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**Childhood Trauma and Internet Addiction Among Chinese College Students
With DSM-5-Based Self-Reported Tobacco Dependence: The Serial
Mediating Roles of Self-Control and Aggression**

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Abstract

Background: Internet addiction is frequently examined among university students, but less is known about how early adverse experiences are associated with problematic Internet use in students who already show elevated tobacco-use symptoms. Drawing on the Interaction of Person-Affect-Cognition-Execution (I-PACE) framework and self-regulation perspectives, this study tested whether self-control and aggression serially mediated the association between childhood trauma and Internet addiction among Chinese college students who met a DSM-5-based self-report screening threshold for tobacco dependence symptoms. **Methods:** A cross-sectional questionnaire survey was conducted with 663 Chinese college students who reported DSM-5-based tobacco-use symptoms at a score of 4 or above. Participants completed measures of childhood trauma, self-control, aggression, Internet addiction, and demographic characteristics. Pearson correlations were used to examine zero-order associations. A serial mediation model was estimated using PROCESS Model 6 with 5,000 bootstrap samples, controlling for gender and age. **Results:** Childhood trauma was positively correlated with Internet addiction ($r = .196, p < .01$) and aggression ($r = .290, p < .01$), and negatively correlated with self-control ($r = -.138, p < .01$). Self-control was strongly and negatively correlated with both aggression ($r = -.557, p < .01$) and Internet addiction ($r = -.511, p < .01$). The mediation model showed that childhood trauma negatively predicted self-control ($B = -0.083, p < .001$), self-control negatively predicted aggression ($B = -0.744, p < .001$), and aggression positively predicted Internet addiction ($B = 0.131, p = .001$). The direct effect of childhood trauma on Internet addiction remained significant ($B = 0.080, p = .009$). Bootstrap analyses indicated significant indirect effects through self-control alone, aggression alone, and the serial pathway through self-control and aggression. **Conclusions:** Among Chinese college students with elevated DSM-5-based tobacco-use symptoms, childhood trauma was associated with Internet addiction partly through impaired self-control and heightened aggression. Self-regulatory deficits appeared to be the dominant mechanism, whereas aggression represented a smaller but significant externalizing pathway. Because the design was cross-sectional and based on self-report measures, causal interpretation is not warranted.

Keywords: childhood trauma; self-control; aggression; Internet addiction; tobacco dependence; Chinese college students

Introduction

Problematic Internet use remains an important concern in university populations because digital platforms are deeply embedded in learning, social contact, entertainment, and emotion regulation. In this manuscript, Internet addiction refers to a maladaptive pattern of excessive or poorly controlled Internet use associated with functional impairment and difficulty disengaging from online activities, rather than to ordinary high-frequency Internet use. The construct was introduced in early clinical and empirical work on problematic Internet use, and subsequent research has continued to treat impaired control, salience, mood modification, tolerance-like escalation, withdrawal-like discomfort, and functional impairment as central features of clinically relevant problematic Internet use (Young, 1998; Wei et al., 2025). University students may be especially vulnerable because they experience greater autonomy, reduced direct parental monitoring, academic pressure, peer influence, and unrestricted access to digital platforms.

The present study focused on a subgroup of college students with elevated tobacco-use symptoms. DSM-5 and DSM-5-TR classify substance use disorders by the number of endorsed criteria, with four or five criteria corresponding to moderate severity when a structured diagnostic assessment is used (American Psychiatric Association, 2013, 2022; Hasin et al., 2013). However, the present study used self-reported DSM-5-based tobacco criteria as a screening threshold, not a clinician-administered diagnostic interview. Therefore, the sample is described as college students with elevated self-reported tobacco dependence symptoms, not as a clinically diagnosed tobacco use disorder sample. This distinction matters because tobacco-use symptoms may indicate a broader vulnerability to impaired control and dependence-prone coping, while tobacco dependence and Internet addiction remain conceptually distinct phenomena.

Childhood trauma is a plausible developmental risk factor for Internet addiction. The Childhood Trauma Questionnaire framework conceptualizes maltreatment histories across emotional abuse, physical abuse,

sexual abuse, emotional neglect, and physical neglect (Bernstein et al., 2003). A large adverse childhood experiences literature links early adversity to later mental health and addictive outcomes, suggesting that early stress exposure can shape stress regulation, reward processing, interpersonal expectations, and coping behavior (Felitti et al., 1998). More directly, recent meta-analytic evidence among students in mainland China showed a stable positive association between childhood trauma and problematic Internet use (Wang et al., 2023). Thus, childhood trauma may function as an upstream vulnerability that increases reliance on immediately rewarding or relief-oriented online activities.

The Interaction of Person-Affect-Cognition-Execution (I-PACE) model provides a clear theoretical framework for the present serial mediation model. The updated I-PACE model proposes that addictive behaviors develop and are maintained through interactions among person-level predispositions, affective and cognitive responses, and executive-control processes (Brand et al., 2019). In this framework, childhood trauma can be conceptualized as a person-level vulnerability, self-control as an executive or regulatory capacity, aggression as an affective-behavioral externalizing tendency, and Internet addiction as a maladaptive behavioral outcome. The model therefore supports a mechanism in which early adversity is translated into problematic Internet use through impaired self-regulation and maladaptive behavioral responses.

Self-control was specified as the first mediator because it is closely tied to impulse inhibition, delay of gratification, resistance to temptation, and persistence toward long-term goals (Tangney et al., 2004). Meta-analytic evidence indicates that lower self-control is consistently associated with higher Internet addiction among students, supporting its role as a central regulatory factor in problematic Internet use (Li et al., 2021). In trauma-exposed students, weaker self-control may increase vulnerability to immediate online rewards and reduce the ability to disengage from online activities despite negative consequences. Given the strong negative correlation between self-control and Internet addiction in the present data, self-control was expected to be the dominant indirect pathway.

Aggression was specified as the second mediator because it captures an externalizing tendency that may follow impaired self-regulation and contribute to dysregulated Internet use. The General Aggression Model conceptualizes aggression as emerging from person and situational inputs through affective, cognitive, and arousal-related routes (Anderson & Bushman, 2002). Childhood trauma may increase anger, hostility, and hostile attributional patterns, while lower self-control may reduce the ability to inhibit aggressive impulses or manage frustration (Buss & Perry, 1992; Lv et al., 2013). In digital environments, aggressive tendencies may be linked to interpersonal conflict, emotional arousal, retaliatory communication, or maladaptive online coping, making aggression a theoretically meaningful downstream mechanism.

The present study tested a serial mediation model in which childhood trauma predicted Internet addiction through self-control and aggression among Chinese college students meeting a DSM-5-based self-report tobacco symptom threshold. Based on the I-PACE model, self-regulation theory, general aggression theory, and prior meta-analytic evidence, we hypothesized that: (1) childhood trauma would be positively associated with Internet addiction; (2) childhood trauma would be negatively associated with self-control and positively associated with aggression; (3) self-control would be negatively associated with aggression and Internet addiction; and (4) self-control and aggression would serially mediate the association between childhood trauma and Internet addiction (Anderson & Bushman, 2002; Brand et al., 2019; Li et al., 2021; Wang et al., 2023).

Methods

Design and Participants

This study used a cross-sectional questionnaire design. The analytic sample consisted of 663 Chinese college students who completed all study variables and who met the inclusion criterion of scoring 4 or above on a DSM-5-based self-report screening measure of tobacco dependence symptoms. When

symptoms are assessed as criteria counts, four or five DSM-5 substance-use criteria correspond to moderate severity; however, because the present study relied on self-report screening rather than clinician-administered diagnostic interviews, the sample is described as students with elevated DSM-5-based self-reported tobacco dependence symptoms rather than clinically diagnosed tobacco use disorder (American Psychiatric Association, 2013, 2022; Hasin et al., 2013).

All cases had complete data for gender, age, and source region. The sample included 497 men (75.0%) and 166 women (25.0%). Participants ranged in age from 18 to 30 years ($M = 20.44$, $SD = 1.51$).

Regarding pre-university long-term residence, 275 participants (41.5%) were from urban/town areas and 388 participants (58.5%) were from rural areas.

Measures

DSM-5-based tobacco dependence symptom screening. Participants completed a self-report measure based on the 11 DSM-5 tobacco-use symptom criteria, which cover impaired control, social impairment, risky use, and pharmacological features such as tolerance and withdrawal (American Psychiatric Association, 2013, 2022; Hasin et al., 2013). Participants scoring 4 or above were retained for analysis. This variable was used only to define the analytic sample and was not treated as a focal mediator or outcome.

Childhood trauma. Childhood trauma was assessed using the Childhood Trauma Questionnaire-Short Form (CTQ-SF), a 28-item measure that assesses emotional abuse, physical abuse, sexual abuse, emotional neglect, and physical neglect, with additional minimization/denial validity items (Bernstein et al., 2003). Chinese-language psychometric evidence supports the use of the CTQ-SF among undergraduates and related samples (He et al., 2019; Zhao et al., 2005). Higher total scores indicated greater exposure to childhood trauma.

Self-control. Self-control was assessed using a 19-item Chinese self-control scale adapted from trait self-control research (Tangney et al., 2004; Tan & Guo, 2008). Items are typically rated on a Likert-type

response scale and summed so that higher scores indicate stronger self-regulatory capacity. In the mediation model, self-control was specified as the first mediator because it represents a proximal regulatory capacity relevant to impulse inhibition and disengagement from immediately rewarding online activities.

Aggression. Aggression was assessed using a Chinese college-student version of the Buss-Perry Aggression Questionnaire (BPAQ), which was developed from the original Aggression Questionnaire (Buss & Perry, 1992; Lv et al., 2013). Higher scores indicate greater aggressive tendency. Aggression was specified as the second mediator because it represents an externalizing behavioral tendency that may follow impaired self-control and contribute to dysregulated Internet use.

Internet addiction. Internet addiction was assessed using a self-report total score based on Young's Internet Addiction Test framework, with higher scores indicating more severe problematic Internet use (Young, 1998). Recent Chinese undergraduate evidence supports the continued psychometric evaluation and use of Young's Internet Addiction Test in Chinese university populations (Wei et al., 2025). Internet addiction was specified as the outcome variable.

Covariates. Gender and age were included as covariates in all mediation equations. Source region was described demographically but was not included as a covariate because the supplied PROCESS output included only gender and age.

Table 1

Measures, Scoring Direction, and Source References

Measure	Operationalization	Scoring direction	Main source reference(s)
DSM-5-based tobacco symptom screening	11 self-reported DSM-5 tobacco-use criteria; score ≥ 4 used for sample inclusion	Higher scores = more tobacco-use symptoms	American Psychiatric Association, 2013, 2022; Hasin et al., 2013
Childhood trauma	CTQ-SF total score	Higher scores = greater childhood trauma	Bernstein et al., 2003; He et al., 2019; Zhao et al., 2005
Self-control	19-item Chinese self-control scale	Higher scores = stronger self-	Tangney et al., 2004; Tan & Guo,

	total score	control	2008
Aggression	Chinese college-student BPAQ total score	Higher scores = greater aggression	Buss & Perry, 1992; Lv et al., 2013
Internet addiction	Young's Internet Addiction Test total-score framework	Higher scores = more severe problematic Internet use	Young, 1998; Wei et al., 2025

Note. Reliability coefficients for the restricted analytic sample should be reported after verifying the original dataset. The mediation results above are unchanged by this reporting table.

Statistical Analysis

All analyses were conducted using IBM SPSS Statistics and PROCESS macro version 4.1. Descriptive statistics summarized demographic characteristics. Pearson correlation coefficients examined zero-order associations among focal variables. The serial mediation model was tested using PROCESS Model 6, with childhood trauma as the independent variable, self-control as the first mediator, aggression as the second mediator, and Internet addiction as the dependent variable. Gender and age were entered as covariates. Indirect effects were evaluated using 5,000 bootstrap samples and 95% bootstrap confidence intervals, following the regression-based conditional process framework described by Hayes (2022). An indirect effect was considered statistically significant when the bootstrap confidence interval did not include zero.

Because the data were cross-sectional, the serial mediation model was interpreted as a theoretically specified indirect-effect model rather than evidence of temporal or causal ordering. The terms predict and effect are used in the statistical sense of regression modeling and do not imply causal inference. This interpretive restriction is important because cross-sectional mediation can support compatibility with a theoretical mechanism but cannot establish temporal precedence or causal process.

Results

Participant Characteristics

The final sample included 663 Chinese college students with DSM-5-based self-reported tobacco dependence symptoms at or above the study threshold. Demographic characteristics are shown in Table 2.

Table 2

Demographic Characteristics of the Sample (N = 663)

Characteristic	n	%
Gender: Male	497	75.0
Gender: Female	166	25.0
Source region: Urban/town	275	41.5
Source region: Rural	388	58.5
Age, years: M (SD)	20.44	1.51
Age range	18-30	

Note. Percentages are based on valid cases. Age was calculated from the frequency distribution supplied in the analysis output.

Zero-Order Correlations

The zero-order correlations among the focal variables were consistent with the proposed model (Table 3). Childhood trauma was positively associated with aggression and Internet addiction and negatively associated with self-control. Self-control showed a strong negative association with both aggression and Internet addiction. Aggression was positively associated with Internet addiction.

Table 3

Pearson Correlations Among Focal Study Variables

Variable	1	2	3	4
1. Childhood trauma	—			

2. Self-control	-.138**	—		
3. Aggression	.290**	-.557**	—	
4. Internet addiction	.196**	-.511**	.399**	—

Note. N = 663. ** $p < .01$, two-tailed.

Serial Mediation Model

The conceptual serial mediation model is presented in Figure 1. The adjusted path model is presented in Figure 2.

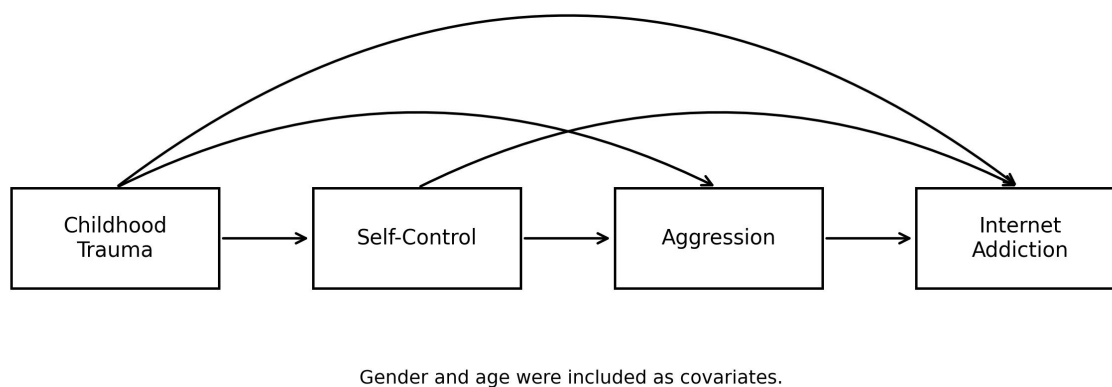


Figure 1. Conceptual serial mediation model.

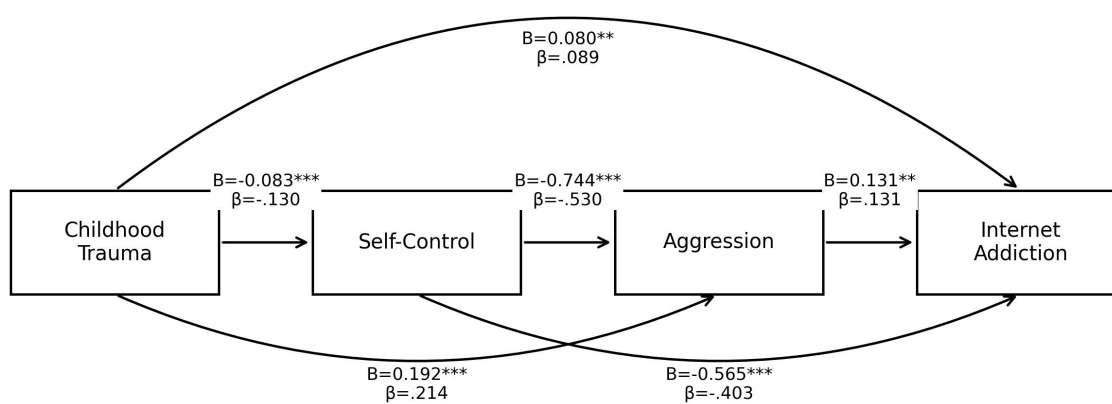


Figure 2. Adjusted path coefficients for the serial mediation model.

Table 4**Regression Results for the Serial Mediation Model**

Outcome	Predictor	B	SE	t	p	95% CI	β
Self-control	Childhood trauma	-0.083	0.024	-3.434	< .001	[-0.130, -0.036]	-.130
Self-control	Gender	-4.969	0.890	-5.581	< .001	[-6.717, -3.221]	-.211
Self-control	Age	0.344	0.256	1.345	.179	[-0.159, 0.847]	.051
Aggression	Childhood trauma	0.192	0.028	6.757	< .001	[0.136, 0.248]	.214
Aggression	Self-control	-0.744	0.045	-16.374	< .001	[-0.833, -0.654]	-.530
Aggression	Gender	-0.029	1.062	-0.028	.978	[-2.114, 2.056]	-.001
Aggression	Age	0.361	0.299	1.207	.228	[-0.226, 0.948]	.038
Internet addiction	Childhood trauma	0.080	0.030	2.626	.009	[0.020, 0.140]	.089
Internet addiction	Self-control	-0.565	0.056	-10.117	< .001	[-0.675, -0.455]	-.403
Internet addiction	Aggression	0.131	0.040	3.250	.001	[0.052, 0.211]	.131
Internet addiction	Gender	4.256	1.101	3.865	< .001	[2.094, 6.418]	.129
Internet addiction	Age	0.816	0.310	2.629	.009	[0.206, 1.425]	.086

Note. Gender and age were included as covariates. B = unstandardized coefficient; β = standardized coefficient; CI = confidence interval.

Table 5**Model Summary for Regression Equations**

Outcome	R	R ²	MSE	F	df	p
Self-control	.260	.068	97.726	15.902	3, 659	< .001
Aggression	.598	.358	132.769	91.626	4, 658	< .001
Internet addiction	.558	.311	142.755	59.356	5, 657	< .001

In the first regression equation, childhood trauma significantly and negatively predicted self-control. In the second equation, childhood trauma positively predicted aggression, whereas self-control negatively

predicted aggression. In the final equation, childhood trauma, self-control, and aggression all significantly predicted Internet addiction. The direct effect of childhood trauma on Internet addiction remained significant after inclusion of the mediators, indicating partial mediation.

Table 6

Direct and Indirect Effects of Childhood Trauma on Internet Addiction

Effect pathway	Effect	Boot SE	95% Boot CI	Completely standardized effect	95% Boot CI
Direct: CT -> IA	0.0799	0.0304	[0.0202, 0.1397]	0.0891	—
Total indirect effect	0.0801	0.0196	[0.0423, 0.1198]	0.0893	[0.0480, 0.1318]
CT -> SC -> IA	0.0468	0.0147	[0.0192, 0.0781]	0.0522	[0.0214, 0.0857]
CT -> AGG -> IA	0.0252	0.0099	[0.0073, 0.0459]	0.0281	[0.0081, 0.0513]
CT -> SC -> AGG -> IA	0.0081	0.0040	[0.0017, 0.0172]	0.0090	[0.0019, 0.0190]

Note. CT = childhood trauma; SC = self-control; AGG = aggression; IA = Internet addiction. Bootstrap samples = 5,000. All confidence intervals are 95% percentile bootstrap confidence intervals.

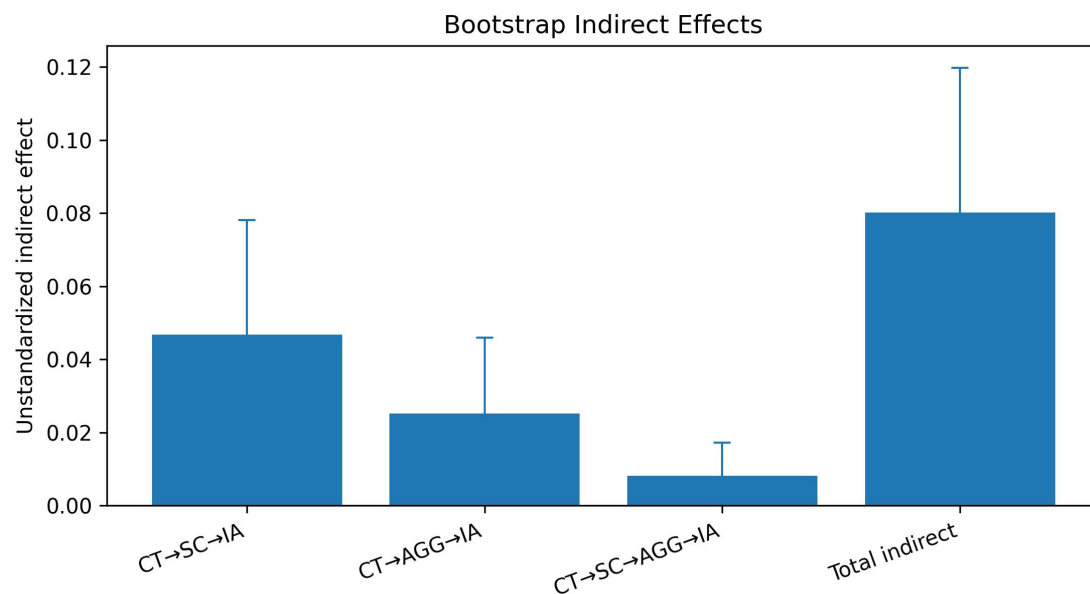


Figure 3. Bootstrap indirect effects with 95% confidence intervals.

Discussion

This study examined whether self-control and aggression explained the association between childhood trauma and Internet addiction among Chinese college students who met a DSM-5-based self-report threshold for tobacco dependence symptoms. The findings supported the proposed serial mediation model. Childhood trauma was associated with lower self-control and higher aggression, and both mediators were associated with Internet addiction. Importantly, the indirect effects through self-control alone, aggression alone, and the serial path from self-control to aggression were all statistically significant. These findings are consistent with the I-PACE model, which emphasizes the interaction of person-level vulnerability, affective-cognitive responses, and executive-control processes in addictive behaviors (Brand et al., 2019). The most substantial indirect pathway was the path through self-control. This finding suggests that self-regulatory capacity is the central explanatory mechanism in the present model. Students reporting greater childhood trauma may have weaker capacity to inhibit impulses, delay gratification, maintain long-term goals, or disengage from immediately rewarding online activities. This interpretation aligns with trait self-control theory and evidence that self-control predicts broad adjustment outcomes (Tangney et al., 2004). It is also consistent with meta-analytic evidence showing that lower self-control is robustly associated with higher Internet addiction among students (Li et al., 2021). In the present sample, self-control was the strongest proximal correlate of Internet addiction among the focal mediators.

The aggression pathway was also significant. Childhood trauma positively predicted aggression, and aggression positively predicted Internet addiction. This result suggests that trauma-related risk may also operate through externalizing tendencies. The General Aggression Model proposes that aggressive behavior is shaped by person factors, situational inputs, affective arousal, cognition, and appraisal processes (Anderson & Bushman, 2002). Childhood trauma may contribute to anger, hostility, interpersonal conflict, and threat-oriented interpretations, whereas reduced self-control may weaken inhibition of aggressive impulses (Buss & Perry, 1992; Lv et al., 2013). Within online environments,

these tendencies may contribute to dysregulated use through conflictual communication, emotional arousal, or avoidant coping. However, the aggression pathway was weaker than the self-control pathway, so aggression should be interpreted as an additional mechanism rather than the primary explanatory route.

The serial pathway from childhood trauma to Internet addiction through self-control and aggression was statistically significant but small in magnitude. This result is theoretically informative but should not be overstated. It suggests that one route from early adversity to problematic Internet use may involve weakened self-control, followed by increased aggression, followed by greater Internet addiction symptoms. The small effect size indicates that aggression explains only part of how regulatory weakness is translated into Internet-addiction risk. A more defensible interpretation is that self-control carries most of the mediated association, whereas aggression adds a narrower externalizing channel.

The findings should also be interpreted in the context of the tobacco-symptom-defined sample. Substance-use symptoms and problematic Internet use are distinct, and DSM-5 does not classify generalized Internet addiction as a formal substance-related diagnosis (American Psychiatric Association, 2013, 2022). Nevertheless, both tobacco-use symptoms and problematic Internet use involve impaired control, repetitive reward seeking, and difficulty disengaging from harmful behavior. Studying Internet addiction within a group of students with elevated tobacco-use symptoms therefore helps clarify whether early trauma and self-regulation mechanisms remain relevant in a dependence-prone subgroup. The present results suggest that self-control is a useful intervention target in this risk context.

Several practical implications follow. First, screening for childhood trauma and self-control deficits may help identify students at risk for problematic Internet use, especially in populations with elevated tobacco-use symptoms. Second, interventions should not focus only on reducing screen time. They should also address underlying self-regulatory difficulties, emotional reactivity, hostile cognition, and adaptive coping. Third, aggression management may be useful, but the current results suggest that self-control enhancement should be prioritized as the core intervention target. Programs involving goal setting, delay

of gratification, impulse monitoring, emotion regulation, and replacement coping strategies may be especially relevant (Li et al., 2021; Tangney et al., 2004).

Several limitations should be noted. First, the cross-sectional design prevents causal inference. Although the model was specified on theoretical grounds, alternative temporal arrangements are possible; for example, Internet addiction may worsen self-control over time, and aggression may both precede and follow problematic Internet use. Longitudinal or experimental designs are needed to test temporal ordering. Second, all variables were based on self-report, which may introduce common-method bias and social desirability effects. Third, the DSM-5-based tobacco measure was used as a self-report screening threshold rather than a structured clinical diagnosis. Fourth, the sample was predominantly male, which may limit generalizability. Fifth, reliability coefficients and full scale-level descriptive statistics should be verified and reported in the final submission. Sixth, because generalized Internet addiction remains a debated construct and is not identical to Internet gaming disorder, future studies should distinguish generalized Internet addiction, social media addiction, smartphone addiction, and gaming disorder more explicitly.

In conclusion, childhood trauma was associated with Internet addiction among Chinese college students with elevated DSM-5-based tobacco-use symptoms, and this association was partially mediated by self-control and aggression. The results identify self-control as the dominant mediating pathway and aggression as a smaller but significant externalizing mechanism. The findings support a trauma-informed and self-regulation-focused account of Internet addiction in a substance-use-risk college population while requiring cautious interpretation because the data are cross-sectional and based on self-report measures.

Declarations

Informed consent: All participants provided informed consent before participating in the questionnaire survey.

Availability of data and materials: The datasets analyzed during the current study are available from the corresponding author on reasonable request, subject to institutional and ethical restrictions.

Competing interests: The authors declare that they have no competing interests.

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Authors' contributions: YanBingna contributed to study conception and design. YanBingna collected the data. [Insert author initials] performed the statistical analysis. YanBingna drafted the manuscript. All authors reviewed and approved the final manuscript.

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