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Distinct Psychological Pathways from Childhood Adversity to Addictive Outcomes in College Students: Parallel Mediating Roles of Internalizing Distress and Externalizing Dysregulation

Xiaodong Li[1]* , Xinyue Liang[1], Maodan Shen[1]

1 Research center of Humanities and Medicine, Zunyi Medical University, Zunyi, China

*Corresponding author: Xiaodong Li; email:1964148671@qq.com

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Abstract:

This study examined the psychological pathways linking childhood adversity to different addictive outcomes among college students, with a focus on the parallel mediating roles of internalizing distress and externalizing dysregulation. A cross-sectional survey was conducted among 1,198 college students with smoking behavior from universities in Guizhou Province, China. Childhood adversity was assessed through childhood trauma, parental rejection, and parental overprotection; internalizing distress was indicated by depression, anxiety, and stress; externalizing dysregulation was indicated by aggression and poor self-control. Structural equation modeling was used to test two parallel mediation models for internet-related addiction and nicotine dependence. The results showed that childhood adversity significantly and positively predicted both internalizing distress and externalizing dysregulation, whereas its direct effects on internet-related addiction and nicotine dependence were not significant. For nicotine dependence, the pathway through internalizing distress was relatively stronger, and remained significant after controlling for internet-related addiction. For internet-related addiction, externalizing dysregulation was the dominant mediating pathway, while internalizing distress showed a significant negative suppression effect. These findings suggest that although behavioral and substance-related addictive outcomes share childhood adversity as a common distal risk factor, they may be driven by distinct proximal psychological mechanisms. Prevention and intervention programs for college students should therefore emphasize emotion regulation for nicotine dependence and behavioral control for internet-related addiction.

Keywords:childhood adversity; internalizing distress; externalizing dysregulation; internet-related addiction; nicotine dependence; college students

1. Introduction

College students are in a critical developmental period spanning late adolescence and emerging adulthood, during which addictive behaviors may begin to consolidate and intensify. In this population, internet-related addiction and nicotine dependence deserve particular attention. Existing evidence indicates that problematic internet use and problematic computer gaming are not uncommon among undergraduates and are significantly associated with mental health problems such as depression and self-harm, suggesting that they have become important concerns for university mental health services (Stevens et al., 2020). Smoking among college students, although often characterized as light or intermittent, remains associated with nicotine dependence and multiple health risks (Halperin et al., 2010). In addition, smoking behavior in this population has shown stable links with negative affect, which has been identified as one of the most robust correlates of college student smoking (Magid et al., 2009). Accordingly, examining internet-related addiction and nicotine dependence simultaneously, and comparing their shared risk background as well as their potentially distinct psychological mechanisms, is of clear theoretical and practical importance in college student populations.

Childhood adversity has been widely recognized as an important upstream risk factor for a range of addiction-related outcomes. Classic work has shown that adverse childhood experiences are significantly associated with smoking during adolescence and adulthood, with greater adversity exposure corresponding to higher smoking risk (Anda et al., 1999). In the field of internet-related addiction, a recent meta-analysis likewise demonstrated a significant and stable positive association between childhood adverse experiences and internet addiction (Hao et al., 2024). More student-focused evidence further suggests that childhood trauma is moderately and positively associated with problematic internet use among students in mainland China (Wang et al., 2023), and that family-level adverse childhood experiences are related to elevated risks of

problematic internet use and problematic smartphone use in college samples (Forster et al., 2021). Together, these findings suggest that childhood adversity may represent a common upstream risk background for both internet-related addiction and nicotine dependence in college students. However, prior studies have largely focused on the overall association between childhood adversity and a single addictive outcome, whereas direct comparisons of how childhood adversity may influence different types of addiction through distinct psychological pathways remain limited.

Importantly, the present study adopts a relatively broad operationalization of childhood adversity, encompassing not only traumatic experiences but also persistent negative parenting and maladaptive parent-child interaction environments. Parental rejection, as a classic dimension of negative parenting, has consistently been linked to children's and adolescents' internalizing and externalizing problems. For example, Rothenberg et al. (2022) found in a longitudinal multicultural study that perceived parental acceptance-rejection significantly predicted later internalizing and externalizing behaviors. Parental overprotection, although not traditionally classified as a core adverse childhood experience, has also been increasingly recognized as developmentally harmful. Specifically, overprotection reflects excessive involvement, control, and restriction of autonomy, all of which may undermine adaptive development. A systematic review and meta-analysis showed that parental overprotection assessed by the EMBU was stably and positively associated with offspring internalizing and externalizing problems, with maternal overprotection often showing stronger effects than paternal overprotection (de Roo et al., 2022). Related work has further linked overprotection to lower behavioral autonomy, poorer psychosocial adjustment, and frustration of adolescents' psychological needs (Van Petegem et al., 2020; Williams et al., 2002). Because these variables capture relational experiences in early development rather than current college-period states, their theoretical meaning is appropriately

supported by child and adolescent developmental research. Accordingly, the present study includes parental rejection and parental overprotection as observed indicators of childhood adversity in order to more comprehensively capture relational adversity in early life.

From a developmental psychopathology perspective, childhood adversity is unlikely to lead to a single maladaptive outcome. Instead, it may simultaneously activate multiple maladaptive pathways. One pathway is characterized by inwardly directed distress, namely an internalizing pathway involving depression, anxiety, and stress. The other is characterized by behavioral dysregulation, namely an externalizing pathway involving heightened aggression and reduced self-control. In college students, both pathways appear relevant to addiction-related behaviors. Meta-analytic evidence indicates that problematic internet use is stably associated with depression, anxiety, and other mental health problems in student populations (Cai et al., 2023). In university samples, problematic internet use has also been linked with PTSD, depression, and anxiety symptoms (Xie et al., 2021). Moreover, evidence from child and adolescent samples suggests that problematic internet use is associated with a range of psychiatric disorders and functional impairments, including both internalizing and externalizing problems (Restrepo et al., 2020), implying that shared but differentiable mechanisms may underlie this phenomenon. With respect to smoking, negative affect has likewise been shown to be stably related to smoking behavior among college students (Magid et al., 2009). Taken together, internalizing distress and externalizing dysregulation may represent two key psychological pathways through which childhood adversity influences addictive behaviors in college students. Yet previous studies have typically examined internalizing or externalizing problems separately, and relatively few have incorporated both as parallel mechanisms within the same model.

Although internet-related addiction and nicotine dependence can both be conceptualized as addiction-related outcomes, they may not arise through identical psychological processes. In

college students, internet-related addiction is embedded in everyday digital media environments and may therefore be especially closely tied to impulsivity, behavioral disinhibition, and immediate reward seeking. By contrast, nicotine dependence may be more closely linked to emotional distress, internal regulatory needs, and behavioral dysregulation. Direct comparative evidence on these mechanisms in college student samples remains limited. Therefore, comparing internet-related addiction and nicotine dependence may clarify whether childhood adversity affects different addictive outcomes through similar or distinct psychological pathways, and may in turn shed light on the mechanisms differentiating behavioral and substance-related addiction in college students.

In summary, prior research has established robust links between childhood adversity and addictive behaviors, yet direct comparisons of how childhood adversity may affect different addictive outcomes through distinct psychological pathways remain scarce. In particular, few studies have simultaneously examined internalizing distress and externalizing dysregulation as parallel mediators and further tested whether their roles differ across behavioral and substance-related addiction. To address this gap, the present study focused on college students with smoking behavior from universities in Guizhou Province, China, and constructed two parallel mediation structural equation models to examine whether childhood adversity influences internet-related addiction and nicotine dependence through internalizing distress and externalizing dysregulation. In addition, cross-outcome control analyses were conducted to test the specificity of the mechanisms underlying the two addictive outcomes. Based on the existing literature, we proposed that childhood adversity would positively predict both internet-related addiction and nicotine dependence; that childhood adversity would positively predict internalizing distress and externalizing dysregulation; that internalizing distress and externalizing dysregulation would mediate the associations between childhood adversity and the two addictive outcomes; and that

the two mediation pathways might show different patterns across internet-related addiction and nicotine dependence.

2. Method

2.1 Participants and Procedure

This study used a cross-sectional survey design and recruited college students with smoking behavior from universities in Guizhou Province, China. Data were collected online from October to December 2025. A total of 1,350 questionnaires were distributed. After excluding cases with obviously patterned responses and those scoring 0 on both the DSM-5 smoking diagnosis and the nicotine dependence questionnaire, 1,198 valid questionnaires were retained, resulting in an effective response rate of 88.74%.

The final sample included 871 males (72.7%) and 327 females (27.3%), with ages ranging from 16 to 30 years ($M = 20.35$, $SD = 1.46$). Because all questionnaire items were mandatory, there were no missing data. All participants provided informed consent prior to participation. The study was approved by the Ethics Committee of Zunyi Medical University ([Zunyi Ethics Review 2025 No. 3-009]).

2.2 Measures

2.2.1 Childhood Adversity

Childhood adversity was modeled as a latent construct reflected by indicators of childhood trauma and adverse parenting-related experiences. In the present study, childhood adversity was operationalized broadly to include both traumatic experiences and adverse parenting-related experiences during early development.

Childhood trauma was assessed using the Childhood Trauma Questionnaire (CTQ). The CTQ consists of 28 items rated on a 5-point scale (0 = never to 4 = always) and assesses five dimensions of childhood trauma, including emotional abuse, physical abuse, sexual abuse, emotional neglect, and physical neglect. The scale also includes validity items for detecting minimization/denial responses (Bernstein et al., 1994). In the present study, the CTQ demonstrated high internal consistency ($\alpha = 0.898$).

Parenting-related experiences were assessed using a short-form version of the Egna Minnen av Barndoms Uppfostran (EMBU) (Perris et al., 1980). Four subscale scores were selected as observed indicators, including father overprotection (FOP), father rejection (FR), mother overprotection (MOP), and mother rejection (MR). The internal consistency coefficients for these four indicators were 0.667, 0.859, 0.713, and 0.841, respectively. In the structural models, CTQ, FOP, FR, MOP, and MR were specified as observed indicators of childhood adversity.

2.2.2 Internalizing Distress

Internalizing distress was modeled as a latent construct reflected by three observed indicators: depression (DEP), anxiety (ANX), and stress (STR). These indicators were assessed using the Depression Anxiety Stress Scales-21 (DASS-21), which includes 21 items rated on a 4-point scale (0 = did not apply to me at all to 3 = applied to me very much or most of the time) (Lovibond & Lovibond, 1995). In the present study, the internal consistency coefficients were 0.857 for DEP, 0.837 for ANX, and 0.861 for STR.

2.2.3 Externalizing Dysregulation

Externalizing dysregulation was modeled as a latent construct reflected by aggression (AGG) and reverse-scored self-control (RSC). Aggression was assessed using the Buss-Perry Aggression Questionnaire (BPAQ), a 22-item measure rated on a 5-point Likert scale, with higher scores

indicating greater aggression (Buss & Perry, 1992). Internal consistency was excellent (α = 0.923). Self-control was assessed using the 19-item Self-Control Scale, rated on a 5-point scale (Tangney et al., 2004). In the present study, the scale was reverse scored so that higher scores indicated poorer self-control. The internal consistency coefficient of RSC was 0.867.

2.2.4 Internet-Related Addiction

Internet-related addiction was modeled as a latent construct reflected by symptoms of internet gaming disorder and generalized internet addiction. Internet gaming disorder was assessed using the Internet Gaming Disorder Scale-Short Form (IGDS9-SF). This 9-item scale is rated on a 5-point Likert scale, with higher scores indicating more severe internet gaming disorder symptoms (Petry et al., 2014). Internal consistency in the present study was 0.898. Generalized internet addiction was assessed using the Internet Addiction Test (IAT), a 20-item measure rated on a 5-point Likert scale, with higher scores indicating more severe problematic internet use (Young, 1998). Internal consistency in the present study was 0.938. In the structural models, these two indicators were labeled IGD and IA, respectively.

2.2.5 Nicotine Dependence

Nicotine dependence was assessed using the Fagerstrom Test for Nicotine Dependence (FTND), a 6-item measure yielding a total score from 0 to 10, with higher scores indicating more severe nicotine dependence (Heatherton et al., 1991). Following conventional cutoffs, scores of 0-3 indicate mild dependence, 4-6 indicate moderate dependence, and scores of 7 or above indicate severe dependence. Internal consistency in the present study was acceptable (α = 0.637). FTND served as the observed indicator of nicotine dependence in the structural model.

2.3 Covariates

Gender, age, and only-child status were included as covariates. Gender was coded as 1 = male and 2 = female. Age was recorded in years. Only-child status was coded as 1 = yes and 2 = no. In the extended models, these variables were included as covariates to examine the robustness of the core pathways after controlling for demographic characteristics.

2.4 Data Preprocessing and Common Method Bias

Because the survey was administered online and all items were mandatory, no missing data were present in the final dataset. Descriptive statistics and correlations among the core variables were first examined.

Given that all data were collected through self-report measures, Harman's single-factor test was used to assess the potential influence of common method bias. All measurement items were entered simultaneously into an unrotated exploratory factor analysis. Common method bias was considered unlikely to be a serious concern if the first unrotated factor accounted for less than the conventional cutoff proportion of variance.

2.5 Statistical Analyses

All statistical analyses were conducted using SPSS 26.0 and Mplus 8.3. First, descriptive statistics and correlation analyses were performed to examine the basic associations among the core variables. Second, the measurement model was evaluated by examining standardized factor loadings, composite reliability (CR), and average variance extracted (AVE) in order to assess convergent and discriminant validity.

After establishing an acceptable measurement model, structural equation modeling was conducted to test whether childhood adversity was associated with internet-related addiction and nicotine dependence via internalizing distress and externalizing dysregulation. Internalizing

distress and externalizing dysregulation were specified as two parallel mediators. Although the two mediators were allowed to correlate, no direct path was specified between them. Thus, the model focused on two parallel psychological pathways rather than a serial mediation process.

Model fit was evaluated using the chi-square to degrees of freedom ratio (χ^2/df), the comparative fit index (CFI), the Tucker-Lewis index (TLI), the root mean square error of approximation (RMSEA), and the standardized root mean square residual (SRMR). To test the significance of mediation effects, 5,000 bootstrap samples were used to estimate total effects, direct effects, total indirect effects, and specific indirect effects. Mediation effects were considered significant when the 95% confidence interval did not include zero.

Finally, cross-outcome control analyses were conducted to examine the specificity of the proposed mechanisms. Specifically, nicotine dependence was controlled in the internet-related addiction model, and internet-related addiction was controlled in the nicotine dependence model, in order to test whether the core pathways remained stable after accounting for comorbid addictive outcomes.

3. Results

3.1 Preliminary Analyses

3.1.1 Common Method Bias

Because all data in the present study were obtained through self-report, Harman's single-factor test was first conducted prior to structural equation modeling. The results indicated that 27 factors had eigenvalues greater than 1, and the first unrotated factor accounted for 19.91% of the total variance, which was below the conventional 40% cutoff. These findings suggest that serious common method bias was unlikely to be present and that the data were suitable for subsequent analyses.

3.1.2 Descriptive Statistics, Correlations, and Discriminant Validity

Table 1 presents the descriptive statistics, bivariate correlations, and discriminant validity results for the core variables. Childhood adversity was positively correlated with internalizing distress, externalizing dysregulation, internet-related addiction, and nicotine dependence. Internalizing distress was positively correlated with externalizing dysregulation and with both addictive outcomes. Externalizing dysregulation showed a stronger correlation with internet-related addiction than with nicotine dependence. Overall, the observed pattern was consistent with theoretical expectations. In addition, the square roots of the AVEs shown on the diagonal exceeded the corresponding interconstruct correlations, supporting adequate discriminant validity among the latent constructs.

Table 1. Descriptive statistics, correlations, and discriminant validity of the core variables.

Variable	M	SD	1	2	3	4	5
1. CA	107.50	24.93	(0.719)				
2. ID	74.94	23.52	0.525**	(0.913)			
3. ED	95.73	22.50	0.412**	0.631**	(0.756-0.761)		
4. IRA	72.34	19.10	0.319**	0.412**	0.549**	(0.805)	-
5. ND	2.85	2.28	0.228**	0.320**	0.249**	-	(1.000)

Note. Values in parentheses on the diagonal are the square roots of the AVEs. Off-diagonal entries are Pearson correlation coefficients. Because the square root of the AVE for ED differed slightly across the two models, it is presented as a range. IRA and ND served as outcomes in two

separate structural models; therefore, their correlation was not reported. CA = childhood adversity; ID = internalizing distress; ED = externalizing dysregulation; IRA = internet-related addiction; ND = nicotine dependence. ** $p < 0.01$.

3.2 Measurement Model Evaluation

Tables 2 and 3 report the measurement properties of the internet-related addiction model and the nicotine dependence model, respectively. Across both models, the standardized factor loadings were acceptable, and all CR and AVE values of the latent constructs met or exceeded commonly used thresholds. Childhood adversity, internalizing distress, and externalizing dysregulation all demonstrated satisfactory convergent validity and internal consistency. In the nicotine dependence model, FTND was specified as a single-indicator outcome.

Table 2. Measurement properties of the internet-related addiction model.

Construct	Indicator	λ	CR	AVE	α
Childhood adversity	CTQ	0.741	0.839	0.517	0.898
	FR	0.870			0.859
	MR	0.790			0.841
	FOP	0.603			0.667
	MOP	0.540			0.713
Internalizing distress	STR	0.922	0.938	0.834	0.861
	ANX	0.924			0.837

	DEP	0.893			0.857
Externalizing dysregulation	RSC	0.745	0.727	0.572	0.867
	AGG	0.767			0.923
Internet-related addiction	IGD	0.704	0.784	0.648	0.898
	IA	0.895			0.938

Table 3. Measurement properties of the nicotine dependence model.

Construct	Indicator	λ	CR	AVE	α
Childhood adversity	CTQ	0.741	0.839	0.517	0.898
	FR	0.871			0.859
	MR	0.790			0.841
	FOP	0.603			0.667
	MOP	0.540			0.713
Internalizing	STR	0.921	0.938	0.834	0.861

distress					
	ANX	0.925			0.837
	DEP	0.893			0.857
Externalizing dysregulation	RSC	0.702	0.732	0.579	0.867
	AGG	0.815			0.923
Nicotine dependence	FTND	1.000	1.000	1.000	0.637

3.3 Structural Model Fit

Table 4 presents the global fit indices of the two structural models. The nicotine dependence model yielded CFI = 0.965, TLI = 0.950, RMSEA = 0.064, and SRMR = 0.036, whereas the internet-related addiction model yielded CFI = 0.961, TLI = 0.946, RMSEA = 0.066, and SRMR = 0.040. Although the chi-square statistics were significant, the overall pattern of descriptive fit indices indicated acceptable model fit in both models, supporting further interpretation of the structural paths.

Table 4. Global fit indices of the structural equation models.

Model	χ^2	df	χ^2/df	CFI	TLI	RMSEA [95% CI]	SRMR
Internet-related addiction	457.959***	74	6.19	0.961	0.946	0.066 [0.060, 0.072]	0.040

model							
Nicotine dependence model	368.723***	62	5.95	0.965	0.950	0.064 [0.058, 0.071]	0.036

Note:***p<0.001

3.4 Structural Path Estimates

Table 5 presents the standardized structural path coefficients for the two models. In both models, CA significantly and positively predicted ID and ED, indicating that greater adversity was associated with more severe internalizing and externalizing problems. In the ND model, both ID and ED significantly and positively predicted the outcome, whereas the direct path from CA to ND was not significant. In the IRA model, ED significantly and positively predicted the outcome, whereas ID showed a significant negative path. The direct path from CA to IRA was likewise nonsignificant. Overall, the two models were similar in the antecedent paths but differed substantially in the downstream paths leading to the two addictive outcomes.

Table 5. Standardized structural path coefficients for the two models.

Path	IRA β	p	ND β	p
CA → ID	0.577***	< 0.001	0.577***	< 0.001
CA → ED	0.505***	< 0.001	0.511***	< 0.001
ID → outcome	-0.206*	0.004	0.211*	< 0.001
ED → outcome	0.818*	<0 .001	0.137*	0.025

CA → outcome	0.074	0.087	0.031	0.398

Note:*p<0.05,**p<0.01,***p<0.001

In the internet-related addiction model, externalizing dysregulation showed a strong positive association with the outcome (β = 0.818, p < 0.001), whereas internalizing distress showed a significant negative association (β = -0.206, p = 0.004). The direct path from childhood adversity to internet-related addiction was not significant (β = 0.074, p = 0.087), suggesting that the association between adversity and internet-related addiction was primarily transmitted through the mediators. The final internet-related addiction model is shown in Figure 1.

[Insert Figure 1 about here]

Figure 1. Final standardized path model for the internet-related addiction outcome.

In the nicotine dependence model, both internalizing distress (β = 0.211, p < 0.001) and externalizing dysregulation (β = 0.137, p = 0.025) positively predicted nicotine dependence, with the internalizing pathway showing the larger coefficient. The direct path from childhood adversity to nicotine dependence was not significant (β = 0.031, p = 0.398), again suggesting primarily indirect transmission of effects. The final nicotine dependence model is shown in Figure 2.

[Insert Figure 2 about here]

Figure 2. Final standardized path model for the nicotine dependence outcome.

3.5 Bootstrap Decomposition of Mediation Effects

Table 6 reports the bootstrap estimates of total effects, direct effects, total indirect effects, and specific indirect pathways. In the nicotine dependence model, the total effect was significant, the direct effect was not significant, and the total indirect effect was significant, indicating that the

association between childhood adversity and nicotine dependence was primarily mediated. Among the specific indirect effects, the pathway through internalizing distress was larger than the pathway through externalizing dysregulation. In the internet-related addiction model, the total effect and the total indirect effect were likewise significant, whereas the direct effect was not significant. Notably, the indirect effect through externalizing dysregulation was strongly positive, whereas the indirect effect through internalizing distress was significantly negative.

Table 6. Bootstrap decomposition of total, direct, and indirect effects.

Model	Effect	β	95% CI
IRA	Total effect	0.368***	[0.302, 0.431]
IRA	Direct effect	0.074	[-0.012, 0.157]
IRA	Total indirect effect	0.294*	[0.229, 0.363]
IRA	Adversity → Internalizing → Outcome	-0.119**	[-0.207, -0.044]
IRA	Adversity → Externalizing → Outcome	0.413***	[0.333, 0.508]
ND	Total effect	0.223***	[0.163, 0.281]
ND	Direct effect	0.031	[-0.043, 0.104]
ND	Total indirect effect	0.192*	[0.149, 0.237]
ND	Adversity → Internalizing →	0.122***	[0.057, 0.186]

	Outcome		
	Adversity →		
ND	Externalizing →	0.070*	[0.010, 0.134]
	Outcome		

Note:*p<0.05,**p<0.01,***p<0.001

3.6 Specificity Analyses After Controlling for Comorbidity

Table 7 presents the specificity tests after controlling for the other addictive outcome. In the nicotine dependence model, after controlling for internet-related addiction, the adversity → internalizing distress → nicotine dependence pathway remained significant, whereas the adversity → externalizing dysregulation → nicotine dependence pathway became nonsignificant, suggesting that the internalizing pathway showed greater specificity. By contrast, in the internet-related addiction model, after controlling for nicotine dependence, both the adversity → externalizing dysregulation → internet-related addiction pathway and the adversity → internalizing distress → internet-related addiction pathway remained significant, indicating that the core mediation paths in the internet-related addiction model were robust to comorbidity adjustment.

Table 7. Specificity tests after controlling for the other addictive outcome.

Model	Indirect path	Original β	Adjusted β
IRA model	CA → ED → outcome	0.413***	0.346***
	CA → ID → outcome	-0.119**	-0.118***
ND model	CA → ID → outcome	0.122***	0.018**
	CA → ED →	0.070*	0.006 (ns)

outcome

Note:*p<0.05,**p<0.01,***p<0.001

4. Discussion

The present study used two parallel mediation structural equation models in a sample of college students with smoking behavior from Guizhou Province, China, to compare the psychological pathways through which childhood adversity was associated with nicotine dependence and internet-related addiction via internalizing distress and externalizing dysregulation. Three main findings emerged. First, in both models, childhood adversity significantly and positively predicted internalizing distress and externalizing dysregulation, whereas the direct paths from childhood adversity to the addictive outcomes were not significant. This pattern suggests that the association between early adversity and addiction risk was transmitted primarily through emotional and behavioral maladjustment rather than through significant direct effects in the present models. Second, although the two addictive outcomes shared similar antecedent pathways, their downstream pathways diverged: nicotine dependence was showed a stronger effect-size trend to the pathway through internalizing distress, whereas internet-related addiction was more strongly driven by externalizing dysregulation, with internalizing distress showing a significant negative suppression pattern in the internet-related addiction model. Third, the cross-outcome control analyses indicated that these pathway differences remained relatively stable after controlling for the other addictive outcome. Overall, the findings suggest that although substance-related and behavioral addictive outcomes may share a common early risk background, their psychological mechanisms are not identical (Cicchetti & Rogosch, 1996).

4.1 Childhood adversity as a common upstream predictor of internalizing distress and externalizing dysregulation

Across both models, childhood adversity showed moderate-to-strong and similarly directed positive associations with both internalizing distress ($\beta = 0.577$) and externalizing dysregulation ($\beta = 0.505–0.511$), whereas the direct paths from childhood adversity to the addictive outcomes were not significant. This pattern is broadly consistent with the developmental psychopathology perspective of multifinality, according to which a single upstream risk factor may contribute to different maladaptive outcomes through distinct developmental or psychological pathways (Cicchetti & Rogosch, 1996).

In the present study, childhood adversity was conceptualized as a broad construct including both childhood traumatic experiences and adverse relational experiences in the family context. This operationalization extends beyond the traditional ACE framework (Felitti et al., 1998) by also incorporating relational adversity dimensions—specifically, parental rejection and parental overprotection—that may shape later psychological adjustment but are not always captured in conventional ACE inventories.

Moreover, the nonsignificant direct paths and significant total indirect effects in both models indicate that internalizing distress and externalizing dysregulation jointly accounted for the major mediating processes linking childhood adversity to both nicotine dependence and internet-related addiction. This pattern reinforces the importance of focusing on how early adversity becomes translated into later risk, rather than asking only whether adversity has a direct effect on addictive outcomes.

4.2 Nicotine dependence model: the relatively stronger role of internalizing distress

In the nicotine dependence model, both internalizing distress and externalizing dysregulation positively predicted nicotine dependence, but the specific indirect effect through internalizing distress($\beta = 0.122$) was larger than that through externalizing dysregulation ($\beta = 0.070$). This suggests that, in the pathway from childhood adversity to nicotine dependence, internal distress characterized by depression, anxiety, and stress may play a relatively more prominent mediating role.

This interpretation is directionally consistent with prior college-student research showing that negative affect is an important correlate of smoking behavior. Magid et al. (2009) found that negative affect was the most robust correlate of smoking among college students, even after accounting for alcohol and marijuana use. In light of the present findings, this suggests that among college students exposed to higher levels of childhood adversity, internal distress may play a particularly salient role in the development of nicotine dependence risk. At the same time, because the present study did not directly assess smoking motives, these results are more appropriately interpreted as reflecting a risk transmission pattern associated with internalizing distress rather than as direct evidence for any specific motivational mechanism of smoking .

The cross-outcome control analyses provide a more refined interpretation. After additionally controlling for internet-related addiction, the indirect effect through internalizing distress remained significant, whereas the indirect effect through externalizing dysregulation became nonsignificant. This pattern suggests that the association between externalizing dysregulation and nicotine dependence may partially overlap with comorbid risk related to internet-related addiction, whereas the link between internalizing distress and nicotine dependence appears more stable. More broadly, this interpretation is compatible with addiction models that emphasize the role of negative affect and negative reinforcement in substance-related dependence (Baker et al., 2004).

4.3 Internet-related addiction model: the dominant role of externalizing dysregulation and the suppression pattern of internalizing distress

In the internet-related addiction model, externalizing dysregulation showed a comparatively strong association with the outcome ($\beta = 0.818$, $p < 0.001$), and the specific indirect effect through externalizing dysregulation ($\beta = 0.413$) was substantially larger than the corresponding effect in the nicotine dependence model ($\beta = 0.070$). This suggests that, in the present sample, behavioral disinhibition—primarily reflected in higher aggression and poorer self-control—may represent the core psychological pathway through which childhood adversity was associated with internet-related addiction.

This pattern is broadly consistent with the I-PACE model, which proposes that addictive online behaviors develop through interactions among personal predispositions, affective-cognitive responses, and executive control processes, with deficits in inhibitory control playing an important role in the shift from habitual to dysregulated use (Brand et al., 2019). In the present study, externalizing dysregulation was indicated by aggression and poor self-control, both of which correspond closely to the central features of behavioral disinhibition and impaired executive control. Accordingly, the current findings are consistent with the possibility that, in the digital media environment of college students, deficits in behavioral control may more contribute to the risk of internet-related addiction than internal distress alone.

At the same time, one of the most notable findings of this study is that internalizing distress showed a significant negative path coefficient in the internet-related addiction model ($\beta = -0.206$, $p = 0.004$), and the specific indirect effect through internalizing distress was also negative($\beta = -0.119$, 95% CI [−0.207, −0.044]). Because this indirect effect was opposite in direction to the externalizing pathway and the overall indirect pattern, it suggests a negative suppression effect. As MacKinnon et al. (2000) argued, suppression may occur when adding a third variable changes

the magnitude or direction of the relation between an independent and a dependent variable by reallocating shared variance. In the present context, this means that the negative path from internalizing distress to internet-related addiction is more appropriately understood as a unique residual effect after accounting for externalizing dysregulation, rather than as evidence that internalizing distress generally protects against internet-related addiction .

This interpretation is important because the zero-order association between internalizing distress and internet-related addiction was positive($r = 0.412$, $p < 0.01$), which is consistent with the broader literature showing that problematic internet use is generally positively associated with depression, anxiety, loneliness, and other adverse mental health outcomes (Cai et al., 2023). The current negative path emerged only after internalizing distress and externalizing dysregulation were modeled simultaneously, and after the shared variance between the two mediators was statistically separated. Thus, the present findings do not suggest that internalizing distress is beneficial. Rather, they indicate that once the variance shared with externalizing dysregulation is accounted for, the remaining unique component of internalizing distress may be associated with a lower tendency toward highly stimulating, strongly interactive, and immediate-feedback-oriented internet-related addictive behaviors .

Empirical work suggests that such a pattern is not entirely without precedent. Zhou et al. (2024) reported a suppression effect in adolescent internet addiction research, showing that direct effects and indirect effects through well-being could operate in opposite directions within the same model. In addition, broader developmental psychopathology research has shown that, after controlling for externalizing psychopathology and depression, the unique effects of internalizing or anxiety symptoms may sometimes become negative rather than positive.Specifically, Rieselbach et al. (2023) found that after controlling for externalizing psychopathology and depression, anxiety was associated with reduced substance use in adolescence. Taken together,

these findings support a cautious interpretation of the present result: after controlling for externalizing dysregulation, the remaining unique variance of internalizing distress may be more strongly associated with withdrawal, avoidance, inhibition, or disengagement, characteristics that may not facilitate internet-related addictive behaviors.

On this basis, the most defensible conclusion is that internalizing distress functioned as a negative suppressor in the internet-related addiction model. At the same time, this interpretation should be regarded as provisional, given the cross-sectional design and the broader literature documenting an overall positive association between internalizing symptoms and problematic internet use.

4.4 Pathway heterogeneity and differentiation between nicotine dependence and internet-related addiction

When the two models are considered together, a consistent pattern emerges: childhood adversity, as a common upstream risk factor, was associated with different addictive outcomes through two parallel pathways—internalizing distress and externalizing dysregulation—but the relative salience of these pathways differed across outcomes.

More specifically, nicotine dependence was more closely associated with the pathway through internalizing distress—characterized by depression, anxiety, and stress- consistent with an affect-regulation-related risk pattern. By contrast, internet-related addiction was more closely associated with the pathway through externalizing dysregulation—characterized by aggression and poor self-control—consistent with an impulse-control-related risk pattern. This differentiation aligns with longstanding theoretical distinctions in addiction science: substance-related dependence has been linked primarily to negative reinforcement and the regulation of negative affect (Baker et al., 2004), whereas behavioral addictive outcomes have been linked

more closely to deficits in inhibitory control and reward-driven decision-making (Brand et al., 2019).

The cross-outcome control analyses provided further, albeit indirect, support for this differentiation. In the nicotine dependence model, the indirect effect through externalizing dysregulation was no longer significant after controlling for internet-related addiction, whereas the indirect effect through internalizing distress remained significant. In the internet-related addiction model, both the externalizing pathway and the negative internalizing suppression pathway remained stable after controlling for nicotine dependence. These results suggest that, although the two addictive outcomes may co-occur, their proximal psychological pathways may not be identical. This interpretation is also consistent with evidence that the role of internalizing symptoms in addiction-related outcomes can vary depending on whether co-occurring externalizing psychopathology is taken into account (Rieselbach et al., 2023). It should be noted, however, that cross-outcome control analyses represent statistical adjustment rather than causal decomposition; the observed pattern therefore provides convergent but not conclusive evidence for pathway specificity.

4.5 Theoretical contributions and practical implications

The present study contributes to the existing literature in several ways. First, whereas previous research has typically examined internalizing and externalizing problems in isolation, the present study incorporated both into a single parallel mediation framework, revealing their differentiated mediating roles across two addictive outcomes. Second, by simultaneously examining nicotine dependence and internet-related addiction within the same sample, the study enabled a direct within-sample comparison of the psychological pathways underlying a substance-related and a behavioral addictive outcome. Third, the inclusion of cross-outcome control analyses allowed us to test whether the observed mediation patterns remained stable after

accounting for comorbid addictive risk, thereby providing convergent evidence for a pattern of shared upstream risk but differentiated downstream pathways. Fourth, the identification of a negative suppression effect of internalizing distress in the internet-related addiction model underscores the importance of attending to shared variance, competing pathways, and potential direction reversals when conducting parallel mediation analyses.

Several practical implications follow from these findings, though they should be considered preliminary given the cross-sectional nature of the data. Prevention efforts targeting college students may benefit from greater attention to childhood adversity as a distal source of risk for multiple addictive outcomes. For students at elevated risk of nicotine dependence, intervention strategies that prioritize emotion regulation and the alleviation of internalizing symptoms may be particularly relevant. For those at elevated risk of internet-related addiction, interventions targeting behavioral control—such as self-control training and impulsivity management—may warrant greater emphasis. Because the two addictive outcomes may co-occur, comprehensive prevention programs should ideally address both emotion regulation and behavioral control, with the relative emphasis tailored to the individual's dominant risk profile. These implications are consistent with the distinct pathway patterns observed in the present models and with prior theoretical work on negative reinforcement in substance dependence and executive-control deficits in behavioral addiction .

4.6 Limitations and future directions

Several limitations should be acknowledged. First, the study employed a cross-sectional design, and all variables were measured at the same time point. Although childhood adversity theoretically precedes current psychological symptoms and addictive behaviors, the causal ordering among internalizing distress, externalizing dysregulation, and the addictive outcomes cannot be established with certainty. Future research should adopt longitudinal or cross-lagged

designs to clarify temporal ordering. Second, the sample was limited to college students with smoking behavior from universities in Guizhou Province, and the proportion of male participants was relatively high. Therefore, the generalizability of the findings to other regions, female samples, and non-smoking college student populations remains to be established. Third, all variables were assessed via self-report, which may have introduced recall bias and social desirability bias. Fourth, nicotine dependence was modeled using FTND as a single indicator with the factor loading fixed at 1, which may have limited the precision of measurement error correction and latent variable estimation. Finally, the χ^2/df values were slightly above conventional heuristic thresholds. Although alternative fit indices such as CFI, RMSEA, and SRMR fell within acceptable ranges, model fit should still be interpreted with appropriate caution .

5. Conclusion

Based on a sample of 1,198 college students with smoking behavior, the present study used dual parallel mediation structural equation models to reveal differentiated psychological mechanisms through which childhood adversity was associated with nicotine dependence and internet-related addiction. The findings indicate that childhood adversity primarily affected the two addictive outcomes indirectly through parallel pathways involving internalizing distress and externalizing dysregulation, rather than through stable direct effects. In the nicotine dependence model, internalizing distress emerged as the relatively more important pathway. In the internet-related addiction model, externalizing dysregulation was the stronger driving pathway, whereas internalizing distress showed a negative suppression pattern. These findings suggest that although substance-related and behavioral addictive outcomes share common early risk backgrounds, they differ meaningfully in their psychological mechanisms. Future prevention and intervention efforts

may therefore benefit from adopting more targeted strategies based on the distinct mechanisms underlying different addictive outcomes (MacKinnon et al., 2000; Brand et al., 2019).

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