), withdrawal (i.e. psychological distress and/or withdrawal symptoms in the absence of pornography use) and relapse (i.e. unsuccessful efforts to reduce or stop pornography use). In addition, a brief, six-item version of the measure (PPCS-6) was developed by selecting the theoretically and methodologically most appropriate items from each factor [32]. Both the PPCS and PPCS-6 demonstrated strong psychometric properties [i.e. reliability, validity, and measurement invariance (MI)], and accurate cut-off scores were established for both with good to excellent sensitivity, specificity, positive predictive value, and negative predictive value

[31, 32]. After the original validation studies, both measures' validity and reliability were corroborated in subsequent studies, including among individuals from different cultures, age groups, and treatment-seeking and non-treatment-seeking groups [34, 36–38].

The BPS [33] is a five-item self-report measure that focuses on core features of PPU characterized by impaired control (i.e. failures to stop/control one's pornography use) and craving [39, 40]. Prior exploratory and confirmatory analyses support a single-factor solution, and MI testing suggested that the BPS is able to meaningfully compare gender- and sexually-diverse groups [40–43]. Previous research on the BPS has shown acceptable psychometric indicators for reliability and validity (i.e. construct, convergent, criterion, discriminant) among multiple community-based and clinical samples [33, 44]. In addition, an accurate cut-off score was established for the BPS with good to excellent sensitivity, specificity, positive predictive value, and negative predictive value [33].

The PPCS, PPCS-6, and BPS' psychometric properties have been tested almost exclusively without the inclusion of PGM populations. Moreover, information regarding the occurrence or prevalence rates of individuals experiencing PPU across diverse populations (e.g. gender-diverse individuals, people with homo- and heteroflexible sexual identities, or PGM populations) has almost completely been absent in the literature [7, 10, 17]. Psychometrically sound and internationally standardized measures would support high-quality studies and allow the inclusion of often under-represented and underserved groups that are currently missing from the literature [7]. Therefore, we aimed to fill these gaps by using data from the International Sex Survey (ISS) [45]. First, we comprehensively validated the PPCS, PPCS-6, and BPS to reduce measurement biases and invalid group comparisons [46, 47]. We then compared PPU across language-, country-, gender- and sexual orientation-based groups and examined differences in pornography use-related behaviors (e.g. treatment-seeking) between no or low PPU-risk (PPU–) versus at-risk for PPU (PPU+) participants. Given the lack of prior large-scale, cross-cultural studies on PPU all research questions were examined in an exploratory manner, although based on the available evidence we anticipated that men would report higher PPU levels than women [18, 20, 21, 23, 24].

METHOD

Procedure

We used data from the ISS, a pre-registered, self-report study conducted in 42 countries [45].* Data collection occurred between October 2021 and May 2022. The English survey was translated into 25 other languages, using a pre-established translation procedure [48]. Participants completed a 25–45-minute anonymous survey on the Qualtrics Research Suite [49]. Methodological details, including data collection and cleaning procedures, are described in the study protocol [45]. For transparency, all published papers and conference presentations from this data set are listed on the study's Open Science Framework (OSF) pages.[†, ‡] The study was conducted following the Helsinki Declaration and was approved or deemed exempt by all collaborating countries' national/institutional ethics review boards (https://osf.io/n3k2c/?view_only=838146f6027c4e6bb68371d9d14220b5).

Participants

After data cleaning (https://doi.org/10.17605/OSF.IO/DK78R), a total of 82 243 participants mean age (M_{age}) = 32.39 years, standard deviation (SD) = 12.52] comprised the final data set. Most participants were women (*n* = 46 874; 57.0%), followed by men (*n* = 32 549; 39.6%) and gender-diverse individuals (*n* = 2783; 3.4%). The majority of respondents were heterosexual (*n* = 56 125; 68.2%). All socio-demographic characteristics are presented in Table 1 and by country at https://osf.io/n3k2c/?view_only=838146f6027c4e6bb68371d9d14220b5.

Measures

All socio-demographic and descriptive questions and answer options, as well as all measures used in the ISS (including the BPS, PPCS, and PPCS-6), are available at OSF (https://osf.io/jcz96/?view_only=9af0068dde81488db54638a01c8ae118) in each study language.

Socio-demographic and pornography-related questions

Several socio-demographic and sexuality-related questions were included in the ISS survey battery [45]. As well as basic socio-demographic information, we focused on pornography-related questions in this study: age at first pornography use, past-year frequency of pornography use, time spent using pornography per session (in minutes), one-item self-perceived addiction, moral disapproval of pornography, past and present treatment-seeking (by professional providers) for pornography use and past-year masturbation frequency [18, 50]. Participants were provided with a definition of pornography before answering these questions [51].[§]

*Egypt, Iran, Pakistan, and Romania were included in the study protocol paper as collaborating countries [45]; however, it was not possible to obtain ethical approval for the study in a timely manner in these countries. Chile was not included in the study protocol paper as a collaborating country [45], as it joined the study after publishing the study protocol. Therefore, instead of the planned 45 countries [45], only 42 individual countries are considered in the present study; see details at https://osf.io/n3k2c/.

[†]Publications: https://osf.io/jb6ey/?view_only=0014d87bb2b546f7a2693543389b934d, Conference presentations: https://osf.io/c695n/?view_only=7cae32e642b54d049e600ceb8971053e.

[‡]Even though the study follows open-science practices [45], the data set is not publicly available due to the sensitive nature of the data. The corresponding author will provide data upon justified request.

[§]'Using pornography (porn) means to intentionally look at, read or listen to: (a) pictures, videos, or films that depict nude individuals or people having sex; or (b) written or audio material that describes nude individuals or people having sex. Using porn does not involve viewing or interacting with actual, live, nude individuals or participating in interactive sexual experiences with other human beings in person or online. For example, participating in live sex chat or a camshow and getting a 'lapdance' in a strip club are not considered porn use'.

TABLE 1 Participants' socio-demographic characteristics.

Variables	*n* = 81 975–82 243	%
Country of residence		
Algeria	24	0.03
Australia	639	0.78
Austria	746	0.91
Bangladesh	373	0.45
Belgium	644	0.78
Bolivia	385	0.47
Brazil	3579	4.35
Canada	2541	3.09
Chile	1173	1.43
China	2428	2.95
Colombia	1913	2.33
Croatia	2390	2.91
Czech Republic	1640	1.99
Ecuador	276	0.34
France	1706	2.07
Germany	3271	3.98
Gibraltar	64	0.08
Hungary	11 200	14.58
India	194	0.24
Iraq	99	0.12
Ireland	1702	2.07
Israel	1334	0.66
Italy	2401	2.92
Japan	562	0.68
Lithuania	2015	2.45
Malaysia	1170	1.42
Mexico	2137	2.60
New Zealand	2834	3.45
North Macedonia	1251	1.52
Panama	333	0.40
Peru	2672	3.25
Poland	9892	12.03
Portugal	2262	2.75
Slovakia	1134	1.38
South Africa	1849	2.25
South Korea	1464	1.78
Spain	2327	2.83
Switzerland	1144	1.39
Taiwan	2668	3.24
Turkey	820	1.00
United Kingdom	1412	1.72
United States of America	2398	2.92
Other	1177	1.43
Language		
Arabic	142	0.17
Bangla	332	0.40

(Continues)

TABLE 1 (Continued)

Variables	*n* = 81 975–82 243	%
Croatian	2522	3.07
Czech	1583	1.92
Dutch	518	0.63
English	13 994	17.02
French	3941	4.79
German	3494	4.25
Hebrew	1315	1.60
Hindi	17	0.02
Hungarian	10 937	13.30
Italian	2437	2.96
Japanese	466	0.57
Korean	1437	1.75
Lithuanian	2094	2.55
Macedonian	1301	1.58
Mandarin: simplified	2474	3.01
Mandarin: traditional	2685	3.26
Polish	10 343	12.58
Portuguese: Brazil	3650	4.44
Portuguese: Portugal	2277	2.77
Romanian	75	0.09
Slovak	2118	2.58
Spanish: Latin America	8926	10.85
Spanish: Spain	2312	2.81
Turkish	853	1.04
Sex assigned at birth		
Male	33 245	40.43
Female	48 987	59.57
Gender (original answer options in the survey)		
Masculine/man	32 549	39.58
Feminine/woman	46 874	56.99
Indigenous or other cultural gender minority identity (e.g. two-spirit)	166	0.20
Non-binary, gender fluid or something else (e.g. genderqueer)	2315	2.81
Other	302	0.37
Gender (categories used in the analyses)		
Man	32 549	39.58
Woman	46 874	56.99
Gender-diverse individuals	2783	3.38
Trans status		
No, I am not a trans person	79 280	96.43
Yes, I am a trans man	357	0.43
Yes, I am a trans woman	295	0.36
Yes, I am a non-binary trans person	881	1.07
I am questioning my gender identity	1137	1.38
I do not know what it means	269	0.33
Sexual orientation (original answer options in the survey)		
Heterosexual/straight	56 125	68.24

TABLE 1 (Continued)

Variables	*n* = 81 975–82 243	%
Gay or lesbian or homosexual	4607	5.60
Heteroflexible	6200	7.54
Homoflexible	534	0.65
Bisexual	7688	9.35
Queer	957	1.16
Pansexual	1969	2.39
Asexual	1064	1.29
I do not know yet or I am currently questioning my sexual orientation	1951	2.37
None of the above	807	0.98
I do not want to answer	308	0.37
Sexual orientation (categories used in the analyses)		
Heterosexual	56 125	68.24
Gay or lesbian	4607	5.60
Bisexual	7688	9.35
Queer and pansexual	2926	3.56
Homo- and heteroflexible identities	6734	8.19
Asexual	1064	1.29
Questioning	1951	2.37
Other	807	0.98
Highest level of education		
Primary (e.g. elementary school)	1002	1.22
Secondary (e.g. high school)	20 325	24.71
Tertiary (e.g. college or university)	60 896	74.04
Current status in education		
Not in education	49 802	60.55
In primary education (e.g. elementary school)	64	0.08
In secondary education (e.g. high school)	1571	1.91
In tertiary education (e.g. college or university)	30 762	37.40
Work status		
Not working	20 853	25.36
Working full-time	42 981	52.26
Working part-time	11 356	13.81
Doing odd jobs	7029	8.55
Socioeconomic status		
Considers life circumstances among the worst	227	0.28
Considers life circumstances much worse than average	773	0.94
Considers life circumstances worse than average	4232	5.15
Considers life circumstances average	26 742	32.52
Considers life circumstances better than average	31 567	38.38
Considers life circumstances much better than average	14 736	17.92
Considers life circumstances among the best	3957	4.81
Residence		
Metropolis (population is more than 1 million people)	26 441	32.15
City (population is between 100 000 and 999 999 people)	29 920	36.38
Town (population is between 1000 and 99 999 people)	21 103	25.66
Village (population is below 1000 people)	4764	5.79

(Continues)

TABLE 1 (Continued)

Variables	*n* = 81 975–82 243	%
Relationship status		
Single	27 541	33.49
In a relationship	27 440	33.36
Married or common-law partners	24 338	29.59
Widow or widower	428	0.52
Divorced	2472	3.01
Number of children		
None	57 909	70.41
1	8417	10.23
2	10 353	12.59
3	3843	4.67
4	1014	1.23
5	290	0.35
6–9	125	0.15
10 or more	24	0.03
	Mean	SD
Age (years)	32.39	12.52

Percentages might not add up to 100% due to missing data.
SD = standard deviation.

Problematic Pornography Consumption Scale-short (PPCS-6) and long (PPCS) versions [31, 32]

The PPCS assesses PPU severity in the past 6 months with 18 items along six factors (three items per factor): salience, tolerance, mood modification, conflict, withdrawal, and relapse. Participants indicate their answers on a seven-point scale (1 = never; 7 = all the time), with total scores ranging from 18 to 126 points. Scoring ≥ 76 points on the PPCS indicates being at risk of PPU [31]. The PPCS-6 is the brief, six-item version of the PPCS, with one item representing each factor. It assesses PPU in the past 6 months. The answer options are the same as for the PPCS, with total scores ranging between 6 and 42. Scoring ≥ 20 points on the PPCS-6 indicates being at risk of PPU [32].

Brief Pornography Screen [33]

The BPS assesses PPU severity in the past 6 months with five items. Participants indicate their answers on a three-point scale (0 = never; 1 = occasionally; 2 = very often), with total scores ranging between 0 and 10. Scoring ≥ 4 points on the BPS indicates being at risk of PPU [32].

Statistical analyses

We followed a pre-registered analysis plan (https://doi.org/10.17605/OSF.IO/DK78R) using SPSS 28.0 [52] and Mplus version 8.7 [53] to conduct analyses. Missing responses on the PPCS items ranged between 8.69 and 9.12%, and missing responses on the BPS ranged between 8.72 and 8.77%. Little's missing completely at random test (MCRT) indicated that responses were missing completely at random [χ^2 = 2237.98, degrees of freedom (d.f.) = 2215, P = 0.362 and χ^2 = 39.14, d.f. = 45, P = 0.718, respectively] [54]. We used the weighted least squares mean- and variance-adjusted estimator (WLSMV) for the CFAs and MI tests [55]. Therefore, the pairwise present approach, similar to the full-information maximum likelihood method, was used to deal with missing values [53, 56].

Confirmatory factor analyses (CFAs) were conducted to examine the structural validity of the measures, as their factor structures were established in previous studies [31–33, 36–38, 57]. Models were evaluated using goodness-of-fit indices: comparative fit index (CFI; ≥ 0.90 adequate), Tucker–Lewis Index (TLI; ≥ 0.90 adequate), and root mean square error of approximation (RMSEA) with its 90% confidence interval (CI) (≤ 0.10 acceptable) [58–60]. MI tests were conducted using participants' language, country, gender, and sexual orientation as grouping variables to reduce the possibility of measurement biases and invalid comparisons between groups [61, 62]. In each set of MI tests, we tested configural, metric, scalar, residual latent variance–covariance, and latent mean invariance [47, 62]. If models were not fully invariant, partial MI was tested [47]. The measures' reliability was assessed by Cronbach's alpha and McDonald's omega [63–65].[¶]

The measures' associations with each other and theoretically relevant correlates (e.g. frequency of pornography use) were assessed

[¶]The tau-equivalence assumption (i.e. equal factor loadings for all items in factor models) is required for alpha to be comparable to the reliability coefficient [66]. If this assumption is violated (referred to as congeneric models), the reliability value will be underestimated depending on the severity of the violation [67]. Here, we opted to focus on interpreting the omegas because it corrects the underestimation bias of alpha in congeneric models [68, 69].

to examine their validity. Cut-off scores are available for all used measures (a score of ≥ 76 on the PPCS ≥ 20 on the PPCS-6 and ≥ 4 on the BPS suggest being at risk of PPU) [31–33]. Therefore, we reported how many participants scored above the cut-off score of each measure and compared those participants who scored below (i.e. PPU− group) and above (i.e. PPU+ group) the cut-off scores along pornography-use-related characteristics.

RESULTS

Psychometric properties of the PPCS, PPCS-6, and BPS

The theory-based six-factor model of the PPCS had an excellent fit to the data [CFI = 0.985, TLI = 0.981, RMSEA = 0.060 (90% CI = 0.059–0.060)] in the CFA. All PPCS' inter-factor correlations were positive and strong (*r*s = 0.72–0.96). Similarly, the expected one-factor models also had an excellent fit to the data for the PPCS-6 and BPS [PPCS-6: CFI = 0.994, TLI = 0.990, RMSEA = 0.059 (90% CI = 0.057–0.061); BPS: CFI = 0.997, TLI = 0.994, RMSEA = 0.061 (90% CI = 0.058–0.064)]. All measures demonstrated good reliability (α = 0.80–0.95, ω = 0.80–0.95) (Supporting information, Tables S1–S2).

Associations between PPU and pornography use

The PPCS and PPCS-6 had a strong, positive association with each other (r = 0.95, P < 0.001), while their associations with the BPS were slightly weaker, but still strong (r_{PPCS} = 0.73, P < 0.001; $r_{PPCS\text{-}6}$ = 0.70, P < 0.001). Correlations with theoretically relevant correlates were similar in the case of all PPU measures (Table 2). PPU had strong, positive associations with past-year frequency of pornography use and self-perceived addiction to pornography (*r*s ranging between 0.51 and 0.68, *P*s < 0.001). PPU also showed weak to moderate, positive associations with past-year frequency of masturbation and durations of pornography use per session (*r*s ranging between 0.23 and 0.46, *P*s < 0.001), and a weak, positive association with moral disapproval of pornography (*r*s ranging between 0.06 and 0.26, *P*s < 0.001). Lastly, PPU had a weak to moderate, negative association with the age at

TABLE 2 Associations between the Problematic Pornography Consumption Scale (PPCS), its short version (PPCS-6), and the Brief Pornography Screen (BPS), and theoretically relevant correlates.

	Range	Mean	SD	Median	1	2	3	4	5	6	7	8
1. Problematic pornography use (PPCS)	18–126	30.51	17.09	23.00	–							
2. Problematic pornography use (PPCS-6)	6–42	10.54	6.16	8.00	0.95*	–						
3. Problematic pornography use (BPS)	0–10	1.49	2.28	0.00	0.73*	0.70*	–					
4. Age at first pornography use	3–88	14.48	4.93	14.00	−0.21*	−0.19*	−0.16*	–				
5. Past-year frequency of pornography use[a]	0–10	4.22	3.02	4.00	0.68*	0.66*	0.51*	−0.30*	–			
6. Time spent using pornography per session[b]	0–1200	23.19	24.28	15.00	0.33*	0.32*	0.23*	−0.08*	0.23*	–		
7. Self-perceived addiction to pornography[c]	1–7	1.96	1.54	1.00	0.69*	0.68*	0.65*	−0.15*	0.51*	0.25*	–	
8. Moral disapproval of pornography[d]	1–7	2.49	1.68	2.00	0.08*	0.06*	0.26*	0.03*	−0.13*	−0.03*	0.17*	–
9. Past-year frequency of masturbation[a]	0–10	5.36	2.61	6.00	0.46*	0.45*	0.35*	−0.25*	0.69*	0.10*	0.35*	−0.09*

SD = standard deviation.

[a]0: never, 1: once in the past year, 2: 2–6 times in the past year, 3: 7–11 times in the past year, 4: monthly, 5: 2–3 times a month, 6: weekly, 7: 2–3 times a week, 8: 4–5 times a week, 9: 6–7 times a week, 10: more than 7 times a week.

[b]Time spent with pornography use per each session in minutes.

[c]Item: 'I am addicted to porn', 1 = strongly disagree, 2 = disagree, 3 = somewhat disagree, 4 = neither agree nor disagree, 5 = somewhat agree, 6 = agree, 7 = strongly agree.

[d]Item: 'I believe that porn use is morally wrong', 1 = strongly disagree, 2 = disagree, 3 = somewhat disagree, 4 = neither agree nor disagree, 5 = somewhat agree, 6 = agree, 7 = strongly agree.

*P < 0.001.

TABLE 3 Proportion of participants in the no/low-risk (PPU−) and at-risk (PPU+) problematic pornography use groups based on the Problematic Pornography Consumption Scale (PPCS), its short version (PPCS-6), and the Brief Pornography Screen (BPS).

	PPCS							
	PPU− group (*n* = 72 681, 96.83%; 95% CI: 96.71, 96.96)				PPU+ group (*n* = 2378, 3.17%; 95% CI: 3.04, 3.29)			
Variables	***n***	**%**	**Lower 95% CI**	**Upper 95% CI**	***n***	**%**	**Lower 95% CI**	**Upper 95% CI**
Country of residence								
Algeria	20	83.33	67.26	99.41	4	16.67	0.59	32.74
Australia	567	96.26	94.73	97.80	22	3.74	2.20	5.27
Austria	672	98.97	98.21	99.73	7	1.03	0.27	1.79
Bangladesh	291	89.26	85.89	92.64	35	10.74	7.36	14.11
Belgium	579	97.80	96.62	98.99	13	2.20	1.01	3.38
Bolivia	351	95.90	93.86	97.94	15	4.10	2.06	6.14
Brazil	3114	93.68	92.85	94.51	210	6.32	5.49	7.15
Canada	2328	97.73	97.13	98.33	54	2.27	1.67	2.87
Chile	1066	97.35	96.40	98.30	29	2.65	1.70	3.60
China	2106	90.43	89.23	91.62	223	9.57	8.38	10.77
Colombia	1714	98.05	97.41	98.70	34	1.95	1.30	2.59
Croatia	2158	98.45	97.93	98.97	34	1.55	1.03	2.07
Czech Republic	1291	98.40	97.72	99.08	21	1.60	0.92	2.28
Ecuador	250	95.79	93.33	98.24	11	4.21	1.76	6.67
France	1512	97.05	96.21	97.89	46	2.95	2.11	3.79
Germany	2762	98.75	98.34	99.16	35	1.25	0.84	1.66
Gibraltar	58	98.31	94.91	101.70	1	1.69	−1.70	5.09
Hungary	10 050	96.37	96.01	96.73	379	3.63	3.27	3.99
India	168	92.82	89.02	96.62	13	7.18	3.38	10.98
Iraq	80	86.96	79.94	93.97	12	13.04	6.03	20.06
Ireland	1515	97.93	97.22	98.64	32	2.07	1.36	2.78
Israel	1127	98.17	97.39	98.95	21	1.83	1.05	2.61
Italy	2184	99.00	98.59	99.42	22	1.00	0.58	1.41
Japan	531	96.20	94.59	97.80	21	3.80	2.20	5.41
Lithuania	1715	98.28	97.67	98.89	30	1.72	1.11	2.33
Malaysia	1046	93.48	92.03	94.93	73	6.52	5.07	7.97
Mexico	1881	98.64	98.12	99.16	26	1.36	0.84	1.88
New Zealand	2559	98.27	97.77	98.77	45	1.73	1.23	2.23
North Macedonia	1125	97.83	96.98	98.67	25	2.17	1.33	3.02
Panama	298	96.44	94.36	98.52	11	3.56	1.48	5.64
Peru	2420	98.25	97.74	98.77	43	1.75	1.23	2.26
Poland	8757	98.92	98.70	99.13	96	1.08	0.87	1.30
Portugal	1928	98.72	98.22	99.22	25	1.28	0.78	1.78
Slovakia	1009	97.49	96.53	98.44	26	2.51	1.56	3.47
South Africa	1638	96.92	96.10	97.75	52	3.08	2.25	3.90
South Korea	1294	94.94	93.77	96.10	69	5.06	3.90	6.23
Spain	2058	98.42	97.89	98.96	33	1.58	1.04	2.11
Switzerland	1031	98.38	97.61	99.14	17	1.62	0.86	2.39
Taiwan	2271	88.64	87.41	89.87	291	11.36	10.13	12.59
Turkey	703	93.48	91.72	95.25	49	6.52	4.75	8.28
United Kingdom	1258	97.67	96.85	98.50	30	2.33	1.50	3.15

TABLE 3 (Continued)

	PPCS							
	PPU− group (*n* = 72 681, 96.83%; 95% CI: 96.71, 96.96)				PPU+ group (*n* = 2378, 3.17%; 95% CI: 3.04, 3.29)			
Variables	***n***	**%**	**Lower 95% CI**	**Upper 95% CI**	***n***	**%**	**Lower 95% CI**	**Upper 95% CI**
United States of America	2170	96.83	96.11	97.56	71	3.17	2.44	3.89
Gender								
Man	29 459	93.74	93.47	94.01	1967	6.26	5.99	6.53
Woman	40 691	99.28	99.19	99.36	297	0.72	0.64	0.81
Gender-diverse individual	2497	95.71	94.93	96.49	112	4.29	3.51	5.07
Sexual orientation								
Heterosexual	49 013	97.07	96.93	97.22	1478	2.93	2.78	3.07
Gay or lesbian	4172	94.13	93.44	94.83	260	5.87	5.17	6.56
Bisexual	7036	96.89	96.49	97.29	226	3.11	2.71	3.51
Queer and pansexual	2701	97.76	97.20	98.31	62	2.24	1.69	2.80
Homo- and heteroflexible identities	6071	96.24	95.77	96.71	237	3.76	3.29	4.23
Asexual	952	98.55	97.80	99.31	14	1.45	0.69	2.20
Questioning	1742	96.24	95.37	97.12	68	3.76	2.88	4.63
Other	698	96.41	95.05	97.77	26	3.59	2.23	4.95
	PPCS-6							
	PPU− group (*n* = 67 694, 90.17%; 95% CI: 89.96, 90.38)				PPU+ group (*n* = 7380, 9.83%; 95% CI: 9.62, 10.04)			
Variables	***n***	**%**	**Lower 95% CI**	**Upper 95% CI**	***n***	**%**	**Lower 95% CI**	**Upper 95% CI**
Country of residence								
Algeria	16	66.67	46.33	87.00	8	33.33	13.00	53.67
Australia	531	90.15	87.74	92.57	58	9.85	7.43	12.26
Austria	634	93.37	91.50	95.25	45	6.63	4.75	8.50
Bangladesh	243	74.54	69.79	79.29	83	25.46	20.71	30.21
Belgium	519	87.52	84.85	90.19	74	12.48	9.81	15.15
Bolivia	318	86.89	83.41	90.36	48	13.11	9.64	16.59
Brazil	2737	82.32	81.02	83.61	588	17.68	16.39	18.98
Canada	2163	90.81	89.64	91.97	219	9.19	8.03	10.36
Chile	993	90.68	88.96	92.41	102	9.32	7.59	11.04
China	1764	75.74	74.00	77.48	565	24.26	22.52	26.00
Colombia	1647	94.22	93.13	95.32	101	5.78	4.68	6.87
Croatia	2083	94.94	94.02	95.86	111	5.06	4.14	5.98
Czech Republic	1228	93.60	92.27	94.92	84	6.40	5.08	7.73
Ecuador	226	86.59	82.43	90.75	35	13.41	9.25	17.57
France	1395	89.54	88.02	91.06	163	10.46	8.94	11.98
Germany	2627	93.92	93.04	94.81	170	6.08	5.19	6.96
Gibraltar	56	94.92	89.14	100.69	3	5.08	−0.69	10.86
Hungary	9313	89.29	88.70	89.88	1117	10.71	10.12	11.30
India	141	77.90	71.80	84.00	40	22.10	16.00	28.20
Iraq	71	77.17	68.43	85.91	21	22.83	14.09	31.57
Ireland	1434	92.64	91.33	93.94	114	7.36	6.06	8.67
Israel	1087	94.60	93.30	95.91	62	5.40	4.09	6.70
Italy	2082	94.34	93.37	95.30	125	5.66	4.70	6.63
Japan	469	84.96	81.97	87.95	83	15.04	12.05	18.03

(Continues)

TABLE 3 (Continued)

Variables	PPCS-6							
	PPU− group (*n* = 67 694, 90.17%; 95% CI: 89.96, 90.38)				PPU+ group (*n* = 7380, 9.83%; 95% CI: 9.62, 10.04)			
	n	%	Lower 95% CI	Upper 95% CI	*n*	%	Lower 95% CI	Upper 95% CI
Lithuania	1637	93.81	92.68	94.94	108	6.19	5.06	7.32
Malaysia	899	80.34	78.01	82.67	220	19.66	17.33	21.99
Mexico	1808	94.81	93.81	95.81	99	5.19	4.19	6.19
New Zealand	2398	92.05	91.01	93.09	207	7.95	6.91	8.99
North Macedonia	1074	93.31	91.86	94.76	77	6.69	5.24	8.14
Panama	277	89.64	86.23	93.06	32	10.36	6.94	13.77
Peru	2268	92.05	90.98	93.11	196	7.95	6.89	9.02
Poland	8485	95.82	95.40	96.24	370	4.18	3.76	4.60
Portugal	1854	94.88	93.90	95.86	100	5.12	4.14	6.10
Slovakia	938	90.63	88.85	92.41	97	9.37	7.59	11.15
South Africa	1496	88.47	86.94	89.99	195	11.53	10.01	13.06
South Korea	1180	86.57	84.76	88.39	183	13.43	11.61	15.24
Spain	1975	94.45	93.47	95.43	116	5.55	4.57	6.53
Switzerland	971	92.65	91.07	94.23	77	7.35	5.77	8.93
Taiwan	1878	73.30	71.59	75.02	684	26.70	24.98	28.41
Turkey	625	83.11	80.43	85.80	127	16.89	14.20	19.57
United Kingdom	1204	93.48	92.13	94.83	84	6.52	5.17	7.87
United States of America	2016	89.96	88.71	91.21	225	10.04	8.79	11.29
Gender								
Man	25 587	81.40	80.97	81.83	5845	18.60	18.17	19.03
Woman	39 782	97.04	96.87	97.20	1214	2.96	2.80	3.13
Gender-diverse individual	2294	87.89	86.64	89.15	316	12.11	10.85	13.36
Sexual orientation								
Heterosexual	45 847	90.79	90.54	91.04	4652	9.21	8.96	9.46
Gay or lesbian	3592	81.03	79.87	82.18	841	18.97	17.82	20.13
Bisexual	6558	90.29	89.61	90.97	705	9.71	9.03	10.39
Queer and pansexual	2564	92.76	91.80	93.73	200	7.24	6.27	8.20
Homo- and heteroflexible identities	5641	89.40	88.64	90.16	669	10.60	9.84	11.36
Asexual	931	96.38	95.20	97.56	35	3.62	2.44	4.80
Questioning	1629	89.90	88.51	91.29	183	10.10	8.71	11.49
Other	664	91.71	89.70	93.73	60	8.29	6.27	10.30

Variables	BPS							
	PPU− group (*n* = 62 628, 83.43%; 95% CI: 83.16, 83.69)				PPU+ group (*n* = 12 441, 16.57%; 95% CI: 16.31, 16.84)			
	n	%	Lower 95% CI	Upper 95% CI	*n*	%	Lower 95% CI	Upper 95% CI
Country of residence								
Algeria	12	50.00	28.43	71.57	12	50.00	28.43	71.57
Australia	493	83.70	80.71	86.69	96	16.30	13.31	19.29
Austria	612	90.13	87.88	92.38	67	9.87	7.62	12.12
Bangladesh	229	70.46	65.48	75.45	96	29.54	24.55	34.52
Belgium	496	83.50	80.51	86.50	98	16.50	13.50	19.49
Bolivia	261	71.51	66.85	76.16	104	28.49	23.84	33.15

TABLE 3 (Continued)

	BPS							
	PPU− group (*n* = 62 628, 83.43%; 95% CI: 83.16, 83.69)				PPU+ group (*n* = 12 441, 16.57%; 95% CI: 16.31, 16.84)			
Variables	***n***	**%**	**Lower 95% CI**	**Upper 95% CI**	***n***	**%**	**Lower 95% CI**	**Upper 95% CI**
Brazil	2497	75.10	73.63	76.57	828	24.90	23.43	26.37
Canada	2058	86.36	84.98	87.74	325	13.64	12.26	15.02
Chile	840	76.64	74.13	79.15	256	23.36	20.85	25.87
China	1539	66.08	64.16	68.00	790	33.92	32.00	35.84
Colombia	1416	80.91	79.07	82.76	334	19.09	17.24	20.93
Croatia	1927	87.79	86.42	89.16	268	12.21	10.84	13.58
Czech Republic	1188	90.48	88.89	92.07	125	9.52	7.93	11.11
Ecuador	183	70.66	65.07	76.24	76	29.34	23.76	34.93
France	1262	80.90	78.94	82.85	298	19.10	17.15	21.06
Germany	2532	90.62	89.54	91.70	262	9.38	8.30	10.46
Gibraltar	50	84.75	75.30	94.20	9	15.25	5.80	24.70
Hungary	8779	84.16	83.46	84.86	1652	15.84	15.14	16.54
India	119	66.48	59.50	73.46	60	33.52	26.54	40.50
Iraq	57	61.96	51.85	72.07	35	38.04	27.93	48.15
Ireland	1318	85.14	83.37	86.92	230	14.86	13.08	16.63
Israel	991	86.25	84.25	88.24	158	13.75	11.76	15.75
Italy	1996	90.32	89.08	91.55	214	9.68	8.45	10.92
Japan	473	85.69	82.76	88.62	79	14.31	11.38	17.24
Lithuania	1550	88.77	87.29	90.26	196	11.23	9.74	12.71
Malaysia	747	66.76	63.99	69.52	372	33.24	30.48	36.01
Mexico	1609	84.46	82.83	86.09	296	15.54	13.91	17.17
New Zealand	2237	85.87	84.53	87.21	368	14.13	12.79	15.47
North Macedonia	1021	88.71	86.87	90.54	130	11.29	9.46	13.13
Panama	249	80.58	76.15	85.02	60	19.42	14.98	23.85
Peru	1950	79.14	77.53	80.75	514	20.86	19.25	22.47
Poland	8045	90.91	90.32	91.51	804	9.09	8.49	9.68
Portugal	1810	92.73	91.57	93.88	142	7.27	6.12	8.43
Slovakia	847	81.91	79.56	84.26	187	18.09	15.74	20.44
South Africa	1285	75.90	73.86	77.94	408	24.10	22.06	26.14
South Korea	1076	78.94	76.78	81.11	287	21.06	18.89	23.22
Spain	1770	84.69	83.14	86.23	320	15.31	13.77	16.86
Switzerland	890	84.84	82.67	87.02	159	15.16	12.98	17.33
Taiwan	1838	71.74	70.00	73.49	724	28.26	26.51	30.00
Turkey	561	74.60	71.48	77.72	191	25.40	22.28	28.52
United Kingdom	1135	88.12	86.35	89.89	153	11.88	10.11	13.65
United States of America	1860	82.96	81.40	84.52	382	17.04	15.48	18.60
Gender								
Man	22 341	71.08	70.58	71.58	9090	28.92	28.42	29.42
Woman	38 117	92.99	92.75	93.24	2872	7.01	6.76	7.25
Gender-diverse individual	2141	81.94	80.46	83.41	472	18.06	16.59	19.54
Sexual orientation								
Heterosexual	42 156	83.48	83.15	83.80	8344	16.52	16.20	16.85
Gay or lesbian	3433	77.39	76.16	78.62	1003	22.61	21.38	23.84

(Continues)

TABLE 3 (Continued)

	BPS							
	PPU− group (*n* = 62 628, 83.43%; 95% CI: 83.16, 83.69)				PPU+ group (*n* = 12 441, 16.57%; 95% CI: 16.31, 16.84)			
Variables	*n*	%	Lower 95% CI	Upper 95% CI	*n*	%	Lower 95% CI	Upper 95% CI
Bisexual	6115	84.22	83.38	85.06	1146	15.78	14.94	16.62
Queer and pansexual	2415	87.40	86.17	88.64	348	12.60	11.36	13.83
Homo- and heteroflexible identities	5316	84.29	83.39	85.19	991	15.71	14.81	16.61
Asexual	879	90.99	89.19	92.80	87	9.01	7.20	10.81
Questioning	1446	79.85	78.00	81.69	365	20.15	18.31	22.00
Other	626	86.58	84.09	89.07	97	13.42	10.93	15.91

Sample sizes in subgroups might not add up to the total sample size due to missing data.
CI = confidence interval.

first pornography use (*rs* ranging between −0.16 and −0.21, *Ps* < 0.001).

Country-, gender- and sexual orientation-based differences in PPU

Before group comparisons, we conducted language-,[#] country-, gender- and sexual orientation-based MI tests on the PPCS, PPCS-6, and BPS to reduce the possibility of measurement biases (Supporting information, Tables S3–S8, S13–S18). The results were consistent among the PPCS, PPCS-6, and BPS. Overall, findings suggest the lack of potential measurement biases, while group-based differences in PPU scores may be present. The highest PPU scores were observed in Taiwan (M_{PPCS} = 43.41, SD = 23.69; $M_{PPCS\text{-}6}$ = 14.83, SD = 8.27; M_{BPS} = 2.13, SD = 2.58), China (M_{PPCS} = 39.14, SD = 24.61; $M_{PPCS\text{-}6}$ = 13.70, SD = 8.73; M_{BPS} = 2.58, SD = 2.98), Malaysia (M_{PPCS} = 37.76, SD = 20.21; $M_{PPCS\text{-}6}$ = 13.30, SD = 7.32; M_{BPS} = 2.67, SD = 2.98), Turkey (M_{PPCS} = 36.49, SD = 20.46; $M_{PPCS\text{-}6}$ = 12.65, SD = 7.47; M_{BPS} = 2.26, SD = 2.64) and Brazil (M_{PPCS} = 36.18, SD = 20.35; $M_{PPCS\text{-}6}$ = 12.87, SD = 7.41; M_{BPS} = 2.11, SD = 2.70). All pairwise comparisons (with Bonferroni correction-based adjusted *P*-values) between countries had small- to medium-effect sizes, as shown in Supporting information, Tables S9–S11. Men had the highest PPU scores (M_{PPCS} = 38.55, SD = 19.85; $M_{PPCS\text{-}6}$ = 13.42, SD = 7.09; M_{BPS} = 2.39, SD = 2.69), followed by gender-diverse individuals (M_{PPCS} = 32.06, SD = 18.54; $M_{PPCS\text{-}6}$ = 11.16, SD = 6.72; M_{BPS} = 1.71, SD = 2.43) and women (M_{PPCS} = 24.24, SD = 11.03; $M_{PPCS\text{-}6}$ = 8.28, SD = 4.06; M_{BPS} = 0.78, SD = 1.58), with large effect sizes (Tables S12–S15). No significant differences were observed in the PPU levels across the eight sexual orientation-based groups (Supporting information, Tables S16–S18).

[#]Language is a methodological variable and potentially reflects country-based differences. Therefore, we did not examine language-based mean differences in detail.

Comparison of the PPU− and PPU+ groups

A total of 3.2, 9.8, and 16.6% of the participants scored above the pre-established cut-off scores of the PPCS, PPCS-6, and BPS, respectively (i.e. PPU+ group). Detailed information on the country-, gender- and sexual orientation-based proportions of participants belonging to the PPU+ and PPU− groups according to each measure is presented in Table 3.

The PPU+ group reported significantly higher levels of all correlates (e.g. past-year masturbation frequency) than the PPU− group, with small to large effect sizes (Table 4). A total of 4.3–10.2% of the PPU+ group had ever sought treatment for PPU, with an additional 21.0–37.1% wanting to, but not doing so for various reasons (e.g. unaffordability). In contrast, only 0.3–0.6% of the PPU− group had sought treatment for PPU (Table 4). Similar ratios were also reported for current treatment-seeking behaviors; see Supporting information.

DISCUSSION

Responding to recent calls for rigorous and standardized assessment of PPU and inclusion of under-represented and underserved populations in this field [7, 16, 70–72], we comprehensively validated three measures assessing the severity of PPU (i.e. the PPCS, PPCS-6 and BPS) throughout languages, countries, genders, and sexual orientations. These measures are freely available for research and clinical use in 26 languages. We believe that this study represents an initial step in building systematic, cumulative, and inclusive knowledge concerning PPU.

Although arguably to a lesser extent than in prior studies [7, 18, 20, 21, 24, 73], estimates of PPU rates in the present study varied among different groups (e.g. genders) and based on the measure used. Overall, 3.2–16.6% of individuals belonged to the PPU+ groups, with the PPCS demonstrating the lowest PPU estimates and the BPS the largest. These differences may derive from the different goals these measures serve. In particular, the PPCS, PPCS-6, and BPS each

TABLE 4 Comparison of participants' pornography-use-related characteristics in the no/low-risk (PPU−) and at-risk (PPU+) problematic pornography use groups based on the Problematic Pornography Consumption Scale (PPCS), its short version (PPCS-6), and the Brief Pornography Screen (BPS).

Problematic Pornography Consumption Scale (PPCS)

	PPU− group (*n* = 64 067–72 681; 96.83%)			PPU+ group (*n* = 2363–2378; 3.17%)			Mann–Whitney *U*-tests			
Variables	**Mean**	**SD**	**Median**	**Mean**	**SD**	**Median**	***U***	**Z**	***P***	**Cohen's *d***
Problematic pornography use (PPCS)	28.60	13.50	23.00	88.89	11.34	86.00	172 835 418.00	84.01	< 0.001	0.64
Age at first pornography use	14.30	4.71	14.00	12.60	3.72	12.00	56 513 804.00	−21.06	< 0.001	0.16
Past-year frequency of pornography use[a]	4.51	2.81	5.00	8.05	1.86	8.00	146 345 876.00	58.02	< 0.001	0.43
Time spent using pornography per session[b]	22.45	23.05	15.00	43.52	41.56	30.00	109 741 358.00	36.86	< 0.001	0.29
Self-perceived addiction to pornography[c]	1.83	1.39	1.00	5.49	1.35	6.00	144 672 863.00	84.09	< 0.001	0.59
Moral disapproval of pornography[d]	2.45	1.65	2.00	3.45	2.05	3.00	98 269 527.00	24.35	< 0.001	0.60
Past-year frequency of masturbation[a]	5.49	2.52	6.00	7.76	1.91	8.00	132 608 143.50	5.00	< 0.001	0.33

	PPU− group (*n* = 64 067–72 681; 96.83%)		PPU+ group (*n* = 2363–2378; 3.17%)		χ^2 tests		
Variables	***n***	**%**	***n***	**%**	**χ**	***P***	**Cramer's V**
Having ever sought treatment for pornography use							
Yes	466	0.72%	242	10.18%	8944.55	< 0.001	0.37
No, because have not had any problems with pornography viewing	52 311	81.09%	499	20.99%			
No, because have not felt that it was a serious problem	9139	14.17%	712	29.95%			
No, because have not known where should seek help	410	0.64%	170	7.15%			
No, because would have felt uncomfortable or embarrassed	1491	2.31%	584	24.57%			
No, because could not afford it	362	0.56%	127	5.34%			
No, because of other reason	327	0.51%	43	1.81%			
Being currently under treatment for pornography use							
Yes	139	0.22%	130	5.48%	9992.07	< 0.001	0.39
No, because does not have any problems with pornography viewing	54 003	83.74%	540	22.75%			
No, because does not feel that it is a serious problem	7843	12.16%	686	28.90%			
No, because does not know where should seek help	381	0.59%	170	7.16%			
No, because would feel uncomfortable or embarrassed	1268	1.97%	580	24.43%			
No, because could not afford it.	452	0.70%	189	7.96%			
No, because of other reasons	405	0.63%	79	3.33%			

Short version of the Problematic Pornography Consumption Scale (PPCS-6)

	PPU− group (*n* = 59 097–67 694, 90.17%)			PPU+ group (*n* = 7342–7380, 9.83%)			Mann–Whitney *U*-tests			
Variables	**Mean**	**SD**	**Median**	**Mean**	**SD**	**Median**	***U***	**Z**	***P***	**Cohen's *d***
Problematic pornography use (PPCS-6)	8.92	3.61	7.00	25.33	4.84	24.00	499 581 720.00	145.17	< 0.001	1.20
Age at first pornography use	14.40	4.77	14.00	12.89	3.76	13.00	168 816 106.50	−31.21	< 0.001	0.24
Past-year frequency of pornography use[a]	4.29	2.75	4.00	7.63	1.92	8.00	415 601 057.00	94.45	< 0.001	0.73
	21.43	21.65	15.00	37.38	36.48	30.00	301 325 092.00	54.14	< 0.001	0.43

(Continues)

TABLE 4 (Continued)

Short version of the Problematic Pornography Consumption Scale (PPCS-6)

Variables	PPU− group (*n* = 59 097–67 694, 90.17%) Mean	SD	Median	PPU+ group (*n* = 7342–7380, 9.83%) Mean	SD	Median	Mann–Whitney *U*-tests *U*	Z	*P*	Cohen's *d*
Time spent using pornography per session[b]										
Self-perceived addiction to pornography[c]	1.64	1.18	1.00	4.57	1.64	5.00	398 955 344.00	131.03	< 0.001	0.99
Moral disapproval of pornography[d]	2.42	1.64	2.00	2.99	1.90	2.00	257 864 691.50	25.51	< 0.001	0.19
Past-year frequency of masturbation[a]	5.35	2.50	6.00	7.45	1.96	8.00	373 811 777.50	71.14	< 0.001	0.53

Variables	PPU− group (*n* = 59 097–67 694, 90.17%) *n*	%	PPU+ group (*n* = 7342–7380, 9.83%) *n*	%	χ^2 tests χ	*P*	Cramer's V
Having ever sought treatment for pornography use							
Yes	291	0.49%	417	5.65%	12 931.53	< 0.001	0.44
No, because have not had any problems with pornography viewing	50 388	84.66%	2433	32.99%			
No, because have not felt that it was a serious problem	7154	12.02%	2699	36.60%			
No, because have not known where should seek help	238	0.40%	342	4.64%			
No, because would have felt uncomfortable or embarrassed	918	1.54%	1157	15.69%			
No, because could not afford it	250	0.42%	239	3.24%			
No, because of other reason.	282	0.47%	88	1.19%			
Being currently under treatment for pornography use							
Yes	85	0.14%	184	2.50%	13 318.10	< 0.001	0.45
No, because does not have any problems with pornography viewing	51 854	87.14%	2702	36.65%			
No, because does not feel that it is a serious problem	5981	10.05%	2548	34.56%			
No, because does not know where should seek help	218	0.37%	333	4.52%			
No, because would feel uncomfortable or embarrassed	745	1.25%	1103	14.96%			
No, because could not afford it	292	0.49%	349	4.73%			
No, because of other reasons	331	0.56%	153	2.08%			

Brief Pornography Screen (BPS)

Variables	PPU− group (*n* = 54 072–62 628, 83.43%) Mean	SD	Median	PPU+ group (*n* = 12 364–12 441, 16.57%) Mean	SD	Median	Mann–Whitney *U*-tests U	Z	*P*	Cohen's *d*
Problematic pornography use (BPS)	0.61	0.94	0.00	5.92	1.85	5.00	779 154 948.00	192.18	< 0.001	1.68
Age at first pornography use	14.47	4.80	14.00	13.19	3.98	13.00	272 751 680.00	−32.14	< 0.001	0.25
Past-year frequency of pornography use[a]	4.18	2.77	4.00	6.87	2.17	7.00	599 687 248.00	95.88	< 0.001	0.74
Time spent using pornography per session[b]	21.21	21.38	15.00	31.89	32.79	20.00	426 962 325.50	47.84	< 0.001	0.37
Self-perceived addiction to pornography[c]	1.51	1.06	1.00	3.94	1.77	4.00	590 636 501.50	148.25	< 0.001	1.16
	2.28	1.55	2.00	3.38	1.93	3.00	453 987 161.00	61.85	< 0.001	0.47

TABLE 4 (Continued)

Brief Pornography Screen (BPS)										
	PPU− group (*n* = 54 072–62 628, 83.43%)			PPU+ group (*n* = 12 364–12 441, 16.57%)			Mann–Whitney *U*-tests			
Variables	**Mean**	**SD**	**Median**	**Mean**	**SD**	**Median**	**U**	**Z**	***P***	**Cohen's *d***
Moral disapproval of pornography[d]										
Past-year frequency of masturbation[a]	5.29	2.52	6.00	6.92	2.15	7.00	538 409 803.50	68.52	< 0.001	0.51
Variables	PPU− group (*n* = 54 072–62 628, 83.43%)			PPU+ group (*n* = 12 364–12 441, 16.57%)			χ^2 tests			
	n	%		*n*	%		χ	*P*	Cramer's V	
Having ever sought treatment for pornography use										
Yes	177	0.32%		531	4.27%		20 131.95	< 0.001	0.55	
No, because have not had any problems with pornography viewing	48 524	89.08%		4297	34.57%					
No, because have not felt that it was a serious problem	5012	9.20%		4841	38.95%					
No, because have not known where should seek help	96	0.18%		485	3.90%					
No, because would have felt uncomfortable or embarrassed	331	0.61%		1746	14.05%					
No, because could not afford it	109	0.20%		381	3.07%					
No, because of other reasons	221	0.41%		148	1.19%					
Being currently under treatment for pornography use										
Yes	48	0.09%		221	1.78%		20 296.08	< 0.001	0.55	
No, because does not have any problems with pornography viewing	49 727	91.31%		4827	38.85%					
No, because does not feel that it is a serious problem	4021	7.38%		4512	36.32%					
No, because does not know where should seek help	65	0.12%		486	3.91%					
No, because would feel uncomfortable or embarrassed	227	0.42%		1622	13.06%					
No, because could not afford it	129	0.24%		512	4.12%					
No, because of other reasons	241	0.44%		244	1.96%					

SD = standard deviation.

[a]0: never, 1: once in the past year, 2: 2–6 times in the past year, 3: 7–11 times in the past year, 4: monthly, 5: 2–3 times a month, 6: weekly, 7: 2–3 times a week, 8: 4–5 times a week, 9: 6–7 times a week, 10: more than 7 times a week.

[b]Time spent with pornography use per each session in minutes.

[c]Item: 'I am addicted to porn', 1 = strongly disagree, 2 = disagree, 3 = somewhat disagree, 4 = neither agree nor disagree, 5 = somewhat agree, 6 = agree, 7 = strongly agree.

[d]Item: 'I believe that porn use is morally wrong', 1 = strongly disagree, 2 = disagree, 3 = somewhat disagree, 4 = neither agree nor disagree, 5 = somewhat agree, 6 = agree, 7 = strongly agree.

demonstrated strong psychometric properties in the present and prior studies [31–34, 36–38]. However, their abilities in distinguishing between individuals being at no/low versus being at risk of PPU varied. The BPS provided the highest estimates of PPU, which aligns with it being a screening instrument (i.e. a brief measure with limited response options) and its sole focus on control issues concerning pornography use, as it aims to detect all potential cases with PPU [33]. In contrast, the PPCS provided the lowest PPU estimates as it aims to

assess PPU more comprehensively along several items based on the six-component model of addiction [35], and provides more nuanced answer options [31].

When strictly limited resources or time are available, the BPS may be recommended for quick screening of potential PPU, with an understanding that false positives might be more numerous than when other measures are used. When a more detailed picture of PPU is desired or needed, the PPCS may be used, as it may have a greater ability to differentiate between individuals with and without PPU and assess different domains of PPU (e.g. salience). The PPCS-6 has some advantages of both screener-type (e.g. brevity) and comprehensive measures (e.g. more nuanced answer options), but also some shortcomings (e.g. probably being less accurate than the PPCS). In sum, these three measures have their advantages and disadvantages, and researchers and clinicians should be aware of them when deciding which measure to use. Importantly, none of these three measures or any other self-report scale is sufficient to diagnose PPU without a thorough clinical examination.

Apart from the variability in PPU estimates among assessment tools, marked differences among genders and cultures were observed, but not among different sexual orientations. In line with our hypothesis and findings of prior studies [18, 20, 21, 23, 24], men reported the highest levels of PPU, followed by gender-diverse individuals and women. This difference might be attributable to individual (e.g. men's higher impulsivity) or societal differences (e.g. acceptance of pornography use in different genders) [7, 17, 74–76]. As no prior large-scale, cross-cultural studies have compared PPU across countries, we speculate that differences between countries may relate to cultural differences concerning pornography use and sexuality (e.g. in more conservative cultures, individuals may report higher self-perceived PPU due to stricter sexual values) [20, 77, 78], although other factors such as sexual restrictiveness warrant consideration [79]. The observed variability in PPU estimates across countries highlights the importance of examining socio-cultural factors that may contribute to PPU [16, 80].

From a public health perspective, PPU may not be more prevalent than other mental health issues and may not meet the criteria of a public health crisis, despite increasing moral panic around pornography [81–83]. However, PPU is prevalent, and thus systematic approaches are needed to more clearly understand this behavior and provide evidence-based, accessible, and affordable treatments for it [7, 71, 81, 84, 85]. In line with this notion, strikingly, only 4–10% of the individuals in the PPU+ group sought treatment for PPU, while an additional 21–37% did not do so due to various reasons (e.g. stigma, unaffordability). Clearly, there is a need for better access to PPU treatment, but also for more high-quality research concerning the phenomenon that would lead to the development and promotion of evidence-based treatment options (e.g. online versus in person) for PPU [7, 71, 81]. Finally, it would be important to raise awareness about PPU, without creating a moral panic or stigmatizing pornography users in general [81–83].

Despite the study's strengths, some general limitations of the ISS (see https://osf.io/n3k2c/?view_only=838146f6027c4e6bb68371d9d14220b5) and some study-specific limitations should also be considered. The samples used in the study were not probability-based, nationally representative samples and were comprised mainly of highly educated individuals (i.e. 74% of the total sample completed tertiary education). Thus, country-based findings and comparisons should be interpreted carefully considering these limitations, and the findings might not be representative of individuals with lower levels of education. It is also worth noting that assessing compulsive sexual behaviors and PPU based on the component model of addiction (such as the PPCS and PPCS-6) has been criticized, as some of its features (e.g. tolerance) might not distinguish problematic from intensive but not-problematic involvement [86, 87]. However, empirical findings suggest that tolerance and withdrawal symptoms are more frequently present among individuals with compulsive sexual behaviors and PPU, warranting further investigation [23, 34]. In addition, even though the salience and withdrawal factors of the PPCS showed a latent correlation of 0.96 in the CFA, we deemed it appropriate to retain the scale's original six-factor structure in the present study, as the PPCS is based on a well-established theoretical model with six distinct yet related components [35]. In line with the notion of this theoretical model, the first-order, six-factor model in the CFA showed an excellent fit to the data. Moreover, reports of treatment-seeking individuals and therapists corroborate the presence of each of these six symptom domains among individuals seeking treatment for PPU [23, 34, 88–91]. Nevertheless, we encourage future studies to further evaluate the symptoms of PPU and their interrelations, as well as to refine the PPCS to reflect more clearly the six distinct domains of symptoms proposed by the six-component model of addiction [35].

Individuals reporting PPU in the present study might have done so due to their moral disapproval of pornography [4, 5, 92]. Future studies should investigate self-perceived PPU (e.g. due to moral incongruence) and PPU due to behavioral dysregulation, using person-centered approaches and clinical assessments. More in-depth analyses of the complex roles that cultural values, religiosity, the content of pornography, or moral perspectives may play in diagnosing PPU are also recommended [4, 5, 24, 93]. Furthermore, even though the results of traditional MI testing suggested the lack of potential measurement biases, and thus the adequacy of using all three scales in different populations, it should be noted that besides its strengths, this method also has its weaknesses [94–97]. Future studies are recommended to test all three scales' MI among diverse groups using other methods, such as the alignment optimization method or the multi-level CFA approach [96]. Lastly, the PPCS, PPCS-6, and BPS and their cut-off scores should be validated in probability-based surveys in different populations, as well as in longitudinal, clinical, and adolescent samples [7, 37, 71, 98, 99].

CONCLUSIONS

Advancements in understanding PPU depend on a standardized assessment of the phenomenon across socio-cultural settings and different

populations [7, 71]. To improve the assessment of PPU and its comparability across studies, the current study examined three freely available PPU measures (PPCS, PPCS-6, and BPS) among diverse populations and demonstrated their strong psychometric properties. Our arguably conservative occurrence estimate of 3.2% makes PPU as prevalent as many other mental health issues, with varying estimates across populations, emphasizing the need for more inclusive research in this field.

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DATA AVAILABILITY STATEMENT

Even though the study follows open-science practices, the dataset is not publicly available due to the sensitive nature of the data. The corresponding author will provide data upon justified request.

ETHICS

The authors assert that all procedures contributing to this work comply with the relevant national and institutional committees' ethical standards on human experimentation and the Helsinki Declaration. The study was approved by all collaborating countries' national/institutional ethics review boards, or the local ethics committees considered the study exempt and did not further assess the study, as it had already been approved by the ethics committees of the principal investigators' institutions: https://osf.io/n3k2c/?view_only=838146f6027c4e6bb68371d9d14220b5

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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