

Maladaptive Personality Traits and Problematic Pornography Use: Cross-Sectional Serial Indirect Associations Through Personality Functioning and Emotional Avoidance

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Article

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Abstract

Background

Problematic pornography use (PPU) is heterogeneous, and broad personality vulnerability may be related to PPU through more proximal functional and affect-regulatory correlates. We examined a theory-guided cross-sectional configuration linking maladaptive personality traits, personality functioning impairment, emotional avoidance motives for pornography use, and PPU. Because emotional avoidance is also represented within the PPUS, construct overlap was evaluated explicitly.

Methods

Participants were 591 adults aged 18–40 years residing in Tehran who reported past-month pornography use and were recruited through online convenience/snowball procedures. Measures were the PID-5-BF, LPFS-BF 2.0, PCI Emotional Avoidance subscale, and PPUS. Regression-based path models used HC3 robust standard errors and 5,000 bootstrap resamples. Sensitivity analyses examined PPUS with its three escape/avoidance items removed (PPUS-9), alternative mediator configurations, multicollinearity, BCa intervals, and sociodemographic adjustment.

Results

Maladaptive traits were strongly associated with personality functioning impairment ($\beta = .813$), which was associated with emotional avoidance ($\beta = .245$); emotional avoidance was associated with PPUS ($\beta = .690$; all $p < .001$). The theory-guided serial indirect association was $\beta = .137$, 95% percentile bootstrap CI [.060,.216] (BCa CI [.059,.215]). After removing the overlapping PPUS avoidance items, the emotional-avoidance coefficient decreased to $\beta = .507$ and explained variance decreased from $R^2 = .633$ to .444, but the serial indirect association remained supported ($\beta = .101$, 95% CI [.046,.161]). VIFs were 1.00–3.02. A reversed mediator order produced a near-zero serial indirect estimate ($\beta = .002$, 95% percentile CI [-.0001,.0049]), whereas a parallel configuration supported an indirect association through emotional avoidance ($\beta = .191$, 95% CI [.136,.245]).

Conclusions

The findings are consistent with, but do not establish, a theory-guided cross-sectional configuration in which personality functioning and avoidance-motivated pornography use jointly characterize the association between maladaptive traits and PPU. The overlap analysis indicates that the large emotional-avoidance/PPU association was partly attributable to shared item content, although the serial indirect association persisted when overlapping outcome items were removed. Longitudinal and multi-method studies are required before temporal, mechanistic, or clinical conclusions are warranted.

Introduction

Pornography use and problematic pornography use (PPU) are not interchangeable. Many adults use pornography without marked impairment, whereas PPU refers to persistent difficulties involving control, preoccupation, distress, or functional consequences. This distinction has become increasingly important in research on compulsive sexual behavior disorder because frequency alone is not a sufficient indicator of clinically relevant problems. The PPUS was developed to capture several dimensions of problematic involvement, including excessive engagement, difficulty controlling use, adverse functional consequences, and use in relation to negative affect [1]. Contemporary work further emphasizes heterogeneity in PPU and the importance of distinguishing dysregulated behavior from distress that may be influenced by moral incongruence or contextual factors [2, 3].

The Interaction of Person–Affect–Cognition–Execution (I-PACE) framework provides a useful process-oriented account of how relatively distal vulnerabilities may become linked to specific problematic behaviors. In I-PACE, person-level characteristics are not assumed to produce addictive or dysregulated behavior directly; rather, their associations may be expressed through affective and cognitive responses, coping motives, expectancies, cue reactivity, and executive processes [4, 5]. For PPU, this logic suggests that broad dispositional vulnerabilities may be most informative when considered together with more proximal forms of psychological functioning and behavior-specific motives. This process perspective also motivates an ordered statistical model while simultaneously requiring caution: when all variables are assessed at one time point, the proposed order remains theoretical rather than temporally demonstrated [6, 7].

Maladaptive personality traits represent one plausible distal vulnerability. The Alternative Model for Personality Disorders (AMPD) describes pathological trait expression across broad domains such as negative affectivity, detachment, antagonism, disinhibition, and psychoticism, commonly assessed with the PID-5 family of instruments [8, 9]. Trait elevations may reflect enduring tendencies toward dysregulated affect, interpersonal disengagement, impulsive or poorly constrained behavior, and atypical cognition. Meta-analytic and empirical evidence increasingly links personality-related vulnerabilities, including impulsivity and broader maladaptive traits, with PPU. However, trait associations alone leave an explanatory gap because they identify broad vulnerability without specifying how personality pathology is expressed in self-regulation and behavior.

Personality functioning may help bridge that gap. Within the AMPD, Criterion A concerns severity of impairment in self and interpersonal functioning, whereas Criterion B concerns maladaptive trait style. The LPFS-BF 2.0 operationalizes difficulties in self- and interpersonal functioning in a brief self-report format [12, 13]. Although Criterion A and Criterion B are conceptually distinguishable, self-report measures of them can share substantial variance. Accordingly, their relation should not be interpreted as evidence that they are independent causal stages. A more defensible question is whether variance in personality functioning that remains after accounting for broad maladaptive trait burden is associated with a more proximal coping-related variable. This issue is particularly relevant here because PID-5-BF

and LPFS-BF 2.0 scores were strongly correlated, requiring explicit examination of multicollinearity and unique incremental variance.

Emotional avoidance is a theoretically plausible proximal correlate. The Pornography Consumption Inventory (PCI) conceptualizes emotional avoidance as a motive for using pornography to disengage from stressful, unpleasant, or unwanted emotional experiences [14]. Emotion-regulation difficulties and avoidance-oriented motives have been associated with PPU in prior research [19–21], and I-PACE explicitly assigns affective responses and coping processes an important role between person-level vulnerabilities and behavior-specific outcomes. If individuals with greater personality-functioning impairment have more difficulty organizing, tolerating, or managing distress, avoidance-motivated pornography use may be more likely to co-occur with PPU.

A measurement complication is essential, however. Emotional avoidance is not only assessed as a PCI motive; the PPUS itself contains a three-item escape/avoid-negative-emotions domain. Consequently, a model in which PCI Emotional Avoidance predicts the PPUS total may partly correlate conceptually similar item content with itself. Such criterion contamination can inflate the apparent size of the emotional-avoidance/PPU association and the variance explained by the final equation. This issue does not automatically invalidate the model because the PCI measures a motive whereas the PPUS is intended to measure broader problematic involvement, but it requires direct sensitivity analysis. A robust result should remain substantively present when the avoidance-related PPUS items are removed from the outcome.

A second unresolved issue concerns serial ordering. A theory-guided sequence of maladaptive traits -> personality functioning impairment -> emotional avoidance -> PPU is compatible with AMPD and I-PACE reasoning, but cross-sectional covariance cannot establish that this is the temporal sequence. Alternative decompositions, including parallel mediation and reversal of the two mediators, can represent the same observed variables. In saturated four-variable serial models, global fit indices cannot adjudicate the direction because alternative recursive orderings can reproduce the covariance matrix. The informative question is therefore not whether one cross-sectional ordering is proved, but whether the hypothesized decomposition is theoretically coherent, statistically nontrivial, and robust to plausible alternative specifications.

The present study examined these issues in an online convenience sample of past-month pornography consumers residing in Tehran. The primary theory-guided configuration specified PID-5-BF total -> LPFS-BF 2.0 total -> PCI Emotional Avoidance -> PPUS total. We hypothesized that (H1) maladaptive personality traits would be positively associated with personality functioning impairment; (H2) personality functioning impairment would be positively associated with emotional avoidance after adjustment for maladaptive traits; (H3) emotional avoidance would be positively associated with PPU after adjustment for preceding variables; and (H4) the serial indirect association would have a bootstrap confidence interval excluding zero. To address specification and measurement concerns, we additionally examined multicollinearity in every equation, reran the model using a nine-item PPUS score excluding the

three escape/avoidance items, evaluated parallel and reversed mediator configurations, compared percentile and BCa bootstrap inference for the focal indirect effects, and repeated the serial analysis with demographic covariates. These analyses are framed as cross-sectional statistical decompositions, not evidence of temporal mediation or causal mechanism.

Methods

Study design, setting, and participants

This cross-sectional observational study was derived from a broader doctoral research project on psychological correlates of pornography use. The target population for this manuscript was adults aged 18–40 years residing in Tehran, Iran, who reported pornography use during the previous month. Recruitment occurred from September 2025 through March 2026 through Telegram, Instagram, academic mailing lists, and participant sharing of the survey link. The sampling strategy was therefore non-probability convenience sampling with a snowball component. The manuscript follows STROBE principles for transparent reporting of observational research [16]; a completed cross-sectional STROBE checklist is provided as Additional file 4.

The analytic cohort was collected within a broader doctoral project that also generated a separate article examining life satisfaction in relation to maladaptive personality traits and PPU. The present manuscript addresses a distinct research question by focusing on personality functioning and pornography-specific emotional avoidance, and it adds criterion-overlap, alternative-order, and sociodemographic robustness analyses that are not part of the life-satisfaction model. Shared recruitment, ethics, and sample descriptors are reported only where necessary for transparent description of the common project cohort.

A total of 625 questionnaires were submitted. The project screening record documents exclusion of 34 questionnaires because respondents selected the same response option across questionnaire items in a pattern judged to reflect non-attentive or invalid responding. No separate response-time/speeding threshold or stand-alone attention-check exclusion was documented, and the historical screening record did not preserve a numerical long-string cutoff for each excluded case. We therefore do not retrospectively invent a quantitative threshold. This limitation is stated explicitly so that the exclusion procedure is not represented as more reproducible than the retained project documentation allows. The remaining 591 questionnaires constituted the fixed analytic sample. Forced-response settings produced no missing values on the retained focal measures and no imputation was used.

For the broader project, an a priori G*Power 3.1.9.7 calculation used a multiple-regression approximation ($f^2=.15$, $\alpha=.05$, $\text{power}=.95$, two predictors) and yielded a benchmark of 107 participants. This was an approximate regression-based planning benchmark rather than a formal power analysis for the complete serial indirect-association model. The achieved sample substantially exceeded that benchmark; bootstrap confidence intervals provide the principal inferential information for indirect associations in the present study.

Figure 1. **Participant flow from submitted questionnaires to the fixed analytic sample.**

Procedure and privacy protections

The survey was completed anonymously. The introductory page explained the study, voluntary participation, confidentiality, and the right to discontinue before submission. No monetary, material, or course-credit incentives were provided. To reduce duplicate submissions while limiting collection of identifying data, the survey platform used browser-cookie verification and session tracking. These functions were used only for duplicate-prevention/data-quality purposes in accordance with the approved study procedures; persistent identifying IP data were not used as an analytic variable or retained in the analytic dataset. Participants were told that there were no right or wrong answers and were encouraged to respond honestly, a procedural step intended to reduce socially desirable responding in a sensitive research context.

Ethics

The study originated from the first author's doctoral dissertation at Allameh Tabataba'i University. The protocol was approved by the Ethics Committee of Allameh Tabataba'i University (IR/ethics.2025.84423.1242; February 2025). Electronic informed consent was obtained from all participants. Procedures were conducted in accordance with the Declaration of Helsinki and applicable institutional data-protection requirements.

Measures

Problematic Pornography Use Scale

PPU was assessed with the 12-item Problematic Pornography Use Scale (PPUS) [1]. Items are rated from 0 (never true) to 5 (almost always true), with higher scores indicating greater problematic involvement. The instrument includes three-item domains for distress/functional problems, excessive use, control difficulties, and use for escape/avoidance of negative emotions. In the supplied analytic dataset, items 10–12 constituted the escape/avoidance domain. A Persian validation study supported the four-factor structure of the PPUS and reported good internal consistency in an Iranian sample (Cronbach's $\alpha=.85$) [10]. The PPUS total had excellent internal consistency in the present sample ($\alpha=.933$). Because the second mediator also assessed emotional avoidance, the criterion-overlap sensitivity analysis used PPUS-9, defined as the sum of items 1–9 after completely excluding PPUS items 10–12. PPUS-9 retained excellent internal consistency ($\alpha=.925$). This sensitivity outcome is not proposed as a new validated scale; it is used only to examine whether the primary result depends on direct avoidance-content overlap.

Personality Inventory for DSM-5–Brief Form

Maladaptive personality traits were assessed with the 25-item PID-5-BF. The scale represents the five broad AMPD trait domains: negative affectivity, detachment, antagonism, disinhibition, and psychoticism. Items are rated from 0 to 3. Iranian psychometric research has supported the five-domain structure of the PID-5 forms, including the brief form, with evidence of acceptable domain-level reliability and criterion-related validity [11]. For the parsimonious global-burden model, all 25 items were summed to index global maladaptive trait burden rather than entering all domains simultaneously. Internal consistency was high ($\alpha=.895$). This global score is not interpreted as a p-factor or as a clinical diagnosis.

Level of Personality Functioning Scale–Brief Form 2.0

Personality functioning impairment was assessed with the 12-item LPFS-BF 2.0 [12, 13], which provides a brief index of self- and interpersonal-functioning difficulties. The total score was used as the first statistical mediator. Internal consistency was high ($\alpha=.889$). Given the strong relation between PID-5-BF and LPFS-BF 2.0, collinearity diagnostics and incremental R^2 attributable to LPFS were reported explicitly.

Pornography Consumption Inventory: Emotional Avoidance

Pornography-use motives were assessed with the 15-item Pornography Consumption Inventory (PCI) [14]. The present model used only the five-item Emotional Avoidance subscale (dataset items PCI2, PCI3, PCI10, PCI12, and PCI15), which assesses use of pornography in relation to distraction, low mood, stress/anger, uncomfortable emotions, and disengagement from unpleasant circumstances. Items are rated from 1 to 5. Internal consistency in the present sample was excellent ($\alpha=.949$). Additional file 1 (Supplementary Table S1) provides the item-number crosswalk and content descriptors for the PCI Emotional Avoidance and PPUS avoidance domains, and the complete original instruments are cited for verbatim item wording.

Statistical analysis

Analyses were rerun from the item-level dataset ($N = 591$) using reproducible Python code with fixed random seeds. Stored total scores were checked against reconstructed item sums before modeling. Means, standard deviations, ranges, skewness, excess kurtosis, Cronbach's alpha, and Pearson correlations were calculated. Regression equations were estimated by ordinary least squares with HC3 heteroskedasticity-consistent covariance estimates. VIF and tolerance were reported for every equation; because Eq. 1 contains a single predictor, its VIF is necessarily 1.00. The complete reproducible analysis script is provided as Additional file 2, and the variable/scoring codebook is provided as Additional file 3.

The primary theory-guided model specified PID-5-BF total as X, LPFS-BF 2.0 as M1, PCI Emotional Avoidance as M2, and PPUS total as Y. Eq. 1 regressed M1 on X; Eq. 2 regressed M2 on X and M1; and

Eq. 3 regressed Y on X, M1, and M2. We report unstandardized b, HC3 SE, standardized β , p values, and R^2 . Indirect associations were evaluated using 5,000 paired nonparametric bootstrap resamples. Percentile intervals were specified as the primary bootstrap intervals, while bias-corrected and accelerated (BCa) intervals were calculated as a robustness check. For the focal primary serial effect, percentile and BCa inference were concordant. The study and analysis plan were not preregistered; accordingly, the primary model, criterion-overlap benchmark, and subsequent sensitivity analyses are distinguished explicitly rather than described as confirmatory causal tests.

Four sensitivity analyses were used to probe the robustness and interpretability of the primary configuration. First, the complete model was estimated with PPUS-9, excluding all three PPUS escape/avoidance items. Second, VIF/tolerance were calculated for all equations and the unique increment in R^2 attributable to LPFS was quantified. Third, plausible alternative decompositions were examined: a parallel model (LPFS and emotional avoidance entered as parallel statistical mediators) and a reversed serial ordering (PID-5 $\rightarrow$ emotional avoidance $\rightarrow$ LPFS $\rightarrow$ PPU). Because the fully specified four-variable recursive serial models are just-identified, global fit indices cannot discriminate their temporal order; comparisons are therefore presented as sensitivity decompositions rather than model-selection proof. Fourth, the primary and overlap-sensitivity serial effects were re-estimated after entering age group, gender, marital status, education, and employment as categorical dummy covariates in each endogenous equation. Statistical tests were two-sided with $\alpha=.05$.

Use of generative AI in manuscript preparation

During preparation of this manuscript, the authors used OpenAI ChatGPT to support language editing, document organization, and consistency checking. The authors independently verified the statistical results, sources, interpretations, and final text, edited all AI-assisted content as needed, and take full responsibility for the content of the article.

Results

Participant flow and characteristics

Of 625 submitted questionnaires, 34 were excluded at the project screening stage for the documented same-option/highly uniform response pattern, leaving $N = 591$ for analysis (Fig. 1). No focal-variable data were missing. Participant characteristics are shown in Table 1. The sample was an online-recruited group of past-month pornography consumers residing in Tehran and should not be interpreted as population-representative of Iranian adults.

Table 1
Participant characteristics (N = 591)

Variable	Category	n	%
Age (years)	18–23	128	21.7
Age (years)	24–29	173	29.3
Age (years)	30–35	140	23.7
Age (years)	36–40	150	25.4
Gender	Female	326	55.2
Gender	Male	265	44.8
Education	Below diploma	12	2.0
Education	Diploma	72	12.2
Education	Bachelor's	218	36.9
Education	Master's	245	41.5
Education	Doctorate	44	7.4
Marital status	Single	403	68.2
Marital status	Married	161	27.2
Marital status	Divorced	27	4.6
Employment	Unemployed	30	5.1
Employment	Full-time	199	33.7
Employment	Part-time	143	24.2
Employment	Homemaker	28	4.7
Employment	Student	191	32.3

Descriptive statistics, reliability, and correlations

Descriptive statistics and reliability are presented in Table 2.

Table 2
Descriptive statistics and reliability

Variable	M	SD	Observed range	Skew	Excess kurtosis	alpha
PID-5-BF total	26.03	11.50	0–54	0.26	-0.49	0.895
LPFS-BF 2.0 total	25.34	7.11	12–45	0.24	-0.40	0.889
PCI Emotional Avoidance	11.46	5.81	5–25	0.64	-0.59	0.949
PPUS total	15.65	13.28	0–56	0.78	-0.28	0.933
PPUS-9 sensitivity outcome	10.60	9.83	0–43	1.03	0.32	0.925

Zero-order correlations among the four primary constructs were all positive and statistically significant: PID-5 with LPFS $r = 0.813$, PID-5 with emotional avoidance $r = 0.276$, PID-5 with PPUS $r = 0.427$, LPFS with emotional avoidance $r = 0.308$, LPFS with PPUS $r = 0.432$, and emotional avoidance with PPUS $r = 0.762$ (all $p < .001$). Emotional avoidance correlated less strongly with PPUS-9 ($r = 0.599$) than with the full PPUS, whereas it correlated very strongly with the excluded PPUS avoidance domain ($r = 0.888$). This pattern supports the interpretation that shared avoidance-related item content contributed substantially to the unusually large association observed with the full PPUS.

Multicollinearity and unique variance in personality functioning

The correlation between PID-5-BF and LPFS-BF 2.0 was high ($r = .813$), but regression diagnostics did not indicate numerically extreme variance inflation. Eq. 1 contained only PID-5 (VIF = 1.00, tolerance = 1.00). In Eq. 2, VIF was 2.95 for both PID-5 and LPFS (tolerance = .339). In Eq. 3, VIFs were 2.96 for PID-5, 3.02 for LPFS, and 1.11 for emotional avoidance (tolerances = .338, .331, and .903, respectively). These diagnostics indicate meaningful construct overlap and reduced coefficient precision, but not the level of instability typically associated with very large VIF values. Importantly, PID-5 accounted for 66.1% of LPFS variance, leaving 33.9% residual variance in LPFS. Adding LPFS to a model predicting emotional avoidance from PID-5 increased R^2 from .076 to .097 (Delta $R^2 = .020$). By contrast, adding LPFS to the final PPUS equation already containing PID-5 and emotional avoidance increased R^2 only from .631 to .633 (Delta $R^2 = .002$), explaining why the adjusted LPFS $\rightarrow$ PPUS path was small and non-significant in the primary outcome model. Multicollinearity diagnostics for each regression equation are presented in Table 3.

Table 3
VIF and tolerance diagnostics by regression equation

Equation / predictor	VIF	Tolerance
Eq. 1: PID-5 -> LPFS PID-5	1.00	1.000
Eq. 2: emotional avoidance PID-5	2.95	.339
Eq. 2: emotional avoidance LPFS	2.95	.339
Eq. 3: PPUS PID-5	2.96	.338
Eq. 3: PPUS LPFS	3.02	.331
Eq. 3: PPUS emotional avoidance	1.11	.903

Primary theory-guided serial configuration

H1 was supported: PID-5-BF was strongly associated with LPFS-BF 2.0 ($b = 0.503$, HC3 SE = 0.015, $\beta = .813$, $p < .001$; $R^2 = .661$). H2 was supported: after PID-5 was included, LPFS remained associated with emotional avoidance ($b = 0.200$, HC3 SE = 0.056, $\beta = .245$, $p < .001$). The residual PID-5 -> emotional-avoidance path was small and non-significant ($b = 0.039$, HC3 SE = 0.035, $\beta = .077$, $p = .262$); Eq. 2 explained 9.7% of emotional-avoidance variance.

H3 was supported: emotional avoidance was strongly associated with PPUS after adjustment for PID-5 and LPFS ($b = 1.576$, HC3 SE = 0.067, $\beta = .690$, $p < .001$). PID-5 retained a smaller direct association with PPUS ($b = 0.198$, HC3 SE = 0.054, $\beta = .172$, $p < .001$), whereas LPFS -> PPUS was not significant at the .05 level ($b = 0.149$, HC3 SE = 0.080, $\beta = .080$, $p = .063$). The final equation explained 63.3% of PPUS variance. The component path estimates for the primary model are summarized in Table 4.

Table 4
Component paths in the primary model

Path	b	HC3 SE	β	p	Outcome R^2
LPFS <- PID-5	0.503	0.015	0.813	< .001	0.661
EA <- PID-5	0.039	0.035	0.077	0.262	0.097
EA <- LPFS	0.200	0.056	0.245	< .001	0.097
PPUS <- PID-5	0.198	0.054	0.172	< .001	0.633
PPUS <- LPFS	0.149	0.080	0.080	0.063	0.633
PPUS <- EA	1.576	0.067	0.690	< .001	0.633

H4 was supported. The serial indirect association was $\beta = .137$, 95% percentile bootstrap CI [.060,.216]. The BCa interval was [.059,.215], yielding the same inferential conclusion. The specific indirect associations through LPFS alone and emotional avoidance alone had intervals that included zero. The

total indirect association was $\beta = .256$, and the total association was $\beta = .427$. Thus, the original decomposition was concentrated in the jointly ordered serial term rather than in either conditional simple indirect term. The bootstrap decomposition of the primary model is presented in Table 5.

Table 5
Bootstrap decomposition of the primary model

Effect	β	Percentile LL	Percentile UL	BCa LL	BCa UL
Specific indirect: PID-5 -> LPFS -> PPUS	0.065	-0.002	0.132	-0.005	0.130
Specific indirect: PID-5 -> EA -> PPUS	0.053	-0.042	0.148	-0.041	0.148
Serial indirect: PID-5 -> LPFS -> EA -> PPUS	0.137	0.060	0.216	0.059	0.215
Total indirect association	0.256	0.177	0.335	0.176	0.334
Total association	0.427	0.354	0.492	0.355	0.492

Figure 2. Primary theory-guided cross-sectional serial configuration and overlap sensitivity result.

Sensitivity analysis excluding PPUS avoidance-content items

To evaluate criterion contamination, PPUS items 10–12 (the complete escape/avoid-negative-emotions domain in the analytic dataset) were removed and the model was rerun using PPUS-9. This reduced the emotional-avoidance/outcome correlation from $r=.762$ to $r=.599$ and reduced the adjusted emotional-avoidance coefficient from $\beta = .690$ to $\beta = .507$. Explained outcome variance fell from $R^2=.633$ to $R^2=.444$, demonstrating that the full-score model had indeed been inflated by shared avoidance content.

Nevertheless, the central serial result remained: PID-5 -> LPFS -> emotional avoidance -> PPUS-9 was $\beta = .101$, 95% percentile CI [.046,.161], with BCa CI [.046,.161]. The direct PID-5 association remained significant ($\beta = .213$, $p<.001$), and LPFS -> PPUS-9 became small but significant ($\beta = .107$, $p=.041$). PPUS-9 reliability remained excellent ($\alpha=.925$). Accordingly, measurement overlap accounts for a meaningful portion of the large original emotional-avoidance coefficient but does not fully account for the serial indirect association. Results of the outcome-overlap sensitivity model using PPUS-9 are presented in Table 6.

Table 6
Outcome-overlap sensitivity model using PPUS-9

Path/effect	b	HC3 SE	β	p / 95% CI
PPUS-9 <- PID-5	0.182	0.049	0.213	< .001
PPUS-9 <- LPFS	0.148	0.072	0.107	0.041
PPUS-9 <- emotional avoidance	0.858	0.064	0.507	< .001
Serial indirect association	—	—	.101	95% percentile CI [.046,.161]
Total indirect association	—	—	.227	95% percentile CI [.138,.313]

Competing configurations and demographic sensitivity

Alternative configurations were examined to determine how strongly the decomposition depended on the theory-guided ordering. In a parallel configuration, the indirect association through LPFS was $\beta = .065$, 95% CI [-.002,.133], whereas the indirect association through emotional avoidance was $\beta = .191$, 95% CI [.136,.245]. Thus, when the LPFS -> emotional-avoidance ordering was not imposed, emotional avoidance remained the dominant indirect correlate. In the reversed serial configuration (PID-5 -> emotional avoidance -> LPFS -> PPUS), the serial estimate was near zero ($\beta = .002$) and its percentile interval included zero (95% CI approximately [-.0001,.0049]). These comparisons do not prove the hypothesized temporal direction: the alternative full serial orderings are cross-sectional and just-identified, so global model fit cannot distinguish them. Rather, they show that the substantive association is not a generic consequence of any arbitrary serial ordering and that the strongest robust feature is the relation of emotional avoidance with PPU.

Demographic adjustment did not materially alter the focal result. With age group, gender, marital status, education, and employment entered as categorical indicators in all endogenous equations, the primary serial association was $\beta = .136$, 95% percentile CI [.070,.208]. When both demographic adjustment and PPUS-9 were used, the serial association remained $\beta = .094$, 95% CI [.049,.147]. These analyses are robustness checks rather than attempts to eliminate confounding, because important unmeasured variables were unavailable. The competing-configuration and robustness analyses are summarized in Table 7.

Table 7
Competing-configuration and robustness analyses

Analysis	Standardized effect	95% percentile bootstrap CI	Interpretation
Parallel: indirect via LPFS	.065	[-.002,.133]	Not supported
Parallel: indirect via emotional avoidance	.191	[.136,.245]	Supported
Reversed serial order	.002	[-.0001,.0049]	Not supported by percentile CI
Primary serial + demographics	.136	[.070,.208]	Supported
PPUS-9 serial + demographics	.094	[.049,.147]	Supported

Discussion

The results support a restrained interpretation of the full-PPUS model. The theory-guided serial indirect association linking maladaptive traits, personality functioning impairment, emotional avoidance, and PPU was statistically supported in the primary analysis. At the same time, the criterion-overlap analysis showed that shared measurement content materially inflated the emotional-avoidance coefficient: removing the three PPUS escape/avoidance items reduced the coefficient from .690 to .507 and reduced explained outcome variance from 63.3% to 44.4%. Thus, the full-score coefficient should not be interpreted as a pure psychological mechanism. A meaningful portion reflected shared avoidance-related content across the predictor and outcome measures. Importantly, the serial indirect association remained supported after complete removal of those outcome items, indicating that direct content overlap did not fully account for the central statistical pattern.

The association between maladaptive traits and personality functioning was also very large. This finding is compatible with the AMPD, in which Criterion A and Criterion B describe related components of personality pathology, but it reinforces concerns about common general severity captured by brief self-report measures. The collinearity analysis helps delimit this issue. VIFs in the multivariable equations were approximately 3 rather than at levels conventionally interpreted as extreme, yet PID-5 explained 66.1% of LPFS variance. The more meaningful substantive result is therefore the contribution of the residual 33.9% of LPFS variance. Adding LPFS after PID-5 increased explained variance in emotional avoidance by about two percentage points. In the final PPUS equation, however, LPFS added only about 0.2 percentage points beyond PID-5 and emotional avoidance, and its direct coefficient was not conventionally significant. This pattern supports treating LPFS primarily as part of the theory-guided joint configuration rather than as a large independent predictor of PPU.

The overlap sensitivity result changes how the emotional-avoidance finding should be interpreted. In the full PPUS model, emotional avoidance had an exceptionally large coefficient. The PPUS-9 analysis

demonstrates that this estimate was partly due to criterion contamination because the PPUS total contained an avoidance-related domain. Yet the adjusted coefficient remained substantial at .507 after those items were removed. Therefore, avoidance-motivated pornography use is related not only to the avoidance content embedded in PPUS but also to the remaining PPUS content concerning excessive engagement, control difficulties, and functional problems. This is a more defensible result than the original full-score coefficient and should be the central robustness finding emphasized in future citations of the study.

The competing configurations further constrain the theoretical interpretation. A parallel model supported an indirect association through emotional avoidance but not through LPFS alone, whereas the reversed serial ordering produced a near-zero serial estimate under the primary percentile criterion. These results are consistent with the hypothesized sequence, but they do not validate it as the temporal process. Cross-sectional mediation estimates can be biased representations of longitudinal processes, and different longitudinal parameter structures can generate similar cross-sectional covariance patterns [6, 7]. Moreover, the fully specified four-variable serial orderings are just-identified, which means global fit indices cannot choose the causal direction. We therefore describe the model as a theory-guided cross-sectional statistical configuration and regard longitudinal ordering as an empirical question for future work.

The results remain broadly compatible with I-PACE. Maladaptive personality characteristics represent distal person-level correlates, whereas emotional avoidance is a behavior-specific affective motive. Personality functioning may describe a general functional context in which avoidance-based coping becomes more likely. However, the present study does not demonstrate that trait pathology causes impaired functioning, that impaired functioning causes avoidance, or that avoidance causes PPU. Reciprocal relationships are plausible. Repeated PPU may itself contribute to distress, avoidance, or negative self-appraisal, and unmeasured common causes may produce associations among all four constructs.

Several omitted variables are especially important in pornography research. Actual frequency and duration of pornography consumption were not available for covariate adjustment in the present model. Frequency could confound the association because individuals who use pornography more often have more opportunity both to endorse avoidance motives and to accumulate PPUS symptoms. Moral incongruence and religion-related conflict were also not systematically assessed for this analysis. Prior work shows that moral incongruence can contribute to self-perceived pornography problems independently of behavioral dysregulation [2, 15]. Because the present sample was recruited in Iran, these unmeasured contextual factors are important for interpretation; however, any cultural explanation remains provisional because sociocultural, religious, stigma-related, and moral-conflict mechanisms were not directly assessed in this study. Depression and anxiety were likewise not included, although negative affect could plausibly increase both emotional-avoidance motives and PPU reporting. Demographic adjustment cannot substitute for these unmeasured constructs; consequently, residual confounding remains a central limitation.

The clinical implications should therefore remain modest. These data do not show that targeting emotional avoidance or personality functioning will reduce PPU, and the participants were not a diagnosed clinical sample. The findings instead generate hypotheses for longitudinal and intervention research. For example, future studies could test whether within-person increases in negative affect precede avoidance-motivated pornography use, whether such use predicts subsequent loss of control or impairment, and whether changes in avoidance during treatment statistically precede changes in PPU. Existing treatment reviews indicate that cognitive-behavioral, acceptance-based, mindfulness, and emotion-regulation components are frequently used in PPU/CSBD interventions [17, 18], but the present study cannot establish which components are effective or for whom.

The sampling context also limits generalizability. Participants were online-recruited past-month pornography consumers residing in Tehran, not a probability sample of Iranian adults. The sample was comparatively highly educated, with a substantial proportion holding university or graduate-level qualifications. Online recruitment may preferentially reach individuals comfortable disclosing sensitive behaviors digitally while missing groups with limited internet access or stronger privacy concerns. Thus, replication in probability-based, clinical, and culturally diverse samples is needed.

The study nevertheless has several strengths. The study directly tests the principal measurement-contamination concern rather than addressing it rhetorically; reports VIF and tolerance for every regression equation; decomposes specific, serial, total indirect, direct, and total associations; compares percentile and BCa inference for the focal effects; evaluates plausible alternative configurations without claiming that fit indices can identify temporal order; and provides sociodemographic-adjusted robustness checks. All principal results were regenerated from item-level data, and the PPUS-9 sensitivity outcome retained high internal consistency. These additions improve transparency and make the boundary between empirical evidence and theoretical interpretation clearer.

Important limitations remain. First, temporal precedence cannot be inferred from a single measurement occasion. Second, all focal constructs were measured by self-report, creating common-method and response-style variance. Third, the overlap analysis reduces but does not eliminate conceptual proximity between a pornography-specific coping motive and a pornography-specific problem measure. Fourth, the project screening documentation did not retain a quantitative long-string threshold or case-level reason codes for the 34 excluded questionnaires; we therefore report the historical procedure transparently rather than presenting a post hoc threshold as prespecified. Fifth, actual pornography-use frequency/duration, moral incongruence, religiosity, depression, and anxiety were not available for the planned covariate analysis. Sixth, high PID-5/LPFS shared variance limits claims of distinct sequential constructs. Seventh, the questionnaire used only female/male gender response options and did not assess broader gender identities, limiting the interpretation of gender-adjusted sensitivity analyses. Finally, PPUS-9 was constructed solely as a sensitivity outcome and should not be interpreted as a newly validated measure.

Future work should use multiwave and intensive longitudinal designs capable of testing temporal precedence. Ecological momentary assessment could evaluate whether distress predicts subsequent avoidance-motivated pornography use within individuals and whether such episodes are followed by control difficulties or impairment. Cross-lagged or random-intercept longitudinal models could examine reciprocal associations among personality functioning, emotional avoidance, and PPU. Measurement studies should also compare latent models that explicitly separate general PPU severity from avoidance-related content and test whether the present associations replicate when outcomes without emotion-avoidance items are used. Finally, preregistered clinical studies could examine emotional avoidance as a candidate mediator of treatment change without presuming such a role from the present cross-sectional evidence.

Conclusions

In this online convenience sample of 591 past-month pornography consumers in Tehran, maladaptive personality traits, personality functioning impairment, emotional avoidance, and PPU formed a statistically supported theory-guided serial configuration. The strongest robustness finding is not the large emotional-avoidance coefficient in the full PPUS model itself, but the persistence of the serial indirect association after removing overlapping avoidance content from the PPUS: the coefficient decreased substantially, as expected under criterion contamination, while the serial indirect association remained supported. The results therefore justify further longitudinal testing of the proposed configuration but do not establish a mechanism, temporal pathway, or treatment target.

Abbreviations

AMPD

Alternative Model for Personality Disorders

BCa

bias-corrected and accelerated

CI

confidence interval

EA

emotional avoidance

HC3

heteroskedasticity-consistent covariance estimator type 3

I-PACE

Interaction of Person–Affect–Cognition–Execution

LPFS-BF 2.0

Level of Personality Functioning Scale–Brief Form 2.0

PCI

Pornography Consumption Inventory

PID-5-BF

Personality Inventory for DSM-5–Brief Form

PPU

problematic pornography use

PPUS

Problematic Pornography Use Scale

PPUS-9

nine-item sensitivity score excluding the PPUS escape/avoidance domain

VIF

variance inflation factor.

Declarations

Ethics approval and consent to participate

The protocol was approved by the Ethics Committee of Allameh Tabataba'i University (IR/ethics.2025.84423.1242; February 2025). Electronic informed consent was obtained from all participants. Cookie/session duplicate-prevention procedures were used in accordance with the approved study procedures and persistent identifying IP data were not retained in the analytic dataset.

Consent for publication

Not applicable.

Availability of data and materials

The datasets generated and/or analysed during the current study are not publicly available because they contain sensitive sexual-behavior information and public release was not established under the original consent and ethics conditions, but de-identified data are available from the corresponding author on reasonable request, subject to institutional ethics requirements and an appropriate data-use agreement. The reproducible analysis script and data codebook are provided as Additional files 2 and 3.

Competing interests

The authors declare no competing interests.

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Authors' contributions

P.M. contributed to conceptualization, methodology, investigation, data curation, formal analysis, validation, visualization, writing the original draft, writing-review and editing, and project administration.

S.Z. contributed to methodology, investigation, validation, and writing-review and editing. N.M. contributed to methodology, formal analysis, validation, writing-review and editing, and supervision. All authors read and approved the final manuscript.

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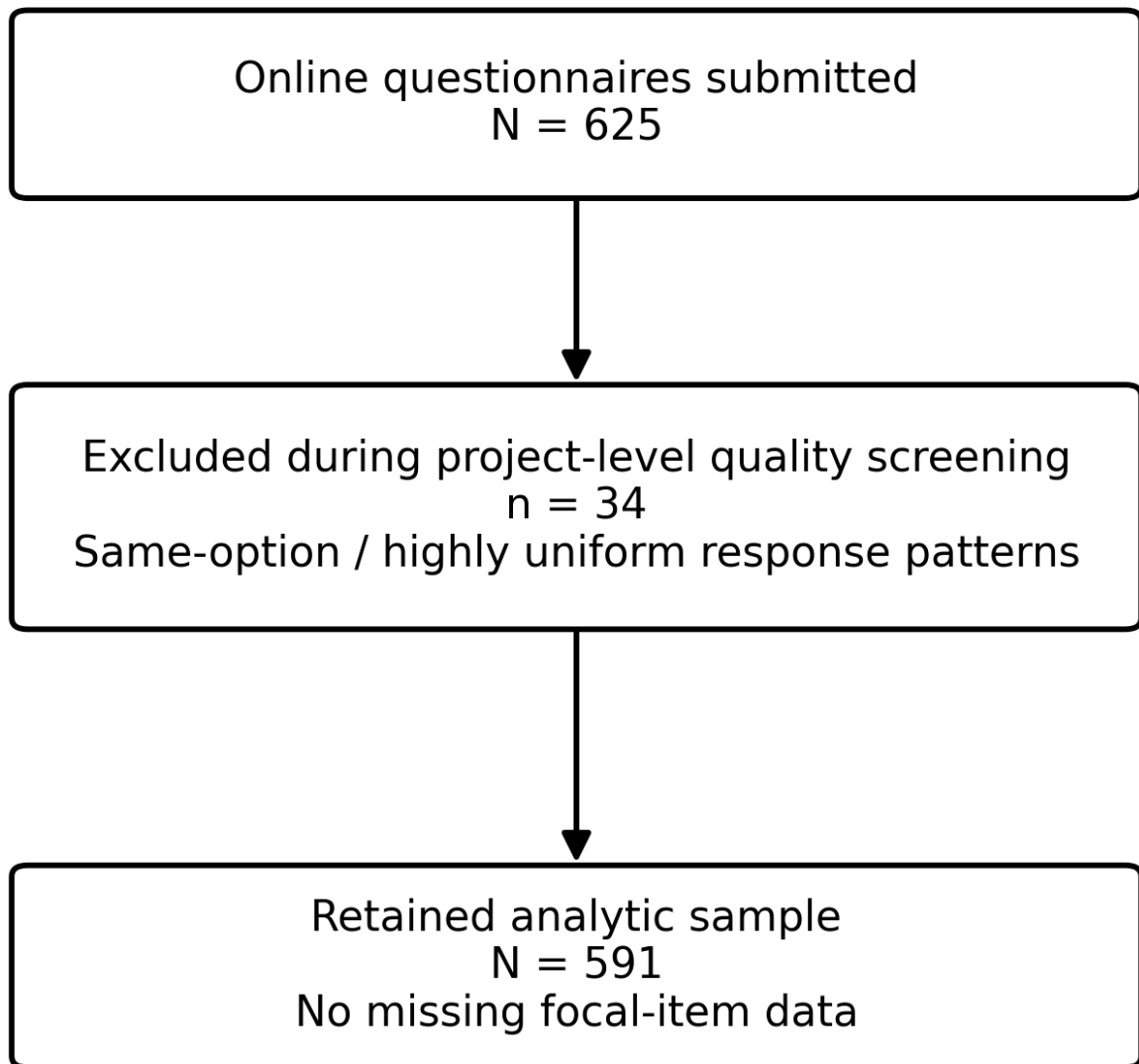
The authors thank all participants who contributed their time to the study.

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Figures



No response-time cutoff or separate attention-check exclusion was documented.

Figure 1

Participant flow to the analytic sample.

Participant flow from 625 submitted questionnaires through 34 historically documented same-option/highly uniform response exclusions to the retained analytic sample of N=591. No response-time cutoff or separate attention-check exclusion was documented.

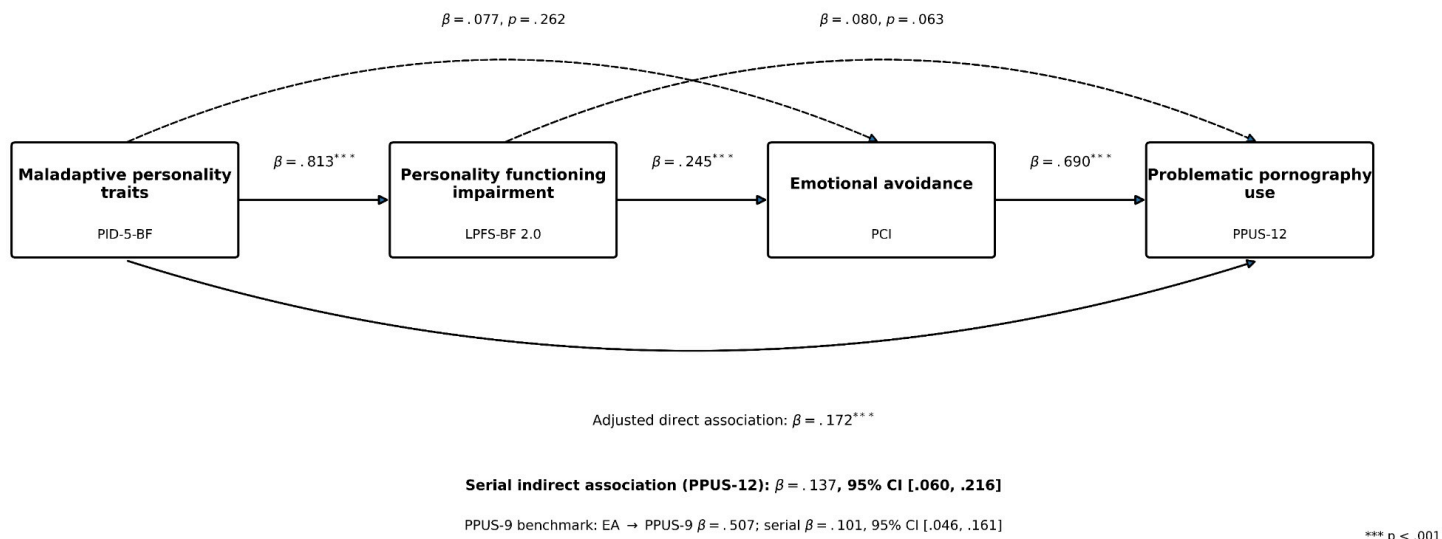


Figure 2

Theory-guided cross-sectional serial configuration.

Solid lines denote statistically significant component associations and dashed lines denote non-significant component associations. Standardized coefficients are shown. The PPUS-9 benchmark reports the criterion-overlap sensitivity result after excluding PPUS items 10–12. The diagram represents cross-sectional statistical associations and does not establish temporal or causal mediation.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [Additionalfile2ReproducibleAnalysis.py](#)
- [Additionalfile3DataCodebook.txt](#)
- [Additionalfile4STROBEChecklist.docx](#)
- [Additionalfile1SupplementaryAnalyses.docx](#)