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Family Strains and Online Gains: Longitudinal Relationship Between Harsh Parenting and Problematic Internet Use via Relative Deprivation and Online Basic Psychological Need Satisfaction

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Abstract

Harsh parenting has been demonstrated as a risk factor for adolescent problematic internet use (PIU), while its relationships with distinct subtypes of PIU have been scarcely investigated. Aiming to provide evidence that harsh parenting predicts PIU subtypes through divergent mechanisms, the current study draws upon I-PACE model and compensatory satisfaction theory to investigate the longitudinal relationship between harsh parenting and three PIU subtypes via the mediating role of relative deprivation and online basic psychological need satisfaction (OBPNS). A sample of 475 Chinese adolescents ($M_{age} = 15.640$, $SD_{age} = .640$, 57.89% female) participated in a two-wave panel survey with a one-year time lag. Participants completed self-reported measures of harsh parenting and relative deprivation at Wave 1, and the measure of OBPNS at Wave 2. Severity of PIU subtypes was measured across two waves. Results of structural equation modeling indicated that harsh parenting was positively related to PIU via relative deprivation and OBPNS. Furthermore, the model revealed different underlying mechanisms between harsh parenting and three PIU subtypes: problematic gaming was positively predicted by harsh parenting via relative deprivation and online competence satisfaction ($\beta = .025$, 95% CI = [.003, .043]), problematic social media use was positively predicted by harsh parenting via relative deprivation and online relatedness satisfaction ($\beta = .016$, 95% CI = [.001, .032]). However, relationships between harsh parenting and problematic information consumption were not significant. The current study provides a nuanced understanding of how harsh parenting fosters PIU subtypes through unique socio-cognitive mechanisms. These results underscored the necessity to distinguish subtypes of PIU in research on internet addiction. Clinical interventions should also be tailored in accordance with these divergent mechanisms to adapt to different subtypes.

Keywords: adolescent problematic internet use; relative deprivation; basic psychological need satisfaction; problematic gaming; problematic social media use; problematic information consumption

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Introduction

Past two decades have witnessed remarkable popularization and application of the internet. It is worth noting that adolescents have a higher penetration rate of the internet compared to the general population (Pew Research Center, 2024; Statista, 2024). The ubiquitous internet provides unique affordances to cater to adolescents' elevated interests and demands that arise from this transformative stage, while their emotional-behavioral functioning has been immature to deal with risks over the internet (Cerniglia et al., 2017). Consequently, internet may amplify their vulnerability to mental health problems (Orben et al., 2024), with one prominent negative outcome being problematic internet use (PIU).

PIU typically refers to a cluster of online engagement behaviors that are perceived rewarding but uncontrolled and are continued despite experiencing negative consequences that include impairment in important domains of one's life (Moretta et al., 2022). PIU has a prevalence of 12.07% among adolescents worldwide (Meng et al., 2022) and is even inversely proportional to their age (Lozano-Blasco et al., 2022). Additionally, although findings are not universal, adolescents from East Asian regions may have a higher prevalence of PIU (Lozano-Blasco et al., 2022). A recent meta-analysis reported the pooled prevalence of internet addiction among Chinese adolescents was 10.3%; 95% CI = [9.1%–11.7%], and the figure has risen up to 14.7% in studies published between 2019–2023 (Zheng et al., 2025).

The unique family and parenting culture may be a risk factor for the heightened adolescent PIU in East Asia (Schneider et al., 2017), where stresses the importance of strict and authoritarian parenting practices and parental disciplinary actions are prevalent (Hester et al., 2009). Parental punitive actions that are physically or verbally aggressive, especially when children show behavioral deviations, are defined as harsh parenting (M. Wang & Qi, 2017). It is usually regarded as a negative parenting style and represents a continuum of parenting practices from the absence of aggressive behavior to violent assault (Nielsen et al., 2020; Simons et al., 1991).

Existing literature indicated that harsh parenting increases the risk of adolescents becoming addicted to the internet (Lo et al., 2021; M. Wang & Qi, 2017), but these studies have been mainly focused on general PIU, leaving the relationships between harsh parenting and PIU subtypes remain unclear. Meanwhile, how does harsh parenting contribute to PIU has been underexplored. The current study aimed to investigate relationships between harsh parenting and three prominent types of PIU (Problematic Gaming, PG; Problematic Social Media Use, PSMU; Problematic Information Consumption, PIC). Drawing upon the Interaction of Person-Affect-Cognition-Execution (I-PACE) model (Brand et al., 2016, 2019) and compensatory satisfaction theory (Q. Liu et al., 2016), this study further investigated the mediating role of relative deprivation and online basic psychological need satisfaction (OBPNS), and explored whether harsh parenting was linked to PIU subtypes via divergent mediation pathways.

Harsh Parenting in Relation to PIU

The negative parental and family features have been identified as a group of significant risk factors among a range of biological, psychological, social, and environmental factors of PIU (Brand et al., 2025). The Interaction of Person-Affect-Cognition-Execution (I-PACE) model considers the negative parental and family features contribute to individuals' susceptible predispositions during early development stages of PIU (Brand et al., 2016). These predispositions interact with situational features to determine affective and cognitive responses towards addiction-related stimuli, which lead to the decision to use the internet. In later stages, individuals form biased subjective expectancies toward addiction-related stimuli, and behavior becomes automatic and eventually addictive (Brand et al., 2019).

Harsh parenting is one of the most common adversities that children experience from their family context (Zhang et al., 2024), it may be positively related to adolescents' susceptibility to PIU according to the I-PACE model. In support of this view, studies suggest that adolescents from families that engaged in more punitive practices are more likely to foster internet dependency (Xiuqin et al., 2010). Experiencing excessive parent-to-child physical or verbal violence increased the probabilities of PIU up to 2.5 times (Guo et al., 2023; Vadlin et al., 2016). The severity of harsh parenting was positively related to adolescent PIU, regardless of whether harsh parenting was reported by spouse or child (Lo et al., 2021; M. Wang & Qi, 2017).

Nonetheless, two major limitations have emerged from this field. First, studies predominantly examined relationships between harsh parenting and generalized PIU. However, adolescent PIU is a spectrum that founded on various addictive online behaviours (Starcevic & Billieux, 2017) that distinct PIU subtypes may have unique risk factors (Baggio et al., 2024). Thus, the relationship between harsh parenting and PIU may vary depending on the specific PIU subtype. To our knowledge, only two studies examined PIU subtypes, revealing that harsh parenting positively predicted PG (M. Wang et al., 2024) and short-form video addiction (J. Wang, M. Wang, et al., 2023). Up to now, relationships between harsh parenting and PSMU as well as PIC have yet to be examined. A closer look at this issue would advance the current literature by providing a more nuanced picture of how harsh parenting contributes to different subtypes of PIU in different ways. Second, existing research also relied heavily on cross-sectional design, whereas this design makes conclusions as to the nature of the link inconclusive (Nielsen et al., 2020), the longitudinal design is thus preferred to establish temporal relationships and is more helpful in making causal inferences.

Harsh Parenting Indirectly Relates to PIU Subtypes Through Relative Deprivation and OBPNS

Beyond gaps mentioned above, mechanisms linking harsh parenting to PIU have not been thoroughly unpacked. As illustrated in the I-PACE model, both emotional and cognitive responses play critical roles in the relationship between distal environmental factors and PIU. However, cognitive factors including internet-related perceptions, beliefs, or expectancies (Brand et al., 2016, 2019) were far less studied in the harsh parenting – PIU literature. Previous studies have tapped into the role of emotional factors that facilitate the use of the internet such as emotion dysregulation and depression (Lin et al., 2023; M. Wang & Qi, 2017; J. Wang, M. Wang, et al., 2023). While considering the emotion-related mechanisms, the direct relationships between harsh parenting and problematic use of digital media are still significant (M. Wang & Qi, 2017; D. Wang et al., 2024; H. Wang et al., 2024), indicating that emotional perspective can only partially explain the effect of harsh parenting (M. Wang & Qi, 2017). To explore cognitive mechanisms of the relationship between harsh parenting and PIU, two studies have tapped into maladaptive cognitions (Sebre et al., 2020; H. Wang et al., 2024). These studies assumed that the belief that the virtual world is superior to the real world would lead to PIU. However, it still remains unclear why adolescents undergoing harsh parenting would form maladaptive cognitions toward the internet.

The current study assumed that relative deprivation and OBPNS sequentially mediated the relationship between harsh parenting and PIU. This assumption was built upon the compensatory satisfaction theory (Q. Liu et al., 2016). The main idea of the theory is that individuals would satisfy their psychological needs in both real life and online. Failing to meet needs in real life fosters individuals to satisfy their needs via online activities, and to develop the preference of satisfying needs online. The advantage of meeting the needs online over offline would heighten the risk of PIU (Kardefelt-Winther, 2014; Q. Liu et al., 2016). In line with this theory, we hypothesized that harsh parenting would facilitate relative deprivation of adolescents, which reflects dissatisfaction in real life and fosters them to fulfill their needs via online activities. This advantage of online needs satisfaction would be associated with a severer degree of PIU.

Relative deprivation refers to the cognitive appraisal that occurs when individuals compare themselves with the deserved status or with better-off others (Smith & Huo, 2014). It involves the appraisal that the self is in disadvantage, and the self does not deserve the current disadvantage (Smith & Pettigrew, 2014). Relative deprivation is usually accompanied by dissatisfaction (Smith et al., 2012), and is closely related to the un-met need in real life as depicted in compensatory satisfaction theory (Xie et al., 2018). Additionally, adolescents are prone to experience relative deprivation because of the characteristics of both the developmental stages and social context. Developmentally, social comparison becomes more significant during adolescence (Orben et al., 2024). They are more sensitive to social cues and automatically activate the social comparison process (Cauberghe et al., 2021). Contextually, they spend much time in school, which is a social context ripe for observation, interaction, and social comparison (Kim, 2021).

The current study hypothesized that harsh parenting was positively related to relative deprivation. In family systems, dysfunction from parent-child subsystem affects the child subsystem (Erel & Burman, 1995). In line with this perspective, frequently experiencing harsh discipline may have negative effect on child sociocognitive development. Parental harsh discipline leads children to develop maladaptive social information processing in following years (Weiss et al., 1992). They are more biased to attend to negative information in the environment (S. Yang et al., 2025), and feel less satisfied with their life (Yotyodying et al., 2021), which would contribute to inferiority in social comparison and increase the inclination to perceive relative deprivation. Also, adolescents anticipate their

parents to be empathetic, tender, and appropriately restrictive (Moreno et al., 2023), while an excess of aggressive and punitive actions will be perceived as hostility, threat, and even traumatic events, which may fail to meet child's expectations (Lancaster et al., 2018; Li et al., 2023). This may contribute to increased severity of relative deprivation as adolescents compare actual parenting behavior with the deserved one. Previous findings have indicated the potential positive relationship between harsh parenting and relative deprivation. For example, corporal punishment was negatively related to perceived fairness of parental discipline (Larzelere et al., 1989), and was reasoned by child as the most unfair among parents' discipline methods (Vittrup & Holden, 2010). Meanwhile, adolescents' general level of anger, a core emotional element in relative deprivation, was positively associated with perceived parental hostility or violence (Gershoff, 2002). However, despite these indicative evidences, the relationship between harsh parenting and relative deprivation has yet to be directly examined.

Further, we postulated that relative deprivation may be positively associated with OBPNS. Perceiving being relatively deprived elicits intentions or behaviors that address the individuals' disadvantage (Smith & Pettigrew, 2014). Ryan et al. (1996) identified basic psychological needs as being composed of three dimensions: autonomy, competence, and relatedness. The satisfaction of these needs initiates better social and emotional adjustment for adolescents (Vansteenkiste et al., 2020), which may mitigate the perceived seriousness of relative deprivation. OBPNS represents to what extent individuals perceive these basic psychological needs are fulfilled via online activities. As depicted in compensatory satisfaction theory, the offline disadvantage of needs satisfaction would facilitate online satisfaction (Q. Liu et al., 2016). Thus, it is reasonable to hypothesize that relative deprivation is positively related to online basic psychological need satisfaction longitudinally.

OBPNS is assumed to be positively associated with PIU subtypes. Compensatory satisfaction theory holds that OBPNS is a core proximal factor of PIU. An important reason individuals continue to use the internet is that basic psychological needs can be more effectively fulfilled online versus offline (Q. Liu et al., 2016). Adolescents who perceive more satisfaction online are expected to increase the use of and reliance upon the internet (Lapierre et al., 2019), which may result in PIU in the long run. In line with this view, Shen et al. (2013) found that weekly frequency and time for internet use, as well as positive emotion perceived online were positively related to OBPNS. Furthermore, the association between OBPNS and PIU was also positive when studies tapped into generalized PIU (Q. Liu et al., 2016), PG (Stašek et al., 2024), or PSMU (Q. Liu et al., 2023). But the pattern of this association remains unknown regarding PIC.

Finally, another issue that is well worth exploring is whether the predictive effect of OBPNS on PIU varies depending on what dimension of basic psychological need is satisfied via online activities. The three-dimension structure of OBPNS provided fitting theoretical foundation of this hypothesis. For instance, game playing could satisfy need for autonomy and competence (Ryan et al., 2006). Fulfillment of these basic psychological needs is demonstrated to be a determinant of game addiction in a preliminary study (Scerri et al., 2019). Relatedness satisfaction may be more closely related to PSMU than autonomy and competence satisfaction because social media is primarily designed to maintain and enhance modern interpersonal relation through which individuals perceive adequate fulfillment of relatedness need. This design feature would promote PSMU (Flayelle et al., 2023). The current study also responds to calls for more empirical investigation to uncover nuanced relationship between OBPNS and PIU subtypes (Q. Liu et al., 2016), as no study has revealed how different OBPNS dimensions are related to PIU subtypes by far. A nuanced picture of the OBPNS-PIU relationship would highlight in what way individuals of different PIU subtypes perceive their needs are satisfied via the internet, and give insights into compensatory satisfaction theory update and PIU intervention tailored to specific subtypes. Taken together, the current study aims to further explore whether harsh parenting predicts PIU subtypes via divergent mediating paths that involve relative deprivation and different OBPNS dimensions.

The Current Study

The current study aims at investigating the relationship between harsh parenting and three major subtypes of PIU (i.e., PG, PSMU, and PIC). In addition, based on the I-PACE model and compensatory satisfaction theory, we investigate how harsh parenting is related to PIU subtypes by hypothesizing the mediating role of relative deprivation and OBPNS. Furthermore, we speculate that this indirect relationship may vary depending on the specific satisfaction dimension and PIU subtype. Besides, the harsh parenting-PIU literature has been dominated by cross-sectional studies, which only established limited conclusions on the causal effect. Using longitudinal data to examine the proposed sequential mediation model made it possible to assume temporal precedence between variables (Preacher & Kelley, 2011) and allowed a more rigorous interpretation of causality. Thus, to examine the

sequential mediation model, we use data collected in two waves from a longitudinal study in which harsh parenting and relative deprivation were measured in the first wave (W1), OBPNS measured in the second wave (W2), and PIU measured across two waves.

Taken together, the current study proposed following hypotheses (see Figure 1 for the graphical illustration):

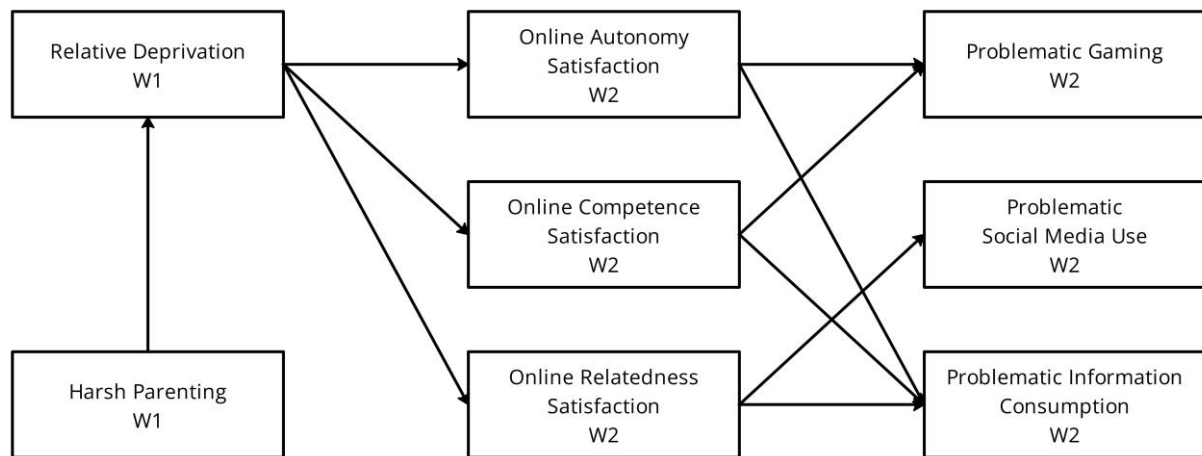
H1: Harsh parenting would positively predict PIU via the sequential mediating effect of relative deprivation and OBPNS.

H2: Harsh parenting would positively predict PG via the sequential mediating effect of relative deprivation and online competence satisfaction, and via the sequential mediating effect of relative deprivation and online autonomy satisfaction.

H3: Harsh parenting would positively predict PSMU via the sequential mediating effect of relative deprivation and online relatedness satisfaction.

Considering paucity of study that could provide inference for OBPNS and PIC, we posed the following **RQ:** How would harsh parenting predict PIC via the sequential mediating effect of relative deprivation and OBPNS?

Figure 1. *The Proposed Mediating Model*



Methods

Participant and Procedure

Data were obtained from a two-wave panel survey carried out in Hubei province of China. W1 was implemented in January 2019, followed by the second wave (W2) in January 2020. A clustering sampling scheme was conducted to invite all students in 7th and 8th Grade from two junior high schools to participate in the survey. Prior to the administration of questionnaires of W1, we obtained agreement from school supervisors and teachers and informed consents from all participants and their parents. Participants completed paper-and-pencil questionnaires during class periods, they were explained the research purpose and assured the confidentiality of their data. In W2, we distributed the survey through a professional online survey platform (<https://www.wjx.cn/>). Participants received the link sent by their homeroom teachers and completed the questionnaire via their or their parents' digital devices. They completed the questionnaire at home under teachers' instruction via instant messaging. All homeroom teachers had been trained prior to the survey administration to make sure the standardization of the administration procedure and minimize insufficient effort during students' response. The current study involves 476 students who responded in both waves. One participant reported never used the internet thus was not included in statistical analysis. The final sample contains 475 participants ($M_{age} = 15.640$, $SD_{age} = .640$, 57.89% female).

Measures

Harsh Parenting

Harsh parenting was measured at W1 with the 4-item scale adapted by M. Wang (2017) from Simons et al. (1991). This scale has been widely used and has good reliability and validity in Chinese context (e.g., Lin et al., 2023; J. Wang, M. Wang, et al., 2023). In the current study, student participants responded to the scale to indicate the degree of their parents' harsh parenting, for example, *when I did something wrong or made my parents angry, they lost temper or even yelled at me*. Responses are categorized into a 5-point Likert scale (1 = never, 5 = always), with higher scores indicating participants perceived a more severe level of harsh parenting. In this study, Cronbach's α was .849, McDonald's ω was .885. Confirmatory Factor Analysis (CFA) indicated that the one-factor model fitted data well (CFI = 1.000, TLI = 1.006, RMSEA = .015, SRMR = .002).

Relative Deprivation

Relative deprivation was measured at W1 using the Relative Deprivation Questionnaire developed by Ma (2012). The questionnaire was originally developed for Chinese adults, and its applicability for Chinese junior high school students has been demonstrated by Xuan et al. (2021). It consists of four items, and a sample item is: *I always feel that others possess things that should belong to me*. Participants rated each item on a 6-point Likert scale (1 = totally disagree, 6 = totally agree), with higher scores indicating participants feel relatively deprived to a large degree. In this study, Cronbach's α was .689, McDonald's ω was .709. Results of CFA indicated that the one-factor model fitted data well (CFI = 1.000, TLI = 1.011, RMSEA = .035, SRMR = .008).

Online Basic Psychological Need Satisfaction

OBPNS was measured at W2 with the scale adapted by Shen et al. (2013). The 12-item scale assessed the extent to which participants perceived the autonomy, competence, and relatedness need satisfaction when they were online. Previous studies have demonstrated good reliability and validity of the adapted scale (Q. Liu et al., 2020, 2023). Example items are *I felt a certain freedom of action when I used the internet* for autonomy satisfaction, *I am satisfied with my performance online* for competence satisfaction, and *When I was online, I felt I was supported by others* for relatedness satisfaction. Responses are categorized into a 7-point Likert scale (1 = totally disagree, 7 = totally agree), with higher scores representing needs are more satisfied. In this study, Cronbach's α for the total 12-item scale was .945, and for autonomy, competence, and relatedness satisfaction subscales were .857, .876, .912 respectively. McDonald's ω for the total 12-item scale was .959, and for autonomy, competence, and relatedness satisfaction subscales were .878, .895, .921 respectively. Results of CFA indicated that the three-factor model fitted data well (CFI = .972, TLI = .958, RMSEA = .078, SRMR = .031).

Problematic Internet Use Subtypes

The tendency of PIU subtypes was measured across W1 and W2 using Internet Addiction Type Questionnaire developed by Zhou and W. Yang (2006). This questionnaire was originally developed in Chinese cultural context and was proved to show good psychometric properties in previous studies (Q. Liu et al., 2023; Wei et al., 2017). The questionnaire captures typical diagnostic symptoms including tolerance, withdrawal, negative consequences, and obsessive-compulsive use of internet. The questionnaire contains 8 items for assessing PG, 6 items for PSMU, and 6 items for PIC. Sample items are *I failed to reduce the time spent on internet games* for PG, *I feel urge to chat online or checking social media as I get up* for PSMU, and *I can't help browsing or downloading information when I am online* for PIC. A 5-point Likert scale (1 = not at all, 5 = exactly the fact) was used to indicate the level of problematic use. In the current study, Cronbach's α for the total 20-item scale was .910 at W1, and .947 at W2; and for PG, PSMU, and PIC subscale were .830, .878, and .825 at W1, and .894, .918, .896 at W2. McDonald's ω for the total 20-item scale was .928 at W1, and .950 at W2; and for PG, PSMU, and PIC subscale were .899, .884, and .868 at W1, and .927, .911, .912 at W2. Test-retest reliability was indicated by intraclass correlation coefficient (ICC). Results showed that ICC for the scale was .586, 95% CI = [.457, .680], thus the scale has a moderate test-retest reliability (Koo & Lee, 2016). Results of CFA indicated that model fitted data well across two waves (in W1, CFI = .916, TLI = .904, RMSEA = .064, SRMR = .058; in W2, CFI = .931, TLI = .920, RMSEA = .075, SRMR = .044).

Covariates

The current study controlled covariates including subjective family socioeconomic status, subjective well-being, depression, and anxiety. Subjective family socioeconomic status was measured at W1. We used a single item adapted to Chinese context (Goodman et al., 2001; Hu et al., 2012) to assess subjective family socioeconomic status. Participants rated on a 10-point Likert scale (1 indicated the worst family economic condition and parental education and 10 indicated the best) to report the socioeconomic status of their family.

Subjective well-being, depression and anxiety were measured at W2. Subjective well-being was assessed using the four-item Subjective Happiness Scale developed by Lyubomirsky and Lepper (1999). Participants rated on a 7-point scale (e.g., In general, I consider myself: 1 = not a very happy person, 7 = a very happy person). In the current study, Cronbach's α for the scale was .713, McDonald's ω was .788. The 9-item Patient Health Questionnaire developed by Kroenke et al. (2001) was used to measure the severity of depression. Participants rated on a 4-point scale (0 = not at all, 3 = nearly every day). The total score was calculated to indicate depression severity. In the current study, Cronbach's α for the scale was .913, McDonald's ω was .929. For measuring anxiety, we used the 2-item Generalized Anxiety Disorder scale developed by Kroenke et al. (2007). These two items represent core anxiety symptoms, and were demonstrated to be a reliable tool for assessing anxiety severity (Delgadillo et al., 2012; Fairbrother et al., 2019). In the current study, Cronbach's α for the scale was .910, McDonald's ω was .936.

Data Analysis

The present study conducted descriptive statistics and correlational analysis using SPSS 25.0. The proposed model was tested using Mplus 8.1. PIU at W1, subjective family socioeconomic status, subjective well-being, depression, and anxiety were entered as the control variables into the model. There was no loss of participants across two time waves. Missing values in W1 accounted for only a minimal percentage across variables, which ranged from 0.00% to 1.50%; in W2, no missing values were generated because online questionnaire cannot be submitted with not responded items. The Little's MCAR test was conducted to identify the pattern of missing values. Results of the test was not significant, indicating the missing completely at random pattern ($\chi^2 = 1407.52$, $df = 1339$, $p = .094$). Thus we handled missing values with full information maximum likelihood (FIML) estimation (Lee et al., 2019). To assess the acceptability of the examined model, we followed these widely-used goodness-of-fit criteria: Comparative Fit Index (CFI) and Tucker-Lewis index (TLI) greater than 0.90, and Root-Mean-Square Error of Approximation (RMSEA) and Standardized Root Mean Square Residual (SRMR) less than 0.08 (Brown, 2015). A parametric bootstrap procedure with 5,000 resamples was used to calculate 95% bias-corrected confidence intervals for the indirect effects.

Results

Common Method Bias

The current study used self-reported measurements to assess all interested variables, which may lead to potential measurement error because of common method variance (Richardson et al., 2009). Thus, we examined common method bias by Harman's single-factor test through EFA. Results showed that the first component accounted for 27.946% of the total variance, which is smaller than the recommended 50% value (Fuller et al., 2016; Podsakoff et al., 2003), indicating the common method bias was not present in the current study.

Descriptive Statistics

Table 1 shows descriptive statistics and correlational relationships between study variables. All variables had skewness and kurtosis values < 2.000 , indicating the normal distribution (West et al., 1995). As expected, there were significant positive bivariate associations between study variables. However, harsh parenting was not correlated with OBPNs and PIC at W2. Meanwhile, relative deprivation was not correlated with online autonomy satisfaction.

Table 1. Descriptive Statistics and Correlations for Study Variables.

Variable	HP (W1)	RD (W1)	OAS (W2)	OCS (W2)	ORS (W2)	PG (W1)	PSMU (W1)	PIC (W1)	PG (W2)	PSMU (W2)	PIC (W2)
HP (W1)	—										
RD (W1)	.218***	—									
OAS (W2)	.065	.083	—								
OCS (W2)	.043	.177***	.699***	—							
ORS (W2)	.069	.148**	.715***	.874***	—						
PG (W1)	.222***	.282***	.223**	.268***	.253***	—					
PSMU (W1)	.214***	.283***	.171***	.238***	.278***	.471***	—				
PIC (W1)	.240***	.266***	.139**	.158**	.167***	.507***	.599***	—			
PG (W2)	.141**	.172***	.390***	.528***	.492***	.475***	.189***	.245***	—		
PSMU (W2)	.139**	.133**	.428***	.507***	.543***	.244***	.433***	.306***	.594***	—	
PIC (W2)	.070	.119**	.424***	.504***	.517***	.260***	.313***	.377***	.652***	.743***	—
<i>M</i>	2.190	3.111	4.189	3.291	3.364	2.314	2.402	2.318	2.010	2.079	2.088
<i>SD</i>	.840	.876	1.407	1.371	1.447	.910	.918	.837	.908	.924	.889
Skewness	.968	.289	−.506	−.082	−.106	.412	.398	.443	.818	.562	.618
Kurtosis	.652	.206	−.085	−.554	−.635	−.503	−.485	−.333	.116	−.470	−.380

Note. HP = Harsh Parenting; RD = Relative Deprivation; OAS = Online Autonomy Satisfaction; OCS = Online Competence Satisfaction; ORS = Online Relatedness Satisfaction; PG = Problematic Gaming; PSMU = Problematic Social Media Use; PIC = Problematic Information Consumption.

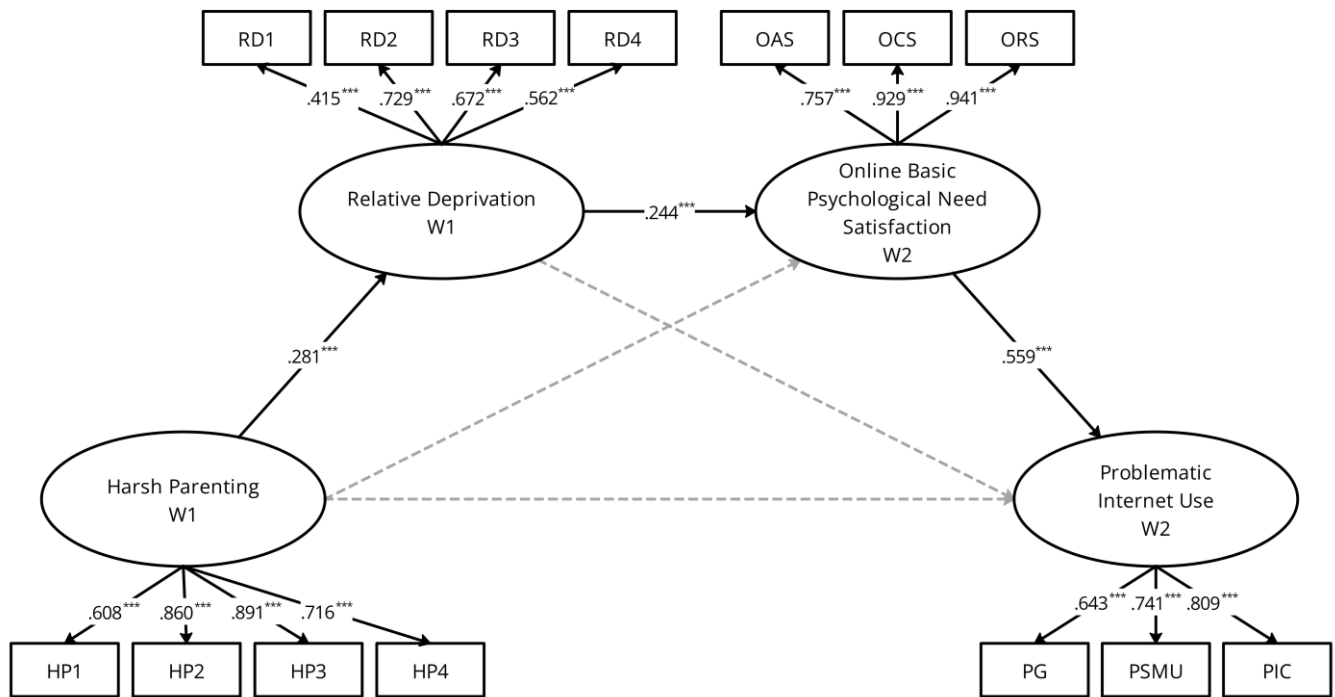
* $p < .05$. ** $p < .01$. *** $p < .001$.

Path Analysis Model for Associations Between Harsh Parenting and PIU Subtypes

We first constructed a sequential mediating model to examine H1 (see Figure 2). The aim of the model was to examine the sequential mediating effect of relative deprivation and OBPNS, thus we did not disentangle three dimensions of OBPNS and three PIU subtypes. Model fit indices indicated that the model acceptably fit to the data (CFI = .947, TLI = .939, RMSEA = .046, SRMR = .077).

In general, results indicated significant associations between variables as hypothesized. Specifically, as demonstrated in Figure 2, harsh parenting was positively correlated with relative deprivation ($\beta = .281, p < .001$), relative deprivation positively predicted OBPNS ($\beta = .244, p < .001$), and OBPNS was positively correlated with PIU ($\beta = .559, p < .001$). Other associations between interested variables were not significant. Given harsh parenting and relative deprivation were both measured at W1, their temporal proximity limits causal inferences regarding mediation. However, the observed relationships suggest that relative deprivation may play a role in the link between harsh parenting and problematic internet use. To test whether relative deprivation and OBPNS sequentially mediated the association between harsh parenting and PIU, the parametric bootstrap procedure with 5,000 resamples was conducted. Results indicated the significant sequential mediating effect of relative deprivation and OBPNS, the indirect effect was .040; 95% CI = [.010, .069], which supported H1. However, the direct effect, mediating effect of relative deprivation, and mediating effect of OBPNS were not significant.

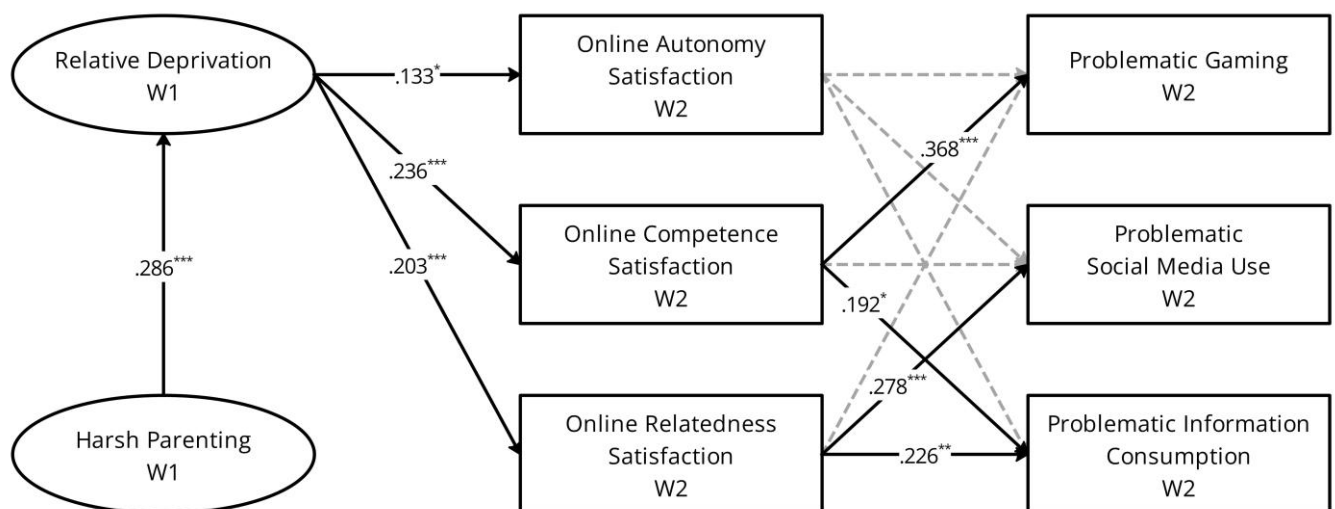
Figure 2. Results of the Proposed Model.



Note. Pathway coefficients are standardized. * $p < .05$. ** $p < .01$. *** $p < .001$.

Then, aiming at examining H2, H3, and RQ, we conducted the second pathway model in which we disentangled OBPNS dimensions and PIU subtypes (Figure 3). Model fit indices indicated that the model acceptably fit to the data (CFI = .945, TLI = .934, RMSEA = .047, SRMR = .079). In general, disentangling OBPNS dimensions and PIU subtypes revealed nuanced associations between harsh parenting and PIU subtypes. Specifically, as shown in Figure 3, the relationship between harsh parenting and relative deprivation remained significant ($\beta = .286$, $p < .001$), which is consistent with the prior model. Additionally, relative deprivation significantly predicted online autonomy, competence, and relatedness need satisfaction. The relationships between three OBPNS dimensions and three PIU subtypes were more intricate. The model revealed that online competence satisfaction was positively related to PG and PIC; online relatedness satisfaction was positively related to OSMU and PIC. However, online autonomy satisfaction didn't predict PG ($\beta = -.013$, $p = .788$), PSMU ($\beta = .078$, $p = .145$), or PIC ($\beta = .081$, $p = .142$).

Figure 3. Results of the Proposed Model With Disentangled Dimensions of OBPNS and PIU Subtypes.



Note. Pathway coefficients are standardized. * $p < .05$. ** $p < .01$. *** $p < .001$.

We again conducted bootstrapping with 5,000 resamples to investigate the significance of mediating pathways. Results showed that the sequential mediating effect of (a) relative deprivation and online competence satisfaction between harsh parenting and PG; (b) relative deprivation and online relationship satisfaction between harsh parenting and PSMU were significant (Table 2), which supported H2 and H3. This indicated that although harsh parenting positively predicted both PG and PSMU, their underlying mechanisms were not identical: adolescents who satisfy their competence need online would be more inclined to develop PG, for those who satisfy their relatedness need online would be more inclined to develop PSMU. However, effects of other pathways were not significant.

Table 2. *Unstandardized and Standardized Mediation Effect.*

Mediation Pathway	Mediation Effect	SE	95% CI (Unstandardized Effect)		95% CI (Standardized Effect)	
			LLCI	ULCI	LLCI	ULCI
HP—RD—OCS—PG	.035/.025	.016/.011	.004	.067	.003	.043
HP—RD—ORS—PSMU	.023/.016	.011/.008	.001	.045	.001	.032
HP—RD—ORS—PIC	.018/.013	.010/.007	-.001	.037	-.001	.027
HP—RD—OCS—PIC	.018/.013	.011/.008	-.003	.039	-.002	.028

Note. Unstandardized/Standardized statistics. SE = Standard Error; LLCI = Lower Limit of Confidence Interval; ULCI = Upper Limit of Confidence Interval.

Discussion

In this study, we investigated the relationship between harsh parenting and three PIU subtypes: PG, PSMU, and PIC. We examined the mediating role of relative deprivation and OBPNS, and explored whether harsh parenting predicted different PIU subtypes via distinct mediation pathways. Overall, we found that harsh parenting positively related to PIU subtypes via relative deprivation and multiple OBPNS. Additionally, mediation pathways varied depending on the dimension of need satisfaction and PIU subtype: harsh parenting positively related to (a) PG through relative deprivation and competence satisfaction; (b) PSMU through relative deprivation and relatedness satisfaction; (c) PIC through relative deprivation and relatedness satisfaction.

Harsh Parenting, PIU, and Mediators

The current study found that harsh parenting was positively and indirectly associated with general PIU via relative deprivation and OBPNS. This finding fills the gap in the existing literature on harsh parenting–PIU relationship, which predominantly focused on emotional mechanisms, by highlighting the critical role of cognitive factors. It also echoes with I-PACE model that the cognitive component plays a critical role in the development of PIU (Brand et al., 2016, 2019). Furthermore, this result supports our central argument that the compensatory advantage of online satisfaction is a core pathway between harsh parenting and PIU and extends PIU theories by underscoring that the advantage of online activities over real-life ways of meeting human needs is critical for the development of PIU.

The current study is the first study that established the positive relationship between harsh parenting and relative deprivation. Past studies mainly discussed the contribution of negative family environment to adolescent relative deprivation from the perspective of the disadvantaged family economic conditions (Bernburg et al., 2009; Nieuwenhuis et al., 2017), while the present study revealed that ill parenting styles such as harsh parenting can also elicit appraisals of deprivation. Engaging in social comparison becomes increasingly important when individuals enter into adolescence (Orben et al., 2024). Adolescents who perceive a severe level of harsh parenting usually have damaged self-evaluation and lower self-esteem (Y. Yang et al., 2024; Zhao & Y. Wang, 2023), they may perceive themselves are less advantaged in peer comparison and more prone to relative deprivation.

Relative deprivation, in turn, positively predicted OBPNS one year later. This positive relationship indicates that online satisfaction is endowed with advantages over real-life ways for those who perceive being relative deprived. This echoes the notion put forth by compensatory satisfaction theory that internet is able to compensate for, and even surpasses offline activities to satisfy unmet demands resulting from negative life events (Q. Liu et al., 2016). Besides, this result also demonstrates that satisfying basic psychological needs via online activities may be a

response to relative deprivation. According to the relative deprivation theory, the way individuals respond to relative deprivation depends on the possibilities for changing their social system: if there is little opportunity for changing, they are likely to improve personal situation in deviant rather than normative ways (Smith & Huo, 2014). Because of the high stability of harsh parenting (Flouri & Midouhas, 2017), adolescents may consider that it is less likely for parents to reduce harsh punitive actions. Consequently, they seek non-normative strategies to improve their disadvantaged situation. As relative deprivation is closely related to the dissatisfaction in real life (Xie et al., 2018), satisfaction via the internet would arise in response to perceived relative deprivation and compensate the real-life dissatisfaction.

Finally, the current study also found that OBPNS positively predicted PIU. This positive association between OBPNS and PIU was also approved in earlier studies (Q. Liu et al., 2023; Stašek et al., 2024). Q. Liu et al. (2023) found that online psychological need satisfaction was positively related to social networking addiction, and Stašek et al. (2024) found the relatedness satisfaction via gaming bridged player needs and gaming disorder. Together with this line of research, the present study lends credence to the idea that online satisfaction of basic psychological needs is a core proximal factor of PIU. As individuals fulfill their basic psychological needs, they may form expectations and preference for the internet and facilitate ongoing use of the internet, which may create a positive reinforcement loop that increases their duration of online activities, and increases the risk of PIU in the long run (Davis, 2001).

Divergent Pathways Towards PIU Subtypes

Online activities introduce novel and convenient ways to meet human needs (Turner et al., 2024), but whether different satisfactions are related to PIU subtypes differentially remained unknown. In the current study, when disentangling online satisfaction dimensions and PIU subtypes, we found harsh parenting predicted PG, PSMU, and PIC via different pathways respectively. Firstly, regarding PG, it was positively predicted by harsh parenting solely via relative deprivation and online competence satisfaction. This can be attributed to a large number of game features that aim at fulfilling players' desire for confidence and achievement to make players get "hooked" on gaming (Flayelle et al., 2023). For example, players learn skills and fulfill competence need through ideally paced challenges in games (Bender & Gentile, 2020). Though social connectedness perceived from in-game interpersonal interaction also relates to PG (Bender & Gentile, 2020), this study suggests that online competence satisfaction may be more prominent in relation to PG compared to relatedness and autonomy, especially for those who eliminate relative deprivation by playing online games.

Secondly, PSMU was positively predicted by harsh parenting solely via relative deprivation and online relatedness satisfaction. This finding further substantiates prior conclusions that satisfaction of belonging or relatedness is a crucial predictive factor for PSMU (Q. Liu et al., 2023). However, in Q. Liu et al. (2023), the cross-lagged panel modeling showed that relatedness, competence, and autonomous need satisfaction online all significantly predicted PSMU, but our study highlighted that the relatedness satisfaction is the most prominent predictor. This may be because we took other PIU subtypes into consideration and used different data analytical approaches. Future research should consider more subtypes and collect more waves of data. In addition, OBPNS was differentially associated with PG and PSMU, this demonstrates that although PG and PSMU represent the similar addictive behavioral pattern towards online activities (Moretta et al., 2022), they are motivated by distinct needs.

Thirdly, though online relatedness and competence satisfaction were significantly related to PIC, the mediation effects of the two paths that involved relatedness and competence need satisfaction were not significant. These results suggest that the indirect relationship between harsh parenting and PIC was inconclusive, and the contributions of online relatedness and competence satisfaction to PIC should be interpreted with caution. Given the scarcity of relevant studies, future studies should further evaluate what motivates individuals' behavior about excessive searching or downloading information.

Lastly, online autonomy satisfaction was not associated with any of the three PIU subtypes. One explanation for the result could be that the need for autonomy is satisfied when individuals feel in control of their actions and personally value what they are doing (Deci & Ryan, 2000). It is the sense of value and control that motivates them in game playing or information consumption (Ballabio et al., 2017; C. Yang et al., 2021), which, in turn, may counteract the formation mechanism of behavioral addiction that involves impaired control over online activities.

Implications, Limitations, and Future Studies

The current study advances the existing literature in following ways. First, it emphasizes the role of biased cognitive factors in the relationship between harsh parenting and adolescent PIU, whereas earlier studies mainly focused on disordered emotion processes (Lin et al., 2023; M. Wang & Qi, 2017; J. Wang, M. Wang, et al., 2023). Second, for relative deprivation theory, the current study implies that seeking compensation from the internet can serve as an alternative way to improve one's disadvantaged situation beyond those established strategies that are illegal or violent, such as damaging others' property (Smith & Huo, 2014). As to the compensatory satisfaction framework for PIU, this study highlights that it is necessary to clarify distinct compensatory satisfaction mechanisms regarding different PIU subtypes. Third, in spite of the fact that PG, PSMU, and PIC can all be initiated by harsh parenting, the underlying psychological process was divergent. Further disentangling this issue will help to understand the unique formation mechanism of different PIU subtypes. The current study goes beyond those studies that investigated the relationship between basic psychological need satisfaction and PIU but failed to specify dimensions of needs or subtypes of PIU (Gu et al., 2023; Gugliandolo et al., 2020; Kaya et al., 2024). As suggested by Baggio et al. (2024), when people engaged in one specific problematic online activity, they did not necessarily engage others. PIU should be considered conditionally that it involves multiple distinct online activities rather than as a broad construct. In this regard, the present results also cast new light on practical implications.

For clinicians, familial factors such as parenting practices or parent-child relationship should be targeted as a part of PIU treatments. For example, multi-family group therapy was demonstrated to be effective for decreasing adolescent PIU symptoms by enhancing communication between parents and adolescents (Q. Liu et al., 2015). Besides, non-pharmacological interventions for PIU should also pay more attention to specific subtypes, with a focus on need satisfaction dimensions that are particularly relevant to each subtype. For example, targeting at reducing the reliance on fulfilling competence-oriented needs via video games may be especially effective for PG treatment. Parents and educators are encouraged to identify types of online activities adolescents are particularly addicted to. As adolescents' online risk mirrors offline vulnerabilities (Odgers & Jensen, 2020), specific PIU subtypes may indicate the corresponding needs are not fulfilled in their real lives. Thus, it is suggested that parents and educators foster adolescents' corresponding need satisfaction in family and school systems. For young people, although online spaces offer opportunities of seeking satisfaction beyond traditional spaces (Odgers et al., 2020), it cannot fully supersede real-life experiences. For instance, Cauberghe et al. (2021) found that using social media as a substitute for offline social interaction during COVID-19 makes adolescents feel less happy. Meanwhile, young people should be aware that digital technologies are designed to promote involvement by satisfying psychological needs (Flayelle et al., 2023), which may increase vulnerability to PIU. Thus, adolescents are encouraged to seek offline support networks and build sustainable relationships in real world to meet basic psychological needs. Finally, for policymakers, prevention of adolescent PIU is suggested to focus on both offline and online practices. Specifically, health services for adolescent PIU should incorporate parental practices promotion and adolescents' digital literacy education. Regulating specific digital affordances that are excessively rewarding for needs satisfaction may be more effective than complete abstinence from internet access.

This study has several limitations. First, considering the research design and assessment, though we collected data from two time waves, the relationship between harsh parenting and relative deprivation, and that between OBPNS and PIU were still cross-sectional. Their temporal proximity limits causal inferences regarding the mediation effect. In other words, the timing of the measurement limits the definiteness to conclude that relative deprivation is the consequence of harsh parenting rather than a co-occurring factor. Future studies should incorporate more waves of data to include all variables measured at each time point. It should also be noted that the first item of the Relative Deprivation Questionnaire had a relatively low factor loading. This could be because this item involves the comparison to participants themselves but other three items all tap into comparisons to others. Although this scale has been frequently used to assess relative deprivation of Chinese young adults among previous studies (e.g., Tao et al., 2023; H. Wang & Lei, 2022; Xuan et al., 2021), future studies should use assessment tools that are more adequate to reflect the essence of relative deprivation, for example, the University Students' Relative Deprivation Questionnaire (Jia, 2022). Second, this study only involves problematic online behaviors that are frequently investigated in adolescents. Future studies should further investigate other PIU subtypes such as online porn addiction and cyberchondria that can originate in harsh parenting. Participants from other age groups are also needed. Third, despite having controlled covariates including subjective family socioeconomic status, subjective well-being, depression, and anxiety, other relevant variables such as social anxiety and obsessive-compulsive symptoms haven't been controlled. Previous research has shown that both are associated with harsh

parenting (Krebs et al., 2019; M. Wang et al., 2022) and can predict problematic internet use (Fineberg et al., 2022; M. Wang & Qi, 2017), suggesting that they may be confounded with the effects in the current study. Future studies should consider these potential covariates to make the revealed mediation effects more robust by eliminating potential confounding effects. Fourth, the effect of negative parental practices on PIU may vary depending on cultural background. Participants in this study were all recruited from China mainland, as previous studies suggested that harsh parenting is considered to be more acceptable and normative in China (L. Liu & M. Wang, 2018), this may attenuate the relationship between harsh parenting and PIU. Future studies should replicate the current study in diverse cultural backgrounds to demonstrate the generalizability of current results.

Conclusion

The primary goal of this study was to examine the mediating role of relative deprivation and online basic psychological need satisfaction, and to further explore how harsh parenting positively predicted three PIU subtypes (i.e., problematic gaming, problematic social media use, and problematic information consumption) via mediating effects that involve different dimensions of online basic psychological need satisfaction (OBPNS). The results showed that the association between harsh parenting and PIU was sequentially mediated by relative deprivation and online basic psychological need satisfaction. Moreover, the current study discovered unique pathways involved different OBPNS dimensions that link harsh parenting to different PIU subtypes. Specifically, problematic gaming was predicted by harsh parenting via relative deprivation and online competence satisfaction; problematic social media use was predicted by harsh parenting via relative deprivation and online relatedness satisfaction; problematic information consumption, however, was not predicted by harsh parenting via relative deprivation and any of the OBPNS dimensions. This study extends the literature by revealing that although harsh parenting increases the risk of PIU, the underlying compensatory mechanism was divergent regarding different PIU subtypes. These unique mechanisms also entail that the PIU intervention programs should be tailored to specific PIU subtypes.

Conflict of Interest

The authors have no conflicts of interest to declare.

Use of AI Services

The authors declare they have not used any AI services to generate or edit any part of the manuscript or data.

Authors' Contribution

Zongyuan Wang: conceptualization, formal analysis, software, methodology, writing—original draft. **Qinxue Liu:** data curation, supervision, validation, writing—review & editing. **Zien Ding:** conceptualization, validation, writing—review & editing. **Di Qi:** methodology, data curation, resources.

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Appendix

Table A1. *Searching Terms and Formulas Used for Searching Literature.*

Database	Searching Formula
Web of Science	TS = (("Internet addiction" OR "problematic Internet use" OR "maladaptive Internet use" OR "obsessive Internet use" OR "compulsive Internet use" OR "pathological Internet use" OR "Internet overuse" OR "Internet use disorder" OR "Internet dependence") AND ((harsh OR harshness OR punitive OR punish) W/1 (parenting OR parental)))
Scopus	TITLE-ABS-KEY (("Internet addiction" OR "problematic Internet use" OR "maladaptive Internet use" OR "obsessive Internet use" OR "compulsive Internet use" OR "pathological Internet use" OR "Internet overuse" OR "Internet use disorder" OR "Internet dependence") AND ((harsh OR harshness OR punitive OR punish) W/1 (parenting OR parental)))
Google Scholar	"Internet addiction" OR "problematic Internet use" OR "maladaptive Internet use" OR "obsessive Internet use" OR "compulsive Internet use" OR "pathological Internet use" OR "Internet overuse" OR "Internet use disorder" OR "Internet dependence" AND (harsh OR harshness OR punitive OR punish) W/1 (parenting OR parental)

Table A2. *Reliability and Validity of Assessment Tools.*

Assessment Tools	Cronbach's α	McDonald's ω	CFA Results				
			CFI	TLI	RMSEA	SRMR	Factor loadings
Harsh Parenting Scale	.849	.885	1.000	1.006	.015	.002	.608~.891
Relative Deprivation Questionnaire	.689	.709	1.000	1.011	.035	.008	.415~.729
OBPNS Scale	.945	.959	.972	.958	.078	.031	.757~.941
Internet Addiction Type Questionnaire (W1)	.910	.928	.916	.904	.064	.058	.643~.809
Internet Addiction Type Questionnaire (W2)	.947	.950	.931	.920	.075	.044	.720~.882

Table A3. *Zero-Order Correlations Between Covariates and PIU Subtypes.*

Variable	1	2	3	4	5	6	7	8	9	10
1. Subjective family socioeconomic status	—									
2. Subjective well-being	.187***	—								
3. Depression	-.116*	-.456***	—							
4. Anxiety	-.087	-.475***	.819***	—						
5. PG (W1)	.165***	-.054	.135**	.097*	—					
6. PSMU (W1)	-.022	-.122**	.180***	.162***	.471***	—				
7. PIC (W1)	-.063	-.080	.100***	.078	.507***	.599***	—			
8. PG (W2)	-.141**	-.126**	.269***	.217***	.475***	.189***	.245***	—		
9. PSMU (W2)	-.029	-.194***	.292***	.267***	.244***	.433***	.306***	.594***	—	
10. PIC (W2)	-.029	-.140**	.265***	.225***	.260***	.313***	.377***	.652***	.743***	—

Note. PG = Problematic Gaming; PSMU = Problematic Social Media Use; PIC = Problematic Information Consumption.

* $p < .05$. ** $p < .01$. *** $p < .001$.

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