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Profiles of problematic pornography use and religiosity-based moral incongruence using latent profile analysis: A two-sample study

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ABSTRACT

Background and Aims: Recent taxonomies propose that pornography-related problems may arise from problematic pornography use (PPU) and/or moral incongruence (MI). Although religiosity is often viewed as a key factor in MI, religious-based MI has not yet been explicitly examined within these taxonomies, which we address herein. *Methods:* Using latent profile analysis of self-report data obtained, we examined distinct and overlapping profiles of PPU and religiosity-based MI in two online samples of male pornography users from the United States (N = 1,356, M_{age} = 36.86, SD = 11.26) and United Kingdom (N = 944, M_{age} = 38.69, SD = 12.26). *Results:* Three classes (15–25% of each sample) showed elevated PPU and/or religiosity-based MI: 'At risk for religiosity-based MI' (4–8%), 'At risk for PPU' (6–10%), and 'At risk for co-occurring PPU and religiosity-based MI' (6–8%). Unlike the two groups with elevated PPU, the group with religious-based MI group did not report heightened psychological distress or treatment-seeking tendencies. Respondents were otherwise classified as "not at risk" (40–47%) "low risk" (27–28%), or moderate-severity PPU (14%, Sample 2 only). *Discussion and Conclusions:* Although the observed heterogeneity validates a taxonomy of PPU and religiosity-based MI, our findings challenge the assumption of elevated psychological distress and treatment-seeking tendencies among individuals with religiosity-based MI. Future research should further examine the clinical relevance of religiosity-based MI and extend these findings to broader (e.g., clinical, culturally diverse) samples.

KEYWORDS

problematic pornography use, moral incongruence, latent profile analysis, pornography addiction, heterogeneity, self-perceived pornography addiction, Compulsive Sexual Behaviour Disorder

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Technological advancements since the mid-2000s have significantly increased global rates of pornography use (Nowakowska, Lewczuk, & Gola, 2020). While most users experience no significant negative effects, a minority develop dysregulated or addictive patterns known as problematic pornography use (PPU; de Alarcón, de la Iglesia, Casado, & Montejo, 2019). Despite varying conceptualisations, PPU is most commonly characterised by impaired control despite adverse consequences, alongside features such as salience (preoccupation with

pornography), relapse (returning to use despite efforts to quit), and sexual dissatisfaction (e.g., reduced pleasure from use; Bőthe, Potenza, et al., 2020; Kraus et al., 2018). Although frequent use often co-occurs with PPU, high-frequency non-problematic use has also been noted as common (Bőthe, Potenza, et al., 2020). Similar to other behavioural addictions, such as Internet gaming and gambling, PPU is associated with elevated psychological distress, heightened impulsivity, compulsivity, and personality traits like higher neuroticism and lower conscientiousness (Albertella et al., 2020; Antons & Brand, 2021; Bőthe, Tóth-Király, et al., 2020; Leeman & Potenza, 2012; Liu et al., 2022). Sociodemographic factors, particularly younger age and male gender, also increase susceptibility to PPU (Castro-Calvo, Gil-Llario, Gimenez-Garcia, Gil-Julia, & Ballester-Arnal, 2020; de Alarcón et al., 2019). Therefore, examining these variables may further clarify the ways in which different subtypes related to PPU may emerge.

PREVALENCE AND CLASSIFICATION OF PPU

PPU research has gained momentum in recent years, but prevalence estimates remain inconsistent. Studies suggest that 3–15% of male pornography users may be at risk for PPU (Bőthe, Tóth-Király, et al., 2020; Dickenson, Gleason, Coleman, & Miner, 2018; Maitland & Neilson, 2023; Zarate, Allen, Kannis-Dymand, Karimi, & Stavropoulos, 2023), while an additional 10–30% may experience subclinical PPU, characterised by milder negative consequences (Hernández-Mora Ruiz Del Castillo, Bonnet, & Varescon, 2023; Zarate et al., 2023).

Ongoing debates focus on how best to classify and diagnose such issues (Grubbs et al., 2020; Kowalewska & Lew-Starowicz, 2021). As of 2018, PPU can be clinically recognised through the new diagnostic category of Compulsive Sexual Behaviour Disorder (CSBD) in the International Classification of Diseases, 11th edition (ICD-11) (Kraus et al., 2018). Although generally welcomed from scientific and public health perspectives (Antons & Brand, 2021; Gola & Kraus, 2021), this new diagnostic category raised concerns about over-pathologising common sexual behaviours (Kardefelt-Winther et al., 2017). A myriad of social, cultural, and moral factors influence how individuals perceive their own pornography use (Hoagland, Rotruck, Moore, & Grubbs, 2023), complicating self-reported accounts of pornography addiction (Briken, 2020).

MORAL INCONGRUENCE AND SELF-PERCEIVED PPU

A growing body of research highlights the role of moral attitudes in shaping self-reported pornography addiction. According to moral incongruence (MI) theory, individuals who morally disapprove of pornography but engage in its use experience a discrepancy between their ideal and perceived selves, which can result in psychological distress (Grubbs, Exline, Pargament, Hook, & Carlisle, 2015, Grubbs et al., 2018; Walton, 2019). This distress may lead individuals to label themselves as being addicted to pornography even in the absence of dysregulated consumption (Grubbs et al., 2015, 2019; Grubbs & Perry, 2019). Consequently, MI may conflate psychological factors (e.g., moral disapproval of pornography) with objective indicators of problematic use (i.e., PPU; Grubbs et al., 2015, 2018). To address this distinction, some researchers have referred to "self-perceived PPU" for cases primarily driven by MI rather than objectively dysregulated and problematic engagement with pornography (Jiang et al., 2022; Kraus & Sweeney, 2019).

The role of religiosity in MI

Religiosity has been identified as a key driver of MI. Studies primarily conducted in the United States—a context shaped in part by religiously conservative ideologies—indicate that internalised beliefs (e.g., sexual conservatism) may amplify guilt and shame related to pornography use (Grubbs, Wilt, Exline, Pargament, & Kraus, 2018). Although MI can arise from other sources (e.g., ethical concerns about the pornography industry; Hoagland et al., 2023), religiosity is likely to be especially salient in shaping deeply held values proscribing pornography use (Mestre-Bach, Blycker, Actis, Brand, & Potenza, 2021). However, MI is often studied as an umbrella construct, meaning the specific psychological sources of MI are typically not distinguished (Hoagland et al., 2023). Operationalising MI as "religiosity-based MI" (indexed by moral disapproval, pornography consumption, and self-reported religiosity) may therefore enhance specificity and clarity in this area.

PROPOSED TYPOLOGIES OF PPU AND MI

Recent theoretical frameworks have proposed clinically relevant subtypes of self-reported PPU to account for the heterogeneity across PPU and MI (broadly defined). Proposed subtypes include i) a "PPU-only" presentation marked by objectively dysregulated pornography consumption; ii) an "MI-only" presentation (aligned with the notion of "self-perceived PPU") characterised by moral incongruence without dysregulated or problematic use; and iii) a co-occurring PPU and MI presentation (Kraus & Sweeney, 2019; Vaillancourt-Morel & Bergeron, 2019). As clinically relevant typologies, these presentations are expected to correlate with heightened psychological distress and an increased likelihood of seeking treatment for pornography-related concerns (Grubbs et al., 2015; Kraus & Sweeney, 2019). Tailored interventions have also been suggested, with PPU-related issues potentially benefiting from cognitive-behavioural therapy (CBT) and MI-related concerns from acceptance and commitment therapy (ACT). For co-occurring cases, combining CBT and ACT may be most effective (Antons et al., 2022; Ripplinger et al., 2024).

Despite these advances, empirical evidence supporting these typologies is limited. Most prior work regarding PPU and MI has used variable-centred approaches (e.g., regression or structural equation models), which make two key assumptions: i) that individuals are derived from a homogenous group, and ii) that the relationships between variables are uniform across the sample. Such approaches therefore may fail to account for different subtypes that may exist within a sample (Feczko et al., 2019). Conversely, person-centred approaches such as latent profile analysis (LPA) can identify distinct 'clusters' or sub-groups of individuals based on their response patterns (Spurk, Hirschi, Wang, Valero, & Kauffeld, 2020) and are therefore especially suitable for examining the proposed heterogeneity associated with PPU and MI.

Several studies have applied LPA or other person-centred approaches in an attempt to identify relevant subtypes (Chen et al., 2022; Jiang et al., 2022). However, only two LPA studies specifically examined heterogeneity related to PPU and MI, and both were conducted among subclinical samples of Chinese males from online self-help forums (Chen et al., 2022; Jiang et al., 2022). While these studies found partial support for the proposed typologies, they did not identify a group with co-occurring PPU and MI, which may reflect both cultural and methodological factors. Culturally, Chinese social and moral norms surrounding pornography use likely differ from Western contexts, where religiosity ostensibly plays a more prominent role (Su, Zheng, & Zheng, 2023). Methodologically, these studies relied on a broad definition of moral disapproval without specifically interrogating religiosity-based MI. Accordingly, examining religiosity-based MI within Western samples may uncover distinct patterns of heterogeneity.

CURRENT STUDY

The present study extends prior work in several ways. First, we focused on Western samples, where religiosity-based MI may be relatively prevalent. Second, we explicitly examined religiosity-based MI (i.e., concurrent religiosity, moral disapproval of pornography, and at least semi-frequent use) to more precisely measure MI according to its typical conceptualisation in the Western context. Third, by recruiting from the general community rather than PPU-specific self-help forums, we sought to map the prevalence of proposed clinical subtypes (PPU-only, religiosity-based MI, and co-occurring PPU and religiosity-based MI), but also subclinical (i.e., moderate or low risk) profiles.

Building on theoretical frameworks for PPU and MI (Kraus & Sweeney, 2019; Vaillancourt-Morel & Bergeron, 2019) and recent qualitative findings (Blinka, Ševčíková, Dreier, Škařupová, & Wölfling, 2022; Ince et al., 2023), we employed latent profile analysis (LPA) to identify meaningful subgroups of pornography users related to PPU and religiosity-based MI. We hypothesised:

h1): Most pornography users would report low scores on both PPU and religiosity-based MI, indicating no or relatively low clinically relevant concerns.

h2): A subset of users would display clinically meaningful patterns of PPU and/or religiosity-based MI, alongside elevated psychological distress and tendencies of seeking (or considering) treatment for pornography-related concerns. We further predicted that these would be distributed across three at-risk typologies:

h2a) A group at risk for PPU only (characterised by elevated PPU but minimal religiosity-based MI).

h2b) a group at risk for religiosity-based MI-only, marked by moral disapproval of pornography despite relatively frequent pornography use, religiosity, and low PPU severity.

h2c) Co-occurring PPU and religiosity-based MI, marked by elevated scores on dimensions related to both PPU and religiosity-based MI (moral disapproval, relatively frequent pornography use, and religiosity).

METHODS

Participants and recruitment

The current data were collected as part of a larger project on PPU among male pornography users from the general population. Although other analyses from this dataset have been used for additional research questions (Ince et al., 2024), such work does not overlap with the current study. The study was advertised as a survey on male sexual behaviours, which was described to participants as "…a study on male sexual behaviours (including pornography use) and how these relate to sexual and psychological well-being". No references or implications toward PPU were given in the study description. The study was advertised on two large-scale crowdsourcing platforms (Prolific.uk and CloudResearch's *Connect* platform), both of which yield reliable self-report data (evidenced by performance on attention checks, survey completion times, and interpretability of responses to open-ended questions) (Douglas, Ewell, & Brauer, 2023). Sample 1 (United States) consisted of 1,356 respondents (M_{age} = 36.86, SD = 11.26) and Sample 2 (United Kingdom) consisted of 944 respondents (M_{age} = 38.69, SD = 12.26). Participants were compensated upon survey completion in line with rates for each platform (2.00USD and 2.50GBP for CloudResearch and Prolific, respectively) (Douglas et al., 2023).

Measures

Respondents completed measures on socio-demographic information, including age, religious denomination, education, and relationship status. Participants' natural history of sexual behaviours in the past six months was measured via frequency of various sexual activities (pornography use, masturbation with and without pornography; each measured as 1 = *Never*, 9 = *Multiple times per day*). Religiosity was measured on a five-point scale (0 = *Not at all religious*, 4 = *Very religious*).

We indexed PPU through the Compulsive Sexual Behaviour Disorder-19 scale (Bőthe, Potenza, et al., 2020) tailored specifically for pornography use (CSBD-19$_{porn}$).

This scale includes 19 items across five subscales, with items rated on a 1-4 Likert scale (1 = *Totally disagree*, 4 = *Totally agree*). Of these five subscales, four include three items each for impaired control (e.g., "My desires for pornography controlled me"), salience (e.g., "When I could use pornography, everything else became irrelevant"), relapse (e.g., "Trying to reduce the amount of pornography I used had almost never worked"), and dissatisfaction (e.g., "I used pornography even when I did not enjoy it anymore"); alongside seven items for negative consequences (e.g., "My pornography use interfered with my work and/or education"). A score of 50+ on the original CSBD-19 has been proposed to indicate high risk for CSBD and was therefore used to indicate being at risk for PPU in the current study (Bőthe, Potenza, et al., 2020).

We also included the *Tolerance* subscale from the Problematic Pornography Consumption Scale (Bőthe et al., 2018) to index PPU-related tolerance/escalation. This decision was threefold. First, burgeoning evidence suggests that pornography-related tolerance is an important aspect of PPU (Ince, Yücel, Albertella, & Fontenelle, 2021, 2023, 2024; Lewczuk et al., 2022). Second, the CSBD-19 scale does not include a tolerance-related dimension. Third, the PPCS has been recommended as the most appropriate scale (based on construct validity and reliability) for measuring PPU-related tolerance/escalation in the current literature (Fernandez & Griffiths, 2021). To further gauge whether respondents considered their pornography use as dysregulated and problematic, we asked whether they had considered or sought professional treatment (e.g., from a family doctor, psychiatric, sex therapist, psychologist, or naturopath) due to difficulties controlling their pornography use (0 = *No, I have not considered or sought treatment*, 1 = *Yes, I have considered it but not sought treatment*, 2 = *Yes, I have sought treatment*, 3 = *Prefer not to say*). Given that many individuals do not actually seek treatment for pornography-related concerns (e.g., due to shame, stigma, or accessibility) (Konkolÿ Thege, Woodin, Hodgins, & Williams, 2015), individuals who responded with '1' or '2' were recoded as 1, thereby creating a binary variable based on having considered/sought treatment (0 = *Had not considered or sought treatment*, 1 = *Had considered or sought treatment*; Bothe et al., 2020).

Moral disapproval of pornography was measured with a single item believed to most appropriately index such perceptions ("As a behaviour, viewing pornography is morally wrong") (Grubbs et al., 2015; Lewczuk, Glica, Nowakowska, Gola, & Grubbs, 2020, 2021), measured on a seven-point scale (1 = *Not at all*, 7 = *Extremely*). We also measured various psychological and psychopathological dimensions known to correlate with PPU and MI, analysing them as auxiliary variables to enhance the interpretation of the extracted profiles. Psychological distress was measured with the DASS-10 (Halford & Frost, 2021; Lovibond & Lovibond, 1995), trait impulsivity was measured with the short version of the UPPS-P impulsivity scale (SUPPS-P; Cyders, Littlefield, Coffey, & Karyadi, 2014), trait compulsivity was measured with Cambridge–Chicago Compulsivity Trait Scale (Chamberlain & Grant, 2018; Liu et al., 2023), and personality dimensions with the short version of the Big Five Inventory (Rammstedt, Kemper, Klein, Beierlein, & Kovaleva, 2013).

Statistical analysis

Statistical analyses were undertaken using R-Studio version 4.2.2 (RStudio Team, 2023). Group comparisons across the two samples were conducted with parametric (independent samples *t*-tests; Welch-corrected for instances of unequal variances) and non-parametric (Chi square test, Mann-Whitney *U*) inferential statistics based on normality assumptions. Statistical significance was set at $\alpha = 0.05$ for all analyses (with Tukey's HSD used to correct for multiple comparisons). Categorical variables (education, relationship status, history of seeking or considering treatment for pornography-related concerns) were dummy coded for analysis (e.g., group comparisons).

Latent profile analysis was performed to identify subgroups of individuals with distinct and meaningful patterns of PPU and religiosity-based MI (Rosenberg, Beymer, Anderson, Van Lissa, & Schmidt, 2018). Our analytic pipeline followed expert guidelines and established conventions for LPA using the *tidyLPA* package (version 1.0.8; Bauer, 2022; Rosenberg et al., 2018). The *tidyLPA* package simplifies and extends the widely used *mclust* package (Scrucca, Fop, Murphy, & Raftery, 2016) by streamlining the parameterisation processes (i.e., selecting the optimal variance-covariance structures across profiles). In short, the tidyLPA package uses maximum likelihood estimation to identify the optimal joint distribution of indicator means, variances and covariances, and automates the decision making process for parameterisation and selects the most optimal joint distribution for included indicators by balancing parsimony with model complexity (Masyn, 2013).

The LPA included nine dimensions. As described above, six were relevant to PPU (each of the five subscales from the $CSBD_{porn}$ plus the PPCS *Tolerance* subscale) while the remaining three dimensions indexed relevant dimensions for religiosity-based MI (i.e., moral disapproval of pornography, frequency of pornography use, and religiosity).

Potential solutions containing one to ten profiles were estimated for each sample. Determining the optimal number of profiles followed an iterative process. In line with recommended pipelines for the TidyLPA package (Bauer, 2022; Rosenberg et al., 2018), we firstly evaluated the following model fit statistics: the Bayesian Information Criteria (BIC) (Schwarz, 1978), Akaike Information Criterion (AIC) (Akaike, 1987), and the corrected Akaike Information Criterion (CAIC) (Anderson, Burnham, & White, 1998). The Bootstrapped Likelihood Ratio Test (BLRT) offered additional information whereby a significant *p*-value ($p > 0.05$) for *K* classes is deemed inferior to a more parsimonious model (*K*-1 classes). As fit statistics may continually decrease (i.e., improve) without substantively improving the model, especially for large samples (Morin & Marsh, 2015; Petras & Masyn, 2010), we examined 'elbow-plots' that visualise the relative improvement in fit statistics from additional classes

(Morin, Meyer, Creusier, & Biétry, 2016; Morin & Marsh, 2015; Petras & Masyn, 2010). The point after which the plot flattens is taken to indicate the most appropriate number of classes (Morin et al., 2016; Petras & Masyn, 2010).

We also evaluated entropy values in which values closer to 1.0 indicate superior class separation (with >0.80 indicating acceptable class enumeration) (Celeux & Soromenho, 1996). Given our focus on numerous clinically-relevant profiles (which are all likely to fall within a minority of our community samples), we allowed for class memberships as low as 3% (i.e., slightly below the generally recommended minimum of 5% when working with smaller sample sizes than ours) (Versella, Piccirillo, Potter, Olino, & Heimberg, 2016). Profiles were evaluated against extant theory to aid interpretation, especially for solutions with low class membership. Indicator values were standardised prior to plotting the LPAs to further assist interpretation when comparing across profiles. We also applied similar group labels to that observed in prior LPA and PPU literature (e.g., to differentiate individuals "not at risk" from "low risk" for PPU) (Bőthe et al., 2018; Chen et al., 2022; Hernández-Mora Ruiz Del Castillo et al., 2023; Jiang et al., 2022; Zarate et al., 2023).

Following class enumeration, differences in auxiliary variables across profiles were examined via ANOVAs (2,500 bootstrapped samples). This permitted comparisons on sociodemographic (age, relationship status), sexual (e.g., frequency of partnered sex), psychological (e,g, distress), and psychopathological dimensions (trait impulsivity and compulsivity). Post-hoc comparisons were performed with Tukey's HSD to adjust for familywise error rate.

Ethics

Ethics approval was obtained from the Monash University Human Research Ethics Committee (#37969) and the study was conducted in accordance with the Declaration of Helsinki. All participants provided informed consent prior to completing the survey.

RESULTS

Table 1 presents the relevant background variables (sociodemographics and natural history of sexual behaviours) for each sample. Table 2 shows the descriptive statistics and psychometric information for variables included in the LPA.

Table 1. Sociodemographics and natural history of sexual behaviours

Characteristics	Sample 1 (USA; N = 1,356) n (%)/M (SD)	Sample 2 (UK; N = 944) n (%)/M (SD)	Chi square tests of independence/ Independent samples t-tests
Sociodemographics			
Age (years)	36.86 (11.26)	38.69 (12.26)	t (1916)[a] = −3.63, p < 0.001,d = −0.16
Education			
None	<1%	<1%	χ^2 (4, N = 2,300) = 14.92, p < 0.001, V = 0.08
Primary/elementary school	1%	<1%	
Secondary school	31%	25%	
Tertiary	51%	55%	
Higher education	17%	20%	
Relationship status			
Single	40%	29%	χ^2 (4, N = 2,300) = 67.55, p < 0.001, V = 0.17
In a relationship	21%	35%	
Married	34%	32%	
Divorced/separated	4%	2%	
Widowed	<1%	<1%	
Religious denomination[b]			
Agnostic/atheist	47	61	χ^2 (6, N = 2,300) = 7.21, p = 0.21, V = 0.19
Buddhist	2	1	
Christian/Catholic	36	24	
Jewish	2	0	
Muslim	2	3	
Other	8	5	
Prefer not to disclose	4	5	
Religiosity[c]	1.31 (1.47)	0.76 (1.17)	t (2,258)[a] = 9.93, p < 0.001, d = 0.41
Natural history of sexual behaviours			
Pornography use frequency	5.19 (1.84)	5.13 (1.90)	t (2,298) = 0.76, p = 0.45, d = 0.04
Porn-free masturbation frequency	3.00 (2.26)	3.23 (2.42)	t (2,298) = −2.29, p = 0.0.03, d = −0.10
Partnered sex frequency[d]	3.82 (2.35)	3.89 (2.40)	t (2,118) = −0.75, p = 45, d = −0.03

Note. [a]Welch-corrected due to unequal variances. [b]Total exceeds 100% due to individuals with multiple religious denominations (n = 18). [c]Religiosity measured on a five-point scale (0 = *Definitely not*, 4 = *Definitely yes*) (Lewczuk, Szmyd, Skorko, & Gola, 2017). [d]Only includes individuals with any history of partnered sex (N_1 = 1,219, N_2 = 901). [e]Sought or considered treatment for pornography problems (0 = *No*, 1 = *Yes*).

Table 2. Descriptive statistics for dimensions included in the latent profile analysis and auxiliary variables

Characteristics	Sample 1 (USA; N = 1,356) M (*SD*)	Reliability [95% CI]	Sample 2 (UK; N = 944) M (*SD*)	Reliability [95% CI]	Mann-Whitney U test/Chi-square test of independence
LPA dimensions					
CSBD-19$_{porn}$ Composite[a]	32.55 (12.46)	ω = 0.96 [0.96–0.96]	32.35 (11.53)	ω = 0.95 [0.95–0.96]	U = 631,652, p = 0.59, R_{bc} = −0.01
CSBD-19$_{porn}$ Control	5.51 (2.56)	ω = 0.92 [0.92–0.93]	5.45 (2.45)	ω = 0.91 [0.90–0.92]	U = 640133.50, p = 0.99, R_{bc}= <0.01
CSBD-19$_{porn}$ Salience	4.36 (1.90)	ω = 0.83 [0.81–0.85]	4.24 (1.62)	ω = 0.78 [0.76–0.81]	U = 641858.00 p = 0.90, R_{bc}<0.01
CSBD-19$_{porn}$ Relapse	5.61 (2.36)	ω = 0.87 [0.86–0.88]	5.80 (2.34)	ω = 0.87 [0.85–0.88]	U = 609543.50, p = 0.05, R_{bc} = −0.05
CSBD-19$_{porn}$ Dissatisfaction	5.71 (2.61)	ω = 0.92 [0.92–0.93]	5.86 (2.48)	ω = 0.91 [0.90–0.92]	U = 610851.00, p = 0.06, R_{bc} = −0.05
CSBD-19$_{porn}$ Neg. conseq.	11.37 (4.97)	ω = 0.93 [0.92–0.93]	11.00 (4.64)	ω = 0.92 [0.91–0.93]	U = 653492.00, p = 0.38, R_{bc} = 0.02
Tolerance (PPCS)	7.49 (4.32)	ω = 0.89 [0.88–0.90]	7.32 (4.34)	ω = 0.90 [0.89–0.91]	U = 656,914, p = 0.28, R_{bc} = 0.03
Frequency of use	5.19 (1.84)	N/A	5.13 (1.90)	N/A	U = 662,548, p = 0.15, R_{bc} = 0.04
Moral disapproval	1.97 (1.63)	N//A	1.82 (1.47)	N//A	U = 658,096, p = 0.18, R_{bc} = 0.03
Religiosity	1.31 (1.47)	N/A	0.76 (1.17)	N/A	U = 766,900, p < 0.001, R_{bc} = 0.20
Auxiliary variables					
Distress (DASS-10)	6.42 (6.35)	ω = 0.93 [0.92–0.94]	6.35 (6.03)	ω = 0.93 [0.92–0.94]	U = 632,796, p = 0.64, R_{bc} = −0.01
Trait impulsivity (SUPPS-P)					
Sensation seeking	9.39 (2.69)	ω = 0.68 [0.65–0.71]	9.72 (2.60)	ω = 0.65 [0.62–0.69]	U = 599,101, p < 0.01, R_{bc} = −0.06
Lack of premeditation	7.18 (1.98)	ω = 0.79 [0.77–0.81]	7.48 (1.94)	ω = 0.80 [0.78–0.82]	U = 585,043, p < 0.001, R_{bc} = −0.09
Lack of perseverance	7.73 (1.99)	ω = 0.70 [0.68–0.73]	7.99 (1.86)	ω = 0.69 [0.66–0.73]	U = 591,634, p < 0.01, R_{bc} = −0.08
Positive urgency	7.53 (2.67)	ω = 0.82 [0.80–0.83]	7.55 (2.51)	ω = 0.82 [0.80–0.84]	U = 633,004, p = 0.65, R_{bc} = −0.01
Negative urgency	8.73 (2.89)	ω = 0.80 [0.78–0.82]	8.82 (2.69)	ω = 0.80 [0.78–0.82]	U = 631,960, p = 0.60, R_{bc} = −0.01
Trait compulsivity (CHI-T)					
Perfectionism	2.15 (0.69)	ω = 0.77 [0.75–0.79]	2.09 (0.65)	ω = 0.75 [0.72–0.77]	U = 680,130, p < 0.01, R_{bc} = 0.06
Reward drive	3.93 (2.08)	ω = 0.70 [0.67–0.73]	4.18 (1.88)	ω = 0.65 [0.62–0.69]	U = 596,034, p < 0.01, R_{bc} = −0.07
Cognitive rigidity	11.41 (3.59)	ω = 0.72 [0.70–0.74]	11.45 (3.01)	ω = 0.63 [0.59–0.66]	U = 643,228, p = 0.84, R_{bc}<0.01
Personality (BFI)					
Openness	7.44 (1.94)	N/A	7.11 (1.86)	N/A	U = 706,383, p < 0.001, R_{bc} = 0.10
Extraversion	5.09 (2.26)	N/A	5.23 (2.13)	N/A	U = 614,767, p = 0.10, R_{bc} = −0.04
Conscientiousness	7.37 (1.87)	N/A	7.02 (1.84)	N/A	U = 708,152, p < 0.001, R_{bc} = 0.11
Agreeableness	6.77 (1.96)	N/A	7.01 (1.80)	N/A	U = 595,104, p < 0.001, R_{bc} = −0.07
Neuroticism	5.43 (2.24)	N/A	5.56 (2.16)	N/A	U = 618,586, p = 0.17, R_{bc} = −0.03
Sought or considered treatment	126 (9)	N/A	85 (9)	N/A	χ^2 (1) = 0.58, p = 0.45, V = 0.02

Note. [a]CSBDporn composite score was not included in the LPA but presented here to allow the reader to compare each profile's score to the suggested cut-off (≥50) for the original CSBD-19 scale. BFI = Big Five Inventory (10-item), CHI-T = Cambridge-Chicago Compulsivity Trait Scale, CSBD-19porn = Compulsive Sexual Behaviour Disorder-19 scale modified for pornography use, CSBD-19porn Neg. Conseq. = *Negative consequences* subscale from the CSBD-19$_{porn}$. DASS-10 = 10-item version of the Depression, Anxiety and Stress scale, LPA = Latent Profile Analysis. Religiosity measured on five-point Likert scale (0 = *Definitely not*, 4 = *Definitely yes*),R_{bc} = Rank biserial correlation coefficient, Tolerance (PPCS) = *Tolerance* subscale from the Problematic Pornography Consumption Scale.

Group differences across samples, where observed, all had small effect sizes (although religious denomination was approached a medium effect size).

Latent profile analysis

Fit indices for LPA solutions with 1–10 profiles for each sample are presented in Table 3 (also see Supplementary Material 1 for elbow plots for each sample).

Sample 1 (USA). Fit indices continually decreased as more profiles were added, indicating an ambiguous solution (likely due to the relatively large sample size; see Supplementary Material 1 for elbow plots). Examination of elbow plots suggested either a five- or seven-class solution as the optimal model. The five-class (rather than seven-class) solution was selected as the final model given superior entropy value (0.93 Vs 0.88) and greater model parsimony. Estimated profiles are presented in Fig. 1 and Table 4 (statistical significance for pairwise comparisons across profiles are indicated in Table 4, while effect sizes are indicated in the Supplementary Material 3).

Not at risk/low risk profiles. The first group (Profile 1) had the largest membership (n = 640, 47.20%) and endorsed low levels of PPU (CSBD-19$_{porn}$ M = 21.99, SD = 3.35) and low levels of moral disapproval of pornography (M = 1.22, SD = 0.60). This profile was therefore termed "not at risk". The second group (Profile 2; n = 360, 26.54%) also endorsed relatively low levels of PPU severity (CSBD-19$_{porn}$ M = 36.66, SD = 4.64) and low levels of moral disapproval (M = 1.39, SD = 0.66), but were appreciably higher than the first group on both dimensions. Accordingly, the second profile was termed "low risk".

Hypothesised at-risk profiles. The third group (Profile 3; n = 114, 8.40%) also endorsed comparably low levels of PPU to the low-risk group (M = 35.49, SD = 7.21). However, this group reported elevated levels of moral disapproval of pornography (M = 5.09, SD = 1.15), somewhat frequent pornography use (M = 4.67, SD = 2.07; i.e., typically between weekly and monthly) and were typically religious (M = 2.66, SD = 1.43). This group was therefore deemed to be at risk for religiosity-based MI. However, contrary to predictions, this group did not report elevated levels of psychological distress or a propensity for treatment-seeking (discussed further in the subsequent section on auxiliary dimensions). As such, this profile did not align with the criteria for clinical relevance as originally hypothesised.

The fourth group (Profile 4; n = 107, 7.89%) exceeded the proposed cut-off score for being at risk for PPU (≧50 on the CSBD-19$_{porn}$; M = 55.62, SD = 6.47) and also endorsed elevated levels of moral disapproval toward pornography (M = 5.29, SD = 1.27) and religiosity (M = 2.76, SD = 1.24). This group was therefore deemed "At risk for co-occurring PPU and religiosity-based MI"). The fifth group (Profile 5; n = 135, 9.96%) also exceeded the proposed cut-off score for PPU (CSBD-19$_{porn}$ M = 50.88, SD = 5.85), but endorsed low levels of moral disapproval (M = 1.81, SD = 0.90) and were therefore referred to as "At risk for PPU". Both of these groups were considered

Table 3. Fit indices for class enumeration across samples. Bold values indicate the final class solution for each sample

Classes	AIC	BIC	CAIC	SABIC	Entropy	n_min	n_max	BLRT_p
Sample 1 (USA; *N* = 1,356)								
1	56,229	56,504	56,323	56,265	1.00	1.00	1	
2	52,331	52,069	51,980	51,898	0.908	0.361	0.639	<0.001
3	50,506	50,544	50,385	50,349	0.92	0.154	0.498	<0.001
4	50,463	50,511	50,311	50,264	0.868	0.115	0.399	<0.001
5	**49,746**	**49,804**	**49,562**	**49,505**	**0.925**	**0.079**	**0.472**	**<0.001**
6	49,664	49,732	49,448	49,380	0.898	0.075	0.367	<0.001
7	49,527	49,605	49,279	49,201	0.881	0.046	0.342	<0.001
8	49,591	49,679	49,311	49,223	0.804	0.047	0.263	0.545
9	49,627	49,725	49,316	49,217	0.79	0.061	0.220	<0.001
10	49,646	49,754	49,303	49,194	0.757	0.000	0.225	<0.001
Sample 2 (UK; *N* = 944)								
1	37,958	38,221	38,045	37,988	1.00	1.00	1.00	
2	35,230	35,366	35,277	35,176	0.914	0.297	0.703	<0.001
3	34,428	34,468	34,347	34,209	0.901	0.156	0.501	<0.001
4	34,235	34,468	34,315	34,141	0.875	0.0657	0.431	<0.001
5	34,049	34,330	34,146	33,934	0.826	0.0487	0.345	<0.001
6	33,619	33,949	33,733	33,485	0.884	0.0413	0.400	<0.001
7	**33,190**	**33,790**	**33,542**	**33,257**	**0.869**	**0.0434**	**0.351**	**<0.001**
8	33,124	33,624	33,345	33,023	0.876	0.0159	0.342	<0.001
9	33,133	33,609	33,298	32,939	0.87	0.0169	0.332	<0.001
10	33,075	33,599	33,256	32,861	0.866	0.0169	0.315	<0.001

Note: AIC = Akaike Information Criterion, BIC = Bayesian Information Criterion, CAIC = Corrected Akaike Information Criterion, SABIC = sample size adjusted Bayesian Information Criterion, n_min = minimum number of individuals included in each profile, n_max = maximum number of individuals included in each profile, BLRT_p = p value for the Bootstrapped Likelihood Ratio Test.

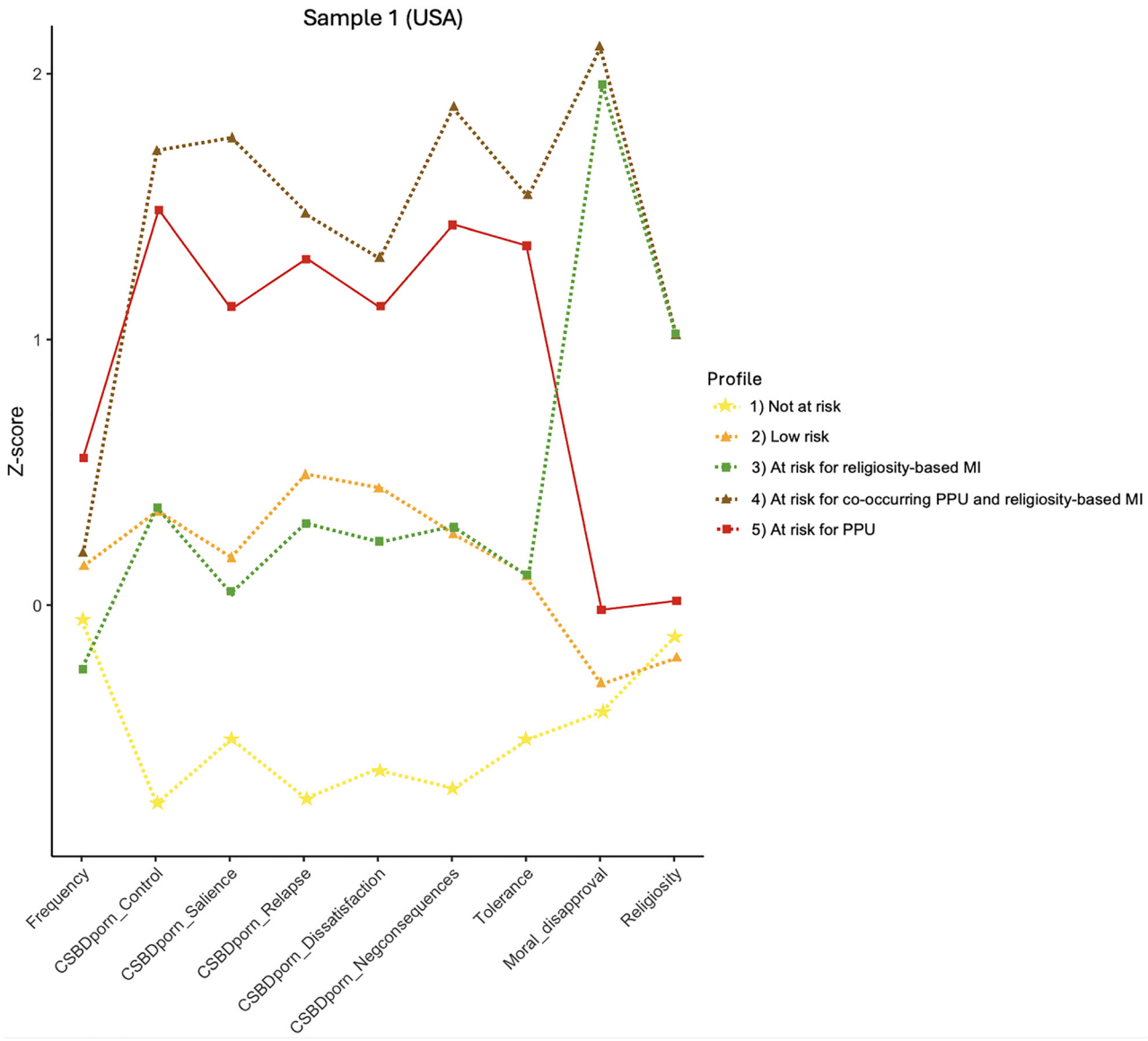

Fig. 1. Latent profile analysis (five-class solution) for Sample 1.

Note. CSBD_19$_{porn}$ = Compulsive Sexual Behavior Disorder Scale-19 modified for pornography use, Moral_disapproval = Single item for moral disapproval of pornography, *PPU_Control* = 'Control' dimension from the CSBD_19$_{porn}$ scale, *PPU_Dissatisfaction* = 'Dissatisfaction' dimension from the CSBD_19$_{porn}$ scale, *PPU_Neg_conseq* = 'Negative consequences' dimension from the CSBD_19$_{porn}$ scale, *PPU_Relapse* = 'Relapse' dimension from the CSBD_19$_{porn}$ scale, *PPU_Salience* = 'Salience' dimension from the CSBD_19$_{porn}$ scale, *PPU_Tolerance* = 'Tolerance' dimension from the Problematic Porngraphy Consumption Scale, *Usage_frequency* = Frequency of pornography use, Religiosity = Single item measuring self-reported religiosity.

clinically relevant based on elevated psychological distress and history of considering/seeking treatment for pornography-related concerns (elaborated in the following sub-section).

Comparisons across profiles on auxiliary dimensions. As shown in Table 4 (and Supplementary Material 3), the groups displayed statistically significant differences of primarily small to medium effect across several auxiliary variables, particularly for the two profiles with elevated PPU severity compared to the remaining profiles: Profile 4 (At risk for co-occurring PPU and religiosity-based MI) and Profile 5 (At risk for PPU). These groups were notably younger than the others and exhibited the highest levels of psychological distress, trait impulsivity (positive and negative urgency), and trait compulsivity (reward drive and cognitive rigidity, but not perfectionism). In contrast, Profile 3 (At risk for religiosity-based MI) showed distinct personality traits, characterised by higher conscientiousness and lower neuroticism compared to the profiles with elevated PPU severity. No meaningful statistically significant group differences were found regarding relationship status or frequency of other sexual activities (pornography-free masturbation or partnered sex).

As noted above, Profile 3 (At risk for religiosity-based MI) did not exhibit key markers typically associated with clinically significant presentations. This group experienced low

Table 4. Group comparisons (ANOVA with 2,500 bootstrap permutations) across profiles (Sample 1) presented as mean (SD) or n (%)

	Total Sample (N = 1,356)	Skewness (Kurtosis)	Profile 1 Not at risk (n = 640; 47%)	Profile 2 Low risk (n = 360; 27%)	Profile 3 At risk for religious-based MI (n = 114; 8%)	Profile 4 At risk for co-occurring PPU and religious-based MI (n = 107; 8%)	Profile 5 At risk for PPU (n = 135; 10%)	$F(H)$[a]	η^2
LPA variables									
CSBDporn Composite[b]	32.55 (12.46)	0.74 (−0.31)	21.99 (3.35)^{1,2,3,4}	36.66 (4.64)^{1,4,5}	35.49 (7.21)^{1,4,5}	55.62 (6.47)^{1,2,3,5}	50.88 (5.85)^{1,2,3,4}	11102.05***	0.86
CSBDporn Control	5.51 (2.56)	0.76 (−0.39)	3.44 (0.86)^{2,3,4,5}	6.28 (1.43)^{1,4,5}	6.31 (1.61)^{1,4,5}	9.70 (1.56)^{1,2,3,5}	9.24 (1.60)^{1,2,3,4}	1038.39***	0.76
CSBDporn Salience	4.36 (1.90)	1.51 (1.93)	3.28 (0.74)^{2,3,4,5}	4.56 (1.49)^{1,4,5}	4.39 (1.51)^{1,4,5}	7.59 (2.35)^{1,2,3,5}	6.36 (1.93)^{1,2,3,4}	632.42***	0.49
CSBDporn Relapse	5.61 (2.36)	0.5 (−0.71)	3.74 (1.16)^{2,3,4,5}	6.67 (1.43)^{1,3,4,5}	6.21 (1.71)^{1,2,4,5}	8.93 (1.56)^{1,2,3}	8.58 (1.51)^{1,2,3}	922.50***	0.67
CSBDporn Dissatisfaction	5.71 (2.61)	0.52 (−0.85)	3.94 (1.60)^{2,3,4,5}	6.70 (2.09)^{1,3,4,5}	6.14 (2.25)^{1,2,4,5}	9.00 (1.67)^{1,2,3}	8.44 (2.18)^{1,2,3}	672.13***	0.49
CSBDporn Negative conseq.	11.37 (4.97)	1.01 (0.13)	7.60 (1.28)^{2,3,4,5}	12.46 (2.98)^{1,4,5}	12.45 (3.67)^{1,4,5}	20.40 (3.66)^{1,2,3,5}	18.27 (3.35)^{1,2,3,4}	988.81***	0.74
Tolerance	7.49 (4.32)	0.89 (0.01)	5.05 (2.62)^{2,3,4,5}	7.76 (3.36)^{1,4,5}	7.75 (3.38)^{1,4,5}	13.88 (3.87)^{1,2,3}	13.10 (3.36)^{1,2,3}	596.17***	0.49
Frequency of use	5.19 (1.84)	0.03 (−0.38)	4.97 (1.88)^{2,5}	5.34 (1.64)^{1,3,5}	4.67 (2.07)^{2,4,5}	5.45 (1.92)^{3,5}	6.11 (1.57)^{1,2,3,4}	60.16***	0.04
Moral disapproval	1.97 (1.63)	1.71 (1.93)	1.22 (0.60)^{2,3,4,5}	1.39 (0.66)^{1,3,4,5}	5.09 (1.15)^{1,2,5}	5.29 (1.27)^{1,2,5}	1.81 (0.90)^{1,2,3,4}	788.01***	0.77
Religiosity	1.41 (1.47)	0.63 (−1.12)	1.04 (1.37)^{3,4}	0.96 (1.26)^{3,4}	2.66 (1.43)^{1,2,5}	2.76 (1.24)^{1,2}	1.24 (1.33)^{4,3}	219.02***	0.18
Auxiliary variables									
Age (years)	36.86 (11.26)	0.84 (0.49)	38.27 (38.27)^{4,5}	37.49 (37.49)^{4,5}	37.35 (37.35)^{4,5}	31.37 (31.37)^{1,2,3}	32.43 (32.43)^{1,2,3}	60.44***	0.04
Relationship status								X^2 (16) = 26.49, p = 0.05	
Single	546 (40)	–	236 (37)	156 (43)	45 (39)	49 (46)	60 (44)		
In a relationship	284 (21)	–	140 (22)	82 (23)	15 (14)	15 (14)	32 (24)		
Married	462 (34)	–	226 (35)	106 (29)	48 (42)	41 (38)	41 (30)		
Divorced/separated	58 (4)	–	35 (5)	13 (4)	6 (5)	2 (2)	2 (1)		
Widowed	6 (1)	–	3 (1)	3 (1)	0 (0)	0 (0)	0 (0)		
Frequency of partnered sex[c]	3.82 (2.35)	0.68 (−0.23)	3.84 (2.36)	3.67 (2.45)	3.90 (2.06)	4.05 (2.19)	3.88 (2.38)	5.18	<0.01
Frequency of porn-free masturbation	3.00 (2.26)	1.29 (0.89)	2.97 (2.19)	2.88 (2.20)	2.88 (2.40)	3.45 (2.57)	3.27 (2.32)	7.00	<0.01
DASS-10	6.42 (6.35)	0.98 (0.19)	4.09 (4.96)^{2,3,4,5}	6.53 (5.50)^{1,4,5}	6.33 (5.80)^{1,4,5}	13.54 (6.93)^{1,2,3,5}	11.55 (7.11)^{1,2,3,4}	266.48***	0.23
SUPPS-P									
Sensation seeking	9.39 (2.69)	−0.04 (−0.56)	9.19 (2.81)^{4}	9.30 (2.54)^{4}	9.74 (2.56)	10.27 (2.63)^{1,2}	9.63 (2.51)	19.61***	0.01
Lack of premeditation	7.18 (1.98)	0.28 (0.23)	6.82 (1.92)^{2,3,5}	7.50 (1.93)^{1}	7.39 (2.02)^{1}	7.32 (1.96)	7.75 (2.07)^{1}	45.64***	0.03
Lack of perseverance	7.73 (1.99)	0.19 (0.18)	7.55 (1.95)^{2}	8.02 (1.94)^{1}	7.69 (2.13)	7.54 (1.92)	7.96 (2.17)	16.14***	0.01

(continued)

Table 4. Continued

	Total Sample (N = 1,356)	Skewness (Kurtosis)	Profile 1 Not at risk (n = 640; 47%)	Profile 2 Low risk (n = 360; 27%)	Profile 3 At risk for religious-based MI (n = 114; 8%)	Profile 4 At risk for co-occurring PPU and religious-based MI (n = 107; 8%)	Profile 5 At risk for PPU (n = 135; 10%)	$F(H)$[a]	η^2
Positive urgency	7.53 (2.67)	0.48 (−0.32	6.59 (2.46)^{2,3,4,5}	7.79 (2.32)^{1,4,5}	8.06 (2.51)^{1,4}	9.98 (2.85)^{1,2,3,5}	8.90 (2.42)^{1,2,4}	214.40***	0.16
Negative urgency	8.73 (2.89)	0.08 (−0.67)	7.56 (2.70)^{2,3,4,5}	9.14 (2.50)^{1,4,5}	9.30 (2.75)^{1,4,5}	11.34 (2.20)^{1,2,3}	10.64 (2.51)^{1,2,3}	267.17***	0.19
CHI-T									
Perfectionism	2.15 (0.69)	−0.55 (0.38)	2.22 (0.68)^{2}	2.06 (0.66)^{1}	2.18 (0.75)	2.11 (0.70)	2.11 (0.70)	16.12***	0.01
Reward drive	3.93 (2.08)	0.04 (−0.50)	3.14 (2.03)^{2,3,4,5}	4.22 (1.76)^{1,4,5}	4.02 (1.84)^{1,4,5}	5.73 (1.69)^{1,2,3}	5.34 (1.67)^{1,2,3}	246.52***	0.18
	11.41 (3.59)	−0.20 (0.41)	10.47 (3.84)^{2,3,4,5}	11.74 (3.01)^{1,4,5}	11.61 (3.31)^{1,4,5}	13.75 (3.06)^{1,2,3}	12.98 (2.83)^{1,2,3}	117.26***	0.09
Personality (BFI)									
Openness	7.44 (1.94)	−0.46 (−0.32)	7.62 (2.00)^{3}	7.36 (1.91)	7.07 (1.95)^{1}	7.07 (1.70)	7.44 (1.79)	3.47***	0.01
Extraversion	5.09 (2.26)	0.35 (−0.75)	5.28 (2.38)	4.92 (2.22)	5.25 (2.14)	4.73 (1.95)	4.78 (2.08)	3.04*	<0.01
Conscientiousness	7.37 (1.87)	−0.26 (−0.81)	7.76 (1.83)^{2,4,5}	7.06 (1.73)^{1,3}	7.68 (1.86)^{1,2,4,5}	6.63 (1.99)^{1,3,5}	6.68 (1.84)^{1,3}	19.96***	0.06
Agreeableness	6.77 (1.96)	−0.35 (−0.43)	7.00 (2.03)^{5}	6.65 (1.85)	6.68 (1.89)	6.51 (1.91)	6.33 (1.87)^{1}	4.74***	0.01
Neuroticism	5.43 (2.24)	0.24 (−0.80)	4.98 (2.25)^{2,4,5}	5.63 (2.19)^{4,5}	5.48 (2.17)^{1,4,5}	6.32 (1.95)^{1,2,3}	6.28 (2.12)^{1,2,3}	16.92***	0.05
Sought/considered treatment		–	5 (1)	29 (8)	9 (8)	51 (48)	41 (30)	X^2 (14) = 299.86, p < 0.001	

Note: BFI = Big Five Intentory (10-item), Conseq. = Consequences, CSBDporn = Compulsive Sexual Behaviour Disorder-19 scale modified for pornography use, CHI-T = Cambridge-Chicago Compulsivity Trait Scale, DASS-10 = 10-item version of the Depression, Anxiety and Stress scale, LPA = Latent Profile Analysis. Religiosity measured on a five-point Likert scale (0 = Not at all, 4 = Very religious). Frequency of sexual behaviours (pornography use, porn-free masturbation, partnered sex) measured on a nine-point scale (1 = *Never*, 9 = *Multiple times per day*). Sought/considered treatment = binary variable indicating previously considering/seeking treatment for pornography use (0 = *No*, 1 = *Yes*), [a]H represents the Kruskal-Wallis H test results to account for non-normality. [b]CSBDporn Composite score not included in the LPA but presented here to allow the reader to compare each profile's score to the suggested cut-off (≥50) for the original CSBD-19 scale. [c]Includes only those with history of partnered sex (n = 1,219).

*p < 0.05.

***p < 0.001.

psychological distress and rarely sought or considered treatment for pornography-related concerns. In contrast, the other at-risk profiles—Profile 4 (At risk for co-occurring PPU and religiosity-based MI) and Profile 5 (At risk for PPU)—were characterised by higher levels of psychological distress and a greater likelihood of treatment-seeking behaviours, distinguishing them from the religiosity-based MI group.

Sample 2 (UK). Fit indices for Sample 2 also continually decreased as more profiles were added to the model (File S1). As the eight- to ten-class solutions each contained at least one group with very low membership (n_{min}ranging between 1.59% and 1.69%), these solutions were rejected. Comparison of the six- and seven-class solutions indicated comparable entropy values (0.88 and 0.87, respectively). The six-class solution included a class which was difficult to interpret, while the seven-class solution showed superior theoretical alignment (described in Supplementary Material 2). As such, the seven-class model was retained as the final model. Estimated profiles are presented in Fig. 2 and Table 5

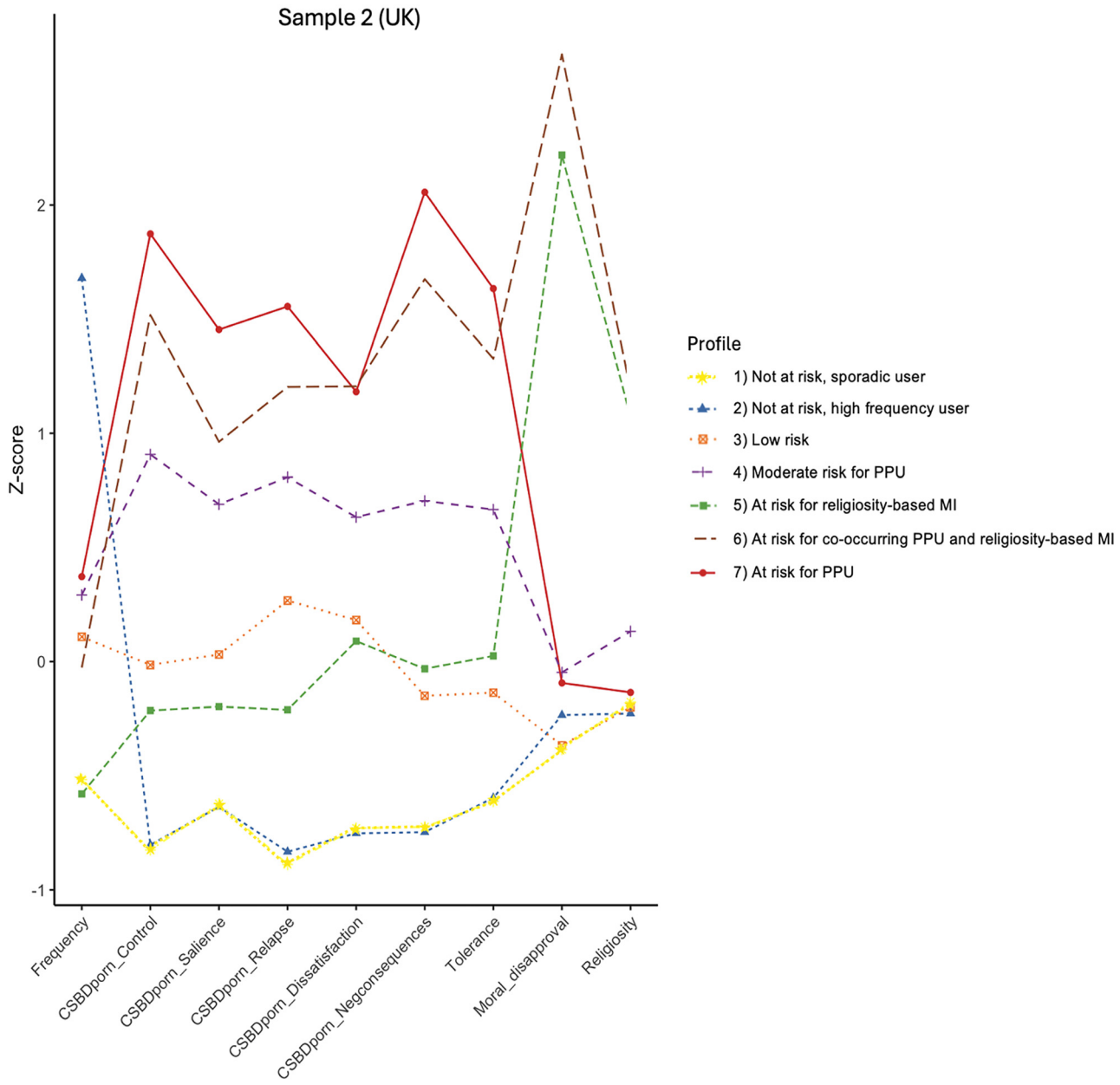

Fig. 2. Latent profile analysis (seven-class solution) for Sample 2.

Note. CSBD_19$_{porn}$ = Compulsive Sexual Behavior Disorder Scale-19 modified for pornography use, Moral_disapproval = Single item for moral disapproval of pornography, *PPU_Control* = 'Control' dimension from the CSBD_19$_{porn}$ scale, *PPU_Dissatisfaction* = 'Dissatisfaction' dimension from the CSBD_19$_{porn}$ scale, *PPU_Neg_conseq* = 'Negative consequences' dimension from the CSBD_19$_{porn}$ scale, *PPU_Relapse* = 'Relapse' dimension from the CSBD_19$_{porn}$ scale, *PPU_Salience* = 'Salience' dimension from the CSBD_19$_{porn}$ scale, *PPU_Tolerance* = 'Tolerance' dimension from the Problematic Porngraphy Consumption Scale, *Usage_frequency* = Frequency of pornography use, Religiosity = Single item measuring self-reported religiosity.

Table 5. Group comparisons (ANOVA with 2,500 bootstrap permutations) across profiles (Sample 2) presented as mean (SD) or n (%)

	Total Sample (N = 944)	Skewness (kurtosis)	Profile 1 Not at risk (sporadic user) n = 331, 35%	Profile 2 Not at risk (frequent user) n = 51, 5%	Profile 3 Low risk n = 266, 28%	Profile 4 Moderate risk for PPU n = 136, 14%	Profile 5 At risk for religious-based MI n = 41, 4%	Profile 6 At risk for co-occurring PPU ad religious-based MI n = 60, 6%	Profile 7 At risk for PPU n = 59, 6%	$F(H)$[a]	η^2
LPA variables											
CSBDporn Composite[b]	32.35 (11.53)	0.81 (0.01)	21.96 (2.97)^{3,4,5,6,7}	21.94 (3.04)^{3,4,5,6,7}	32.80 (3.91)^{1,2,4,6,7}	42.65 (4.13)^{1,2,3,5,6,7}	30.95 (6.16)^{1,2,4,6,7}	51.22 (7.47)^{1,2,3,4,5,7}	55.59 (5.50)^{1,2,3,4,5,6}	937.00***	0.87
CSBDporn Control	5.45 (2.45)	0.80 (−0.24)	3.42 (0.82)^{3,4,5,6,7}	3.47 (0.76)^{3,4,5,6,7}	5.41 (1.28)^{1,2,4,6,7}	7.73 (1.30)^{1,2,3,5,6,7}	4.85 (1.46)^{1,2,4,6,7}	9.18 (1.64)^{1,2,3,4,5,7}	10.10 (1.32)^{1,2,3,4,5,6}	711.51***	0.78
CSBDporn Salience	4.24 (1.62)	1.21 (0.73)	3.21 (0.57)^{2,3,4,5,6,7}	3.20 (0.72)^{1,3,4,6,7}	4.30 (1.26)^{1,2,4,6,7}	5.41 (1.64)^{1,2,3,5,7}	3.90 (1.36)^{1,4,6,7}	5.83 (1.95)^{1,2,3,5,7}	6.59 (1.70)^{1,2,3,4,5,6}	419.10***	0.44
CSBDporn Relapse	5.80 (2.34)	0.45 (−0.59)	3.66 (1.01)^{3,4,5,6,7}	3.88 (1.18)^{3,4,5,6,7}	6.47 (1.35)^{1,2,4,5,6,7}	7.72 (1.45)^{1,2,3,5,6,7}	5.27 (1.52)^{1,2,3,4,6,7}	8.62 (1.80)^{1,2,3,4,5,7}	9.47 (1.39)^{1,2,3,4,5,6}	358.38***	0.70
CSBDporn Dissatisfaction	5.86 (2.48)	0.40 (−0.81)	4.03 (1.60)^{3,4,5,6,7}	3.96 (1.67)^{3,4,5,6,7}	6.32 (1.87)^{1,2,4,6,7}	7.47 (1.80)^{1,2,3,5,6,7}	6.10 (2.43)^{1,2,4,6,7}	8.83 (1.88)^{1,2,3,4,5}	8.81 (2.08)^{1,2,3,4,5}	141.40***	0.48
CSBDporn Neg. conseq.	11.00 (4.64)	1.17 (0.64)	7.64 (1.25)^{3,4,5,6,7}	7.43 (0.90)^{3,4,5,6,7}	10.30 (2.63)^{1,2,4,6,7}	14.32 (3.07)^{1,2,3,5,6,7}	10.83 (2.62)^{1,2,4,6,7}	18.75 (3.82)^{1,2,3,4,5,7}	20.61 (2.70)^{1,2,3,4,5,6}	451.28***	0.74
Tolerance	7.32 (4.34)	1.01 (0.24)	4.62 (2.30)^{3,4,5,6,7}	4.76 (2.00)^{3,4,5,6,7}	6.72 (3.02)^{1,2,4,6,7}	10.35 (3.65)^{1,2,3,5,6,7}	7.41 (4.11)^{1,2,4,6,7}	13.13 (4.46)^{1,2,3,4,5}	14.47 (3.24)^{1,2,3,4,5}	165.84***	0.52
Frequency of use	5.13 (1.90)	0.28 (−0.23)	4.17 (1.42)^{2,3,4,6,7}	8.84 (0.46)^{1,3,4,5,6,7}	5.35 (1.66)^{1,2,5}	5.71 (1.53)^{1,2,5}	4.05 (2.16)^{2,3,4,6,7}	5.03 (1.95)^{1,2,5,7}	5.88 (1.51)^{1,2,5,6}	79.10***	0.34
Moral disapproval	1.82 (1.47)	2.04 (3.43)	1.24 (0.54)^{2,4,5,6,7}	1.57 (0.90)^{1,5,6}	1.28 (0.56)^{4,5,6,7}	1.77 (0.94)^{1,3,5,6}	5.07 (1.01)^{1,2,3,4,6,7}	5.73 (1.09)^{1,2,3,4,5,7}	1.64 (0.91)^{1,3,5,6}	487.68***	0.76
Religiosity	0.76 (1.17)	1.40 (0.77)	0.56 (0.97)^{4,5,6}	0.53 (0.90)^{5,6}	0.50 (0.89)^{4,5,6}	0.99 (1.31)^{1,3,5,6}	1.98 (1.51)^{1,2,3,4,7}	2.13 (1.42)^{1,2,3,4,7}	0.54 (1.01)^{5,6}	31.93***	0.17
Auxiliary variables											
Age (years)	38.69 (12.26)	0.62 (−0.20)	40.95 (12.20)^{4,6,7}	40.20 (12.85)^{6}	39.23 (11.84)^{6}	36.18 (12.21)^{1}	35.68 (12.92)	34.08 (11.88)^{1,3}	34.76 (10.76)^{1}	6.07***	0.04
Relationship status										X^2 (24) = 64.30, p < 0.001	
Single	277 (29)	–	90 (27)	10 (20)	87 (33)	41 (30)	11 (27)	20 (33)	18 (31)		
In a relationship	334 (35)	–	109 (33)	21 (41)	94 (35)	51 (38)	14 (34)	18 (30)	27 (46)		
Married	306 (32)	–	127 (38)	16 (31)	78 (29)	39 (29)	15 (37)	20 (33)	11 (19)		
Divorced/ separated	23 (2)	–	5 (2)	1 (2)	7 (3)	5 (4)	0 (0)	2 (3)	3 (5)		
Widowed	4 (1)	–	0 (0)	3 (6)	0 (0)	0 (0)	1 (2)	0 (0)	0 (0)		
Freq. of partnered sex[c]	3.89 (2.40)	0.80 (−0.08)	4.08 (2.37)	4.10 (2.41)	3.69 (2.31)	3.84 (2.52)	4.28 (2.60)	3.77 (2.58)	3.51 (2.38)	1.13	<0.01
Freq. of porn-free mast.	3.23 (2.42)	1.22 (0.55)	3.12 (2.21)	3.49 (2.80)	3.33 (2.55)	3.26 (2.46)	2.46 (2.05)	3.55 (2.68)	3.32 (2.36)	1.17	<0.01
DASS-10 (psych. distress)	6.35 (6.03)	1.02 (0.52)	4.31 (4.92)^{3,4,6,7}	4.75 (4.61)^{4,6,7}	5.96 (5.54)^{1,4,6,7}	8.76 (6.03)^{1,2,3,5,7}	5.54 (6.07)^{4,6,7}	10.38 (6.59)^{1,2,3,5}	11.93 (7.22)^{1,2,3,4,5}	27.81***	0.15
SUPPS-P (trait impulsivity)											
Sensation seeking	9.72 (2.60)	0.00 (−0.52)	9.70 (2.69)	10.20 (2.54)	9.48 (2.53)	9.95 (2.46)	10.29 (2.38)	9.92 (2.95)	9.37 (2.54)	1.40	<0.01
Lack of premeditation	7.48 (1.94)	0.32 (0.70)	7.19 (1.83)^{4}	7.22 (1.78)	7.35 (1.93)^{4}	8.13 (2.05)^{1,3}	8.10 (1.95)	7.50 (1.77)	7.97 (2.21)	5.59***	0.03
Lack of perseverance	7.99 (1.86)	0.22 (0.75)	7.94 (1.78)	7.71 (1.69)	7.97 (1.81)	8.29 (2.09)	7.93 (2.04)	7.80 (1.98)	8.22 (1.84)	1.08	<0.01
Positive urgency	7.55 (2.51)	0.51 (−0.06)	6.71 (2.32)^{3,4,5,6,7}	6.90 (2.27)^{4,5,6,7}	7.47 (2.25)^{1,4,6,7}	8.50 (2.39)^{1,2,3,6,7}	8.63 (2.90)^{1,2}	8.93 (2.77)^{1,2,3}	8.83 (2.55)^{1,2,3}	18.84***	0.11
Negative urgency	8.82 (2.69)	0.14 (−0.49)	7.67 (2.49)^{2,3,4,5,6,7}	7.43 (2.21)^{3,4,5,6,7}	8.94 (2.34)^{1,2,4,6,7}	9.99 (2.41)^{1,2,3,7}	9.37 (2.88)^{1,2,7}	10.33 (2.60)^{1,2,3}	11.25 (2.49)^{1,2,3,4,5}	34.19***	0.18
CHI-T (trait compulsivity)											
Perfectionism	2.09 (0.65)	−0.29 (0.14)	2.11 (0.62)	2.16 (0.64)	2.09 (0.60)	2.00 (0.73)	2.24 (0.49)	2.03 (0.82)	1.97 (0.64)	1.44	<0.01
Reward drive	4.18 (1.88)	0.04 (−0.21)	3.48 (1.78)^{3,4,5,6,7}	3.41 (1.88)^{3,4,6,7}	4.21 (1.59)^{1,2,4,6,7}	4.92 (1.78)$^{1.2.3.7}$	4.44 (2.05)^{1,7}	5.10 (1.79)^{1,2,3}	5.83 (1.72)^{1,2,3,4,5}	26.48***	0.14
Cognitive rigidity	11.45 (3.01)	−0.02 (0.20)	10.61 (2.98)^{3,4,5,6,7}	10.08 (3.15)^{3,4,5,6,7}	11.56 (2.81)^{1,2,7}	12.33 (2.68)^{1,2}	12.61 (3.06)^{1,2}	12.60 (2.76)^{1,2}	12.81 (2.98)^{1,2,3}	13.56***	0.08

(continued)

Table 5. Continued

	Total Sample (N = 944)	Skewness (kurtosis)	Profile 1 Not at risk (sporadic user) n = 331, 35%	Profile 2 Not at risk (frequent user) n = 51, 5%	Profile 3 Low risk n = 266, 28%	Profile 4 Moderate risk for PPU n = 136, 14%	Profile 5 At risk for religious-based MI n = 41, 4%	Profile 6 At risk for co-occurring PPU ad religious-based MI n = 60, 6%	Profile 7 At risk for PPU n = 59, 6%	$F(H)^a$	η^2
Personality (BFI)											
Openness	7.11 (1.86)	−0.34 (−0.43)	7.11 (1.87)	6.9 (1.89)	7.18 (1.87)	7.08 (1.77)	6.80 (1.74)	7.22 (1.80)	7.00 (2.12)	0.36	<0.01
Extraversion	5.23 (2.13)	0.40 (−0.57)	5.49 (2.20)^{7}	5.45 (2.32)	5.06 (2.07)	5.14 (2.05)	5.90 (2.11)^{7}	4.93 (1.91)	4.39 (1.95)^{1,5}	3.69***	0.02
Conscientiousness	7.02 (1.80)	−0.18 (−0.54)	7.41 (1.78)^{7}	7.31 (1.71)^{4,7}	7.04 (1.78)^{4,7}	6.40 (1.93)^{1,2,3}	7.15 (1.67)^{7}	6.78 (1.78)	6.03 (1.88)^{1,2,3,5,7}	8.71***	0.05
Agreeableness	7.01 (1.80)	−0.48 (−0.11)	7.18 (1.90)^{7}	7.57 (1.63)^{7}	6.99 (1.72)	6.71 (1.62)	6.93 (1.94)	7.13 (1.77)	6.31 (1.79)^{1,2}	3.56***	0.02
Neuroticism	5.56 (2.16)	0.25 (−0.70)	5.06 (2.15)^{1,4}	4.80 (1.83)^{1,3,4,7}	5.79 (2.06)^{1,2}	6.24 (2.10)^{2,3}	5.39 (2.18)	5.68 (2.07)	6.36 (2.35)^{2,7}	8.49***	0.05
Sought/considered treatment	85 (9)	–	0 (0)	1 (2)	11 (4)	20 (15)	4 (10)	22 (37)	27 (46)	X^2 (6) = 203.80, p < 0.001	

Note: BFI = Big Five Inventory (10-item), CSBDporn = Compulsive Sexual Behaviour Disorder-19 scale modified for pornography use, CHI-T = Cambridge-Chicago Compulsivity Trait Scale, DASS-10 = 10-item version of the Depression, Anxiety and Stress scale, LPA = Latent profile analysis, SUPPS-P = short version of the UPPS-P impulsivity scale. Religiosity measured on a five-point Likert scale (0 = *Definitely not*, 4 = *Definitely yes*). Frequency of sexual behaviours (pornography use, porn-free masturbation, partnered sex) measured on a 9-point scale (1 = *Never*, 9 = *Multiple times per day*). Neg. conseq. = Negative consequences. Freq. = Frequency, Mast. = Masturbation, Psych. = Psychological.
[a]H represents the Kruskal-Wallis H test results to account for non-normality. [b]CSBDporn Composite score not included in the LPA but presented here to allow the reader to compare each profile's score to the suggested cut-off (≥50) for the original CSBD-19 scale. [c]Includes only those with history of partnered sex (n = 1,219).
*** p < 0.001.

(statistical significance for pairwise comparisons across profiles are indicated in Table 5, while effect sizes are indicated in the Supplementary Material 3).

Not at risk/low risk profiles. Estimated profiles for Sample 2 are presented in Fig. 2 and Table 6. As shown, two groups endorsed low levels of PPU (CSBD-19$_{porn}$ M = 21.96, SD = 2.97; M = 21.94, SD = 3.04, respectively) and moral disapproval of pornography (M = 1.24, SD = 0.54; M = 1.57, SD = 0.90, respectively) and could therefore be considered as "not at risk". However, these groups were differentiated on their frequency of pornography use (M = 4.17, SD = 1.42; M = 8.84, SD = 0.46, respectively) and were therefore termed "Not at risk (sporadic user)" (Profile 1; n = 331, 35.06%) and "Not at risk (frequent user)" (Profile 2; n = 51, 5.40%).

A third group (Profile 3; n = 266, 28.18%) also reported relatively low levels of PPU severity (although notably higher than the first two groups; M = 32.80, SD = 3.91) and moral disapproval of pornography (M = 1.28, SD = 0.56). This group was therefore termed "Low risk". The fourth group (Profile 4; n = 136, 14.41%) reported relatively higher levels of PPU (M = 42.65, SD = 4.13), but fell below the suggested threshold for being at risk for PPU. This group also reported relative low levels of moral disapproval of pornography (M = 1.28, SD = 0.56). This group was therefore deemed to be at "moderate risk" for PPU.

Hypothesised at-risk profiles. A fifth group (Profile 5; n = 41, 4.34%) also endorsed relatively low levels of PPU severity (CSBD-19$_{porn}$ M = 30.95, SD = 6.16), but reported elevated levels of moral disapproval of pornography (M = 5.07, SD = 1.01), somewhat frequent pornography use (M = 4.05, SD = 2.16; i.e., typically between weekly and monthly) and were often religious (M = 1.98, SD = 1.51). This profile was therefore termed "At risk for religiosity-based MI" (i.e., 'self-perceived PPU'). As observed in Sample 1, this group did not endorse elevated psychological distress and reported relatively rare rates of seeking or considering treatment for pornography-related concerns (see section below on *Auxiliary variables*).

A sixth group (Profile 6; n = 60, 6.36%) reported elevated PPU levels that typically exceeded the proposed cut-off (M = 51.22, SD = 7.47). Moreover, this group reported elevated moral disapproval of pornography use (M = 5.73, SD = 1.09), religiosity (M = 2.13, SD = 1.42) and frequency of pornography use (M = 5.03, SD = 1.95). This group was therefore termed "At risk for PPU & religiosity-based MI". Finally, a seventh group (Profile 7; n = 59, 6.25%) reported elevated levels of PPU (M = 55.59, SD = 5.50), but relatively low levels of moral disapproval (M = 1.64, SD = 0.91) and religiosity (M = 0.54, SD = 1.01). This group was therefore termed "At risk for PPU".

As noted above, Profile 5 ("At risk for religiosity-based MI") endorsed minimal markers of clinically relevant characteristics, including relatively low psychological distress (M = 5.54, SD = 6.07) and low rates of considering or seeking treatment for pornography-related concerns

Table 6. Relative proportions of clinically relevant profiles across samples

Class	Sample 1	Sample 2
At risk for religious-based MI[a]	31%	25%
At risk for co-occurring religious-based MI and PPU[b]	31%	37.50%
At risk for PPU[c]	38%	37.50%

Note: [a]Class 3 in Sample 1, Class 5 in Sample 2; [b]Class 4 in Sample 1, Class 6 in Sample 2; [c]Class 5 in Sample 1, Class 7 in Sample 2.

(9.8%). In contrast, the other at-risk profiles exhibited higher psychological distress (Profile 4: "At risk for co-occurring PPU and religiosity-based MI," $M = 10.38$, $SD = 6.59$; Profile 5: "At risk for PPU," $M = 11.93$, $SD = 7.22$) and greater intentions or behaviours related to treatment-seeking (Profile 4: 36.7%; Profile 5: 45.8%), distinguishing them from the religiosity-based MI group.

Comparisons across profiles on auxiliary dimensions. As shown in Table 5, groups meaningfully differed across auxiliary variables in similar ways to Sample 1. The two groups endorsing the highest levels of PPU (Profiles 6 and 7) were again the youngest, but these differences were only statistically different compared to Profile 1 (Not-at risk, sporadic users). Also in line with Sample 1, the highest levels of psychological distress were found in the groups classified as being at risk for PPU (Profile 6: At risk for comorbid PPU and MI; Profile 7: At risk for PPU). This was followed by Profile 4 (At moderate risk for PPU). All other groups were statistically significantly lower on psychological distress. Trait impulsivity was relatively comparable across profiles, but Profiles 6 and 7 demonstrated the highest levels of negative urgency, a facet of impulsivity, compared to other groups. Positive urgency was moderately elevated across all groups with elevated PPU and/or religiosity-based MI (Profiles 4–7), but such differences were less pronounced than negative urgency. Trait compulsivity (specifically reward drive and cognitive rigidity) was also elevated in the two profiles with high PPU severity (Profiles 6 and 7). No statistically significant group differences were observed in offline sexual behaviours, such as partnered sex or pornography-free masturbation. For personality traits, Profile 5 (At risk for religiosity-based MI) endorsed higher conscientiousness and lower neuroticism relative to Profile 7 (At risk for PPU), but was comparable to Profile 6 (At risk for co-occurring PPU and religiosity-based MI) on these dimensions.

As with Sample 1, Profile 5 (At risk for religiosity-based MI) did not exhibit key markers associated with clinically meaningful profiles. This group reported low psychological distress and minimal treatment-seeking tendencies for pornography-related concerns, distinguishing them from the other at-risk profiles. In contrast, Profiles 6 (At risk for co-occurring PPU and religiosity-based MI) and 7 (At risk for PPU) were characterised by elevated psychological distress and greater likelihood of treatment-seeking behaviours, further highlighting the distinct nature of the religiosity-based MI-only group.

Relative proportions of hypothesised at-risk subtypes across samples

The relative rates of membership of the hypothesised subtypes regarding PPU and religiosity-based MI (H_2) are presented in Table 4. Although the sizes of profile membership was comparable across the two samples, the 'PPU-only' profile was slightly smaller in Sample 1, whereas the 'At risk for religiosity-based MI' profile was slightly smaller in Sample 2.

As noted in earlier passages, the religiosity-based MI group did not endorse elevated psychological distress nor tendencies to consider or seek treatment for pornography-related concerns, but are included in these comparisons given the hypothesised profiles related to PPU and religiosity-based MI.

DISCUSSION

This work sought to examine heterogeneity regarding self-reported problematic pornography use (PPU) and religiosity-based moral incongruence (MI) among males who consume Internet pornography. Experts have recently proposed three distinct subtypes in this area, namely: i) a profile characterised by objectively dysregulated and problematic pornography consumption (i.e., PPU), ii) individuals with elevated moral incongruence regarding their pornography use, and iii) individuals with co-occurring PPU and MI (Kraus & Sweeney, 2019; Vaillancourt-Morel & Bergeron, 2019). Although prior research has provided some evidence for this typology (using samples of sub-clinical Chinese males recruited from PPU self-help forums; Chen et al., 2022; Jiang et al., 2022), such work has lacked specificity in how MI is operationalised. Although religiosity is widely considered a core feature of MI (especially in the Western cultural context) (Floyd et al., 2022; Mestre-Bach et al., 2021), no studies to date have specifically measured religiosity-based MI (i.e., concurrent religiosity, moral disapproval of pornography, and at least somewhat frequent usage). To address these shortfalls, we evaluated heterogeneity across PPU and religiosity-based MI heterogeneity using latent profile analysis (LPA) among two independent samples of male pornography users from the United Kingdom and United States.

Summary of results across samples

Results were broadly consistent across samples. Supporting our first hypothesis (h_1), the majority of respondents

reported low levels of PPU and religiosity-based MI, leading to their classification as "not at risk" (40–47%) or "low risk" (27–28%) across these dimensions. These findings align with previous work suggesting that pornography use is often recreational and adaptive, serving to satisfy sexual needs and curiosity (Bőthe, Tóth-Király, et al., 2020; Hald & Malamuth, 2008).

Consistent with previous research in the Western cultural context, we also identified a subset of individuals (limited to the UK sample; 14%) with elevated PPU scores, but which nevertheless fell below proposed cut-off values. This largely aligned with similar estimates in which approximately 20–30% of individuals were classified as moderate or moderate-high risk (although these samples included both men and women; Hernández-Mora Ruiz Del Castillo et al., 2023; Zarate et al., 2023). These observations suggest a non-trivial subset of individuals are potentially prone to developing patterns of PPU.

Results also partially supported our second set of hypotheses (h2), with a significant minority of respondents (15–25%) aligning with a hypothesised subtype of PPU and religiosity-based MI. These individuals could be further classified into a 'PPU only' subtype (6–10%; h_{2a}), a religiosity-based MI group (4–8%; h_{2b}), and a group at risk for co-occurring PPU and religiosity-based MI (6–8%; h_{2c}). Notably, these estimated rates slightly exceed prior prevalence estimates of PPU (3–15%; Bőthe, Tóth-Király, et al., 2020; Dickenson et al., 2018; Maitland & Neilson, 2023; Zarate et al., 2023), potentially reflecting differences in sample characteristics or measurement approaches. Both groups characterised by elevated PPU symptoms (with or without concurrent religiosity-based MI) reported higher levels of clinically relevant covariates such as psychological distress, tendencies to consider or seek treatment for pornography-related concerns, as well as psychopathological (e.g., impulsivity aspects such as negative urgency; compulsive reward seeking) and psychological markers (e.g., lower conscientiousness). This suggests that PPU may be linked with psychological traits in ways similar to other addictive behaviours (e.g., gambling and substance use; Albertella et al., 2020; Leeman & Potenza, 2012; Liu et al., 2022).

These findings also reinforce the notion that PPU and MI may be driven and maintained by different psychological mechanisms (Brand, 2019; Brand, Blycker, & Potenza, 2019). Finally, lower age among the groups with elevated PPU aligns with prior findings (Castro-Calvo, Ballester-Arnal, Giménez-García, García-Barba, & Gil-Llario, 2023; Reid et al., 2012), though it is worth noting that PPU may, in some cases, represent a transient issue (Castro-Calvo et al., 2023). Notably, however, the religiosity-based MI group (h_{2b}) did not exhibit elevated psychological distress or increased tendencies to seek or consider treatment for pornography-related concerns. These results suggest that - in most cases - individuals with religiosity-based moral incongruence do not experience substantial distress or functional impairment. While some cases of religiosity-based MI may involve treatment-seeking despite the absence of PPU symptoms (Kraus & Sweeney, 2019), such instances appear to be relatively uncommon among general population samples. This challenges the assumption that religiosity-based MI necessarily involves significant inner conflict and instead may reflect a form of moral disapproval without pronounced psychological turmoil. This distinction highlights the importance of refining MI-related measures to better differentiate between moral disapproval and genuine moral incongruence.

Strength, limitations, and future directions

Our work contained various notable strengths and limitations. Applying LPA allowed us to uncover important nuances in how PPU and religiosity-based MI can manifest across individuals in ways that may be otherwise obscured in traditional variable-centred approaches. Such information may help researchers and clinicians to move beyond the traditional and dualistic assumption that PPU and MI are competing explanatory frameworks for self-reported PPU. Instead, our findings support the notion that PPU and (religiosity-based) MI are related yet distinct issues, and the identified profiles suggest potentially important phenotypes that may benefit from tailored interventions. Intuitively, cognitive behaviour therapy may be especially suitable for PPU, acceptance and commitment therapy for (religiosity-based) MI, whereas a combination of both approaches may be suitable for individuals with co-occurring concerns (Antons et al., 2022; Brand, 2019). Additionally, the general consistency of results across our two independent samples enhances the reliability of our results.

Our study also extends prior research on proposed subtypes, which have been examined among Chinese men (Chen et al., 2022; Jiang et al., 2022). While broadly aligning with earlier findings, our results diverge slightly in identifying a group characterised by co-occurring PPU and religiosity-based MI (observed in both samples). This discrepancy may reflect methodological factors, such as our specific focus on religiously-based MI rather than more generalised MI, as well as cultural differences. Notably, MI in Western contexts may be shaped by unique religious and cultural influences inherent to our North American and UK samples (Ahorsu et al., 2023; Su et al., 2023).

Several limitations should also be noted. Our sampling was limited to all-male community samples, which limits generalisability regarding sex/gender diversity and the extrapolation to clinical samples. Furthermore, we combined two different scales to measure PPU: the CSBD-19 scale tailored for pornography use and the *Tolerance* subscale from the PPCS (see Methods). Although these are psychometrically validated scales that cover well-established facets of PPU, future work should compare our results against different indices for PPU (Fernandez & Griffiths, 2021).

It is also important to acknowledge recent advancements in the study of MI, which suggest that individuals may morally object to their pornography use for reasons beyond the traditional frameworks of social or religious conservatism (Hoagland et al., 2023). To this end, our

operationalisation of religiously-based MI represents an important step towards improving the specificity of how moral incongruence is conceptualised. However, other sources of moral disapproval warrant further exploration. For example, individuals may disapprove of their pornography use from feminist, sexual health, or secular ethical perspectives, rather than from a religious framework. Moreover, individuals with PPU who escalate to consuming extreme content (e.g., sexually violent material) may experience moral conflict rooted in ethical or personal values that are independent of religious beliefs (Hoagland et al., 2023; Ince et al., 2023; Wright, 2019). This escalation can clash with individuals' intrinsic moral frameworks beyond their religious dispositions. As such, it is possible that religious individuals might disapprove of their pornography use independently to religious dispositions. Consequently, it is possible that some individuals classified within the comorbid PPU and religiosity-based MI group might have been misclassified as their primary source of moral disapproval was assumed to be religious. These reasons highlight the need for more nuanced measures of MI that specifically capture the reasons for such disapproval, in turn expanding the scope of MI research to focus less centrally on religiosity (Vaillancourt-Morel & Bergeron, 2019; Willoughby, 2019). Finally, MI appears to be relevant to other addictive problems beyond pornography use (e.g., gambling), albeit at weaker effects (Lewczuk, Nowakowska, Lewandowska, Potenza, & Gola, 2021). Future work specifically examining religiosity-based MI across other potentially behaviours is recommended.

CONCLUSION

Overall, our findings suggest that a minority, but still substantial number, of male pornography users self-report problems with the behaviour itself (PPU) and/or with their psychological (moral) relationship to the activity (manifesting in moral incongruence). Important heterogeneity exists across these dimensions, which reinforces the idea that PPU and religiosity-based MI can differentially manifest across individuals. This suggests that individuals with different types of self-reported PPU may require tailored interventions based on the nature of such issues. Future work extending these findings to more diverse populations (e.g., women, treatment-seekers) will help to further clarify our findings and enhance understanding of PPU and related complaints.

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SUPPLEMENTARY MATERIAL

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