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The impact of internet addiction on psychological depression: The mediating role of social anxiety and the moderating role of social support

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Abstract: Excessive internet use among university students has been linked to psychological depression. This study examines the potential relationship between internet addiction and psychological depression using a sample of university students. A total of 2,586 students participated in an empirical analysis conducted through a questionnaire survey. The study further explores the mediating role of social anxiety and the moderating role of social support in this relationship. The results indicate that: (1) Internet addiction has a significant positive effect on psychological depression among Chinese university students; (2) Social anxiety mediates the relationship between internet addiction and psychological depression; (3) Social support moderates the impact of internet addiction on psychological depression. Based on these findings, this study provides strategic support for interventions aimed at reducing internet addiction and psychological depression among university students by enhancing social support and alleviating social anxiety. It also offers valuable theoretical and practical insights into coping and self-regulation strategies to promote students' overall mental and physical well-being.

Keywords: *Chinese university students, Internet addiction, Social anxiety, Psychological depression, Social support.*

1. Introduction

In the digital age, as internet usage deepens and smart devices continue to evolve, university students increasingly integrate these technologies—such as computers, smartphones, and tablets—into their daily social interactions and psychological experiences [1]. The internet has a dual nature: while it offers efficiency and convenience, it also brings negative consequences. Excessive internet use among university students can lead to severe adverse effects, impacting their cognition, emotions, willpower, personality, and social psychology [2]. Mental health issues among university students are becoming increasingly prevalent, with internet addiction contributing significantly to various psychological problems. Some students experience temporary depressive states, while others suffer from prolonged depression, leading to serious psychological distress [3]. Research indicates that students with internet addiction are prone to behavioral dysregulation, psychological and physiological dependence, reduced intelligence and self-control, emotional confusion, and a diminished willingness to participate in daily life [4]. Therefore, studying the factors influencing psychological depression among university students is of great practical significance.

Internet addiction is a chronic or cyclical compulsive state triggered by frequent internet use, characterized by an uncontrollable urge for repeated engagement. It is often accompanied by prolonged online activity, increased tolerance, weakened self-regulation, withdrawal symptoms, and persistent psychological and physiological dependence on the pleasure derived from internet use [5].

Psychological depression refers to a fluctuation from normal mood to a state of emotional downturn. It manifests as persistent feelings of sadness and distress in daily life and academic settings, arising as a natural response to unfavorable circumstances or events. This can range from mild dissatisfaction to profound sorrow and psychological suffering [6].

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Social anxiety is defined as an individual's negative emotional experience—such as nervousness and fear—in social situations due to concerns about negative evaluations from others. This may also lead to avoidance behaviors in social interactions [7].

Social support encompasses both objective and subjective aspects. Objectively, it includes tangible material assistance and the size of one's social network, such as relationships with family, romantic partners, friends, and classmates. Subjectively, it refers to an individual's perceived respect, support, and emotional understanding from their social environment [8].

Investigating the impact of internet addiction on psychological depression among university students—while exploring the mediating role of social anxiety and the moderating role of social support—holds significant theoretical and practical implications. This study focuses on the relationship between internet usage and students' psychological well-being, providing strategic insights to prevent depression. It highlights the importance of overcoming social anxiety and enhancing social support, ultimately promoting students' healthy development and overall well-being.

2. Literature Review

2.1. Internet Addiction and Psychological Depression

Research on the relationship between internet addiction and depression can be categorized into three main models: the unidirectional causal model (where internet addiction may lead to depression, or vice versa), the positive correlation model (where both conditions co-occur at the same time), and the bidirectional causal model (where internet addiction exacerbates depressive symptoms, while depression, in turn, increases the likelihood of internet addiction) [9]. Studies indicate a significant positive correlation between internet addiction and psychological depression among university students [10]. Excessive internet use reduces students' engagement in social activities with family and friends, which may decrease their sense of security and limit their access to social support, thereby intensifying negative emotions and ultimately exacerbating their depressive symptoms [11]. Based on these discussions, this study proposes the following hypothesis:

H_1: Internet addiction has a significant positive effect on psychological depression among Chinese university students.

2.2. Internet Addiction, Social Anxiety, and Psychological Depression

The study by Li and Li [12] (N = 687) further validates this mechanism: for every standard deviation increase in internet dependency, real-world social frequency decreases by 19% ($p < 0.001$), and social skills scores (SPS Scale) drop by 0.23 points ($d = 0.31$), forming a vicious cycle of "anxiety-avoidance-dependence" Li and Li [12]. Xi [13] cognitive-behavioral analysis suggests that the core of this cycle is the "virtual social reinforcement effect": positive feedback in an anonymous online environment fosters a false sense of efficacy ($\beta = 0.27$, $p < 0.001$), leading to a continuous decline in real-world social motivation (by 3.4% per month). This shift in cognitive-behavioral patterns results in an exponential increase in depression risk as internet usage duration increases ($R^2 = 0.38$) [13].

The effect model by Sun, et al. [14] (N = 3,042) demonstrates that the level of friend support significantly alters the correlation between social anxiety and problematic smartphone use. In high-support groups (PSSS ≥ 32), the correlation coefficient between the two decreases by 0.17 ($p = 0.008$), with an explained variance change of $\Delta R^2 = 0.11$. This protective effect is even more pronounced in the dimension of family support. Xi [13] longitudinal data analysis indicates that for every standard deviation increase in family support, the predictive effect of internet addiction on depression decreases by 0.28 β values ($p < 0.01$). This culturally specific moderating mechanism is closely linked to collectivist values: in cultural environments emphasizing family bonds, emotional support from family reduces the psychological costs of digital compensatory behaviors by 41% [15]. Accordingly, this study proposes the following hypothesis:

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H_2: Social anxiety mediates the relationship between internet addiction and psychological depression among Chinese university students.

2.3. Internet Addiction, Social Support, and Psychological Depression

Structural equation modeling reveals complex associations among these variables: internet addiction not only directly predicts higher levels of depression ($\beta = 0.30$) but also indirectly influences depression by increasing social anxiety ($\beta = 0.32$). Meanwhile, social support has both a direct negative effect on depression ($\beta = -0.23$) and a buffering effect that mitigates the negative impact of internet addiction (moderation effect explaining variance $\Delta R^2 = 0.11$). These networked effects exhibit significant differences across demographic groups, with stronger moderation effects observed among males and higher path coefficients found among rural students (by 0.15) [16].

The effectiveness of social support follows a dose-response relationship: when support levels exceed a critical threshold (SSRS total score ≥ 40), its preventive effect on depression demonstrates increasing marginal benefits. This provides an essential quantitative basis for the development of targeted intervention programs [17]. Based on these findings, this study proposes the following hypothesis:

H_3: Social support moderates the relationship between internet addiction and psychological depression among Chinese university students.

2.4. Hypothesis Model

Drawing on existing research and theoretical frameworks, this study constructs a hypothetical model. It posits that social anxiety serves as a mediating variable between internet addiction and psychological depression, while social support acts as a moderating factor in this relationship. Figure 1 illustrates the theoretical model.

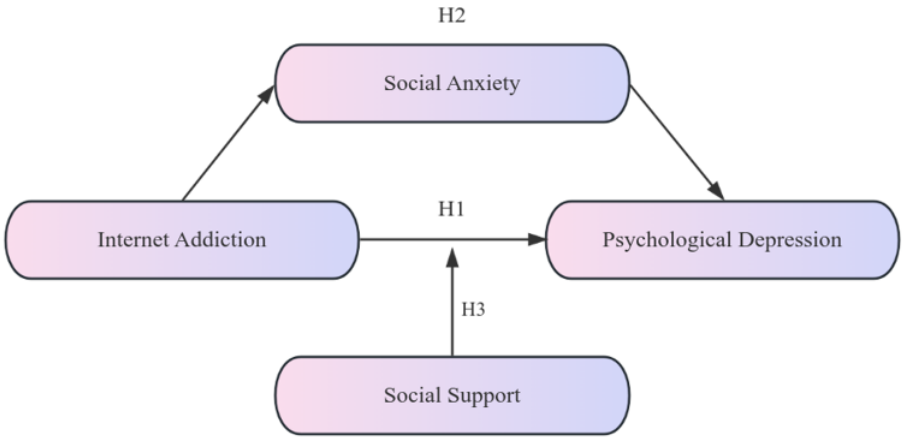

Figure 1.
Research model.

3. Results Analysis

3.1. Correlation Analysis Among Internet Addiction, Social Anxiety, Social Support, and Psychological Depression

Pearson correlation analysis revealed the following relationships:

Internet addiction and social anxiety: → moderate positive correlation.

Internet addiction and psychological depression: → moderate positive correlation.

Social support and psychological depression: → weak negative correlation.

Social anxiety and psychological depression: → moderate positive correlation.

These results are detailed in Table 1.

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Table 1.
Summary of Correlation Analysis Among Variables.

Variable	1	2	3
1. Internet addiction	-		
2. Social anxiety	0.492***	-	
3. Social support	-0.227***	- 0.274***	-
4. Psychological depression	0.445***	0.451***	- 0.311***

Note : $^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$.

3.2. Hypothesis Testing

Based on the tests conducted in Section 3.2, the variables in this study conform to a normal distribution. The conceptual model exhibits good internal validity and external reliability, making it suitable for structural model analysis to examine the relationships among latent variables.
This section follows a three-step approach:

A. Examining the impact of Internet addiction on psychological depression.

B. Testing the mediating effect of social anxiety between Internet addiction and psychological depression.

C. Verifying the moderating role of social support in the relationship between Internet addiction and psychological depression, based on the established main effect.

3.2.1. Main Effect Test of Internet Addiction on Psychological Depression

This study constructs a theoretical model using linear Structural Equation Modeling (SEM) and verifies the causal relationships through AMOS software (Version 21). The path coefficient of Internet addiction's impact on psychological depression is .489 (see Figure 2).

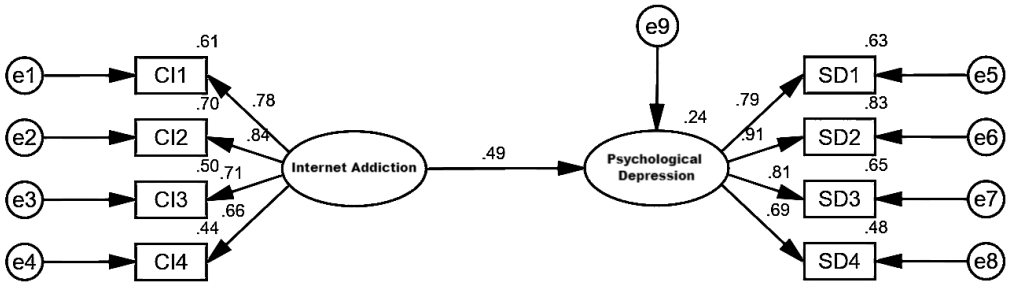

Figure 2.
Structural Model Diagram of the Main Effect of Internet Addiction on Psychological Depression.

The parameter estimates of the direct effect model in this study are shown in Table 2. The error variances of the direct effect model between Internet addiction and psychological depression range from .081 to .243, all of which are positive. The standardized weighted regression coefficients range from .489 to .913, with none exceeding .950. The standard errors range from .027 to .052, and all t-values are significant, indicating that the standard errors are not excessively large.

Table 2.
Parameter Estimates of the Direct Effect Model Between Internet Addiction and Psychological Depression.

Parameter	Regression weight Coefficient	Standard Error	T-value	Error Variance	Multiple Correlation Squared
Internet addiction → Psychological depression	0.489	0.027	20.689***[1]	0.246[2]	0.239[3]
Internet addiction → CI1	0.782	0.049	44.010***	0.149	0.612
Internet addiction → CI2	0.836	0.049	48.023***	0.118	0.699
Internet addiction → CI3	0.705	0.050	37.665***	0.179	0.498
Internet addiction → CI4	0.662	0.052	34.611***	0.206	0.439
Psychological depression → SD1	0.794	0.049	45.338***	0.190	0.630
Psychological depression → SD2	0.913	0.047	53.126***	0.081	0.834
Psychological depression → SD3	0.806	0.044	45.831***	0.146	0.649
Psychological depression → SD4	0.694	0.049	37.728***	0.243	0.482

Note: *p < .05; **p < .01; ***p < .001.
[1] Represents the variance of structural error in psychological depression.
[2] Represents the explanatory power (R^2) of the independent variable on the dependent variable.

This study utilized the data analysis software AMOS (Version 21) to establish the main effect between internet addiction and psychological depression and employed Structural Equation Modeling (SEM) to test Hypothesis H1. As shown in Tables 2 and 3, the path coefficient for [Internet Addiction → Psychological Depression] is .489, with t = 20.689 (t > 1.96) and p < .001, indicating a significant path coefficient (p < .001). This confirms that Hypothesis H1 is supported—Internet addiction among Chinese university students has a significant positive impact on psychological depression. The results suggest that the deeper the dependence on the internet, the higher the level of psychological depression among Chinese university students.

Table 3.
Summary of Path Relationship Testing Between Internet Addiction and Psychological Depression.

Hypothesis	Path	Hypothesize Relationship	Path Coefficient	Supported or Not
H2	Internet addiction → Psychological depression	Positive	0.489***	Supported

Note: *$p < .05$; **$p < .01$; ***$p < .001$.

3.2.2. Testing the Mediating Effect of Social Anxiety

This study's theoretical model hypothesizes that H2: Social anxiety mediates the relationship between internet addiction and psychological depression. In other words, social anxiety plays a mediating role in the effect of internet addiction on psychological depression. To test this hypothesis, the study employs the statistical analysis software AMOS (Version 21) and SPSS (Version 25), using path analysis to examine the mediation effect. Additionally, the Bootstrap method in the Process plugin is used for further verification.

As shown in Tables 2 and 3, when evaluating only the direct effect of internet addiction on psychological depression, internet addiction significantly and positively predicts psychological depression (path coefficient $\beta = .489$, $t = 20.689$ ($t > 1.96$, $p < .001$)).

After introducing the mediating variable (social anxiety):

Internet addiction significantly and positively predicts social anxiety, with a path coefficient of $\beta = .548$, $t = 23.725$ ($t > 1.96$, $p < .001$).

Social anxiety significantly and positively predicts psychological depression, with a path coefficient of $\beta = .325$, $t = 13.442$ ($t > 1.96$, $p < .001$).

Internet addiction still significantly and positively predicts psychological depression, but the direct effect is reduced from $\beta = .489$ to $\beta = .313$, $t = 12.335$ ($t > 1.96$, $p < .001$).

Based on the criteria for determining mediation effects [24], this study concludes that Hypothesis

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H2 is supported: social anxiety partially mediates the effect of internet addiction on psychological depression.

Table 4.
Mediation Effect Testing Table.

Mediation Effect	Estimate	95% Confidence Interval		
		p (BC/PC)	*BC*	*PC*
Indirect effect				
Internet addiction → Social anxiety → Psychological depression	0.178	< 0.001/ < 0.001	0.150 ~ 0.209	0.149 ~ 0.208
Direct effect				
Internet addiction → Social anxiety	0.548	< 0.001/ < 0.001	0.510 ~ 0.585	0.510 ~ 0.584
Internet addiction → Psychological depression	0.313	< 0.001/ < .001	0.262 ~ 0.364	0.262 ~ 0.365
Social anxiety → Psychological depression	0.325	< 0.001/ < .001	0.274 ~ 0.375	0.274 ~ 0.375
Total effect				
Internet addiction →Psychological depression	0.491	< 0.001/ < 0.001	0.451 ~ 0.528	0.452 ~ 0.529

Note: BC: Bias-corrected percentile method;PC: Percentile method.

Following the Bootstrap method recommended by Mackinnon [18] (5,000 resamples, 95% confidence interval), the results in Table 4 indicate that the indirect effect is 0.178, with a 95% confidence interval that does not contain 0 and $p < .001$ (Bias-corrected: 0.150 ~ 0.209; Percentile: 0.149 ~ 0.208), confirming that social anxiety plays a significant mediating role in the relationship between internet addiction and psychological depression. Additionally, the direct effect of Internet Addiction → Psychological Depression is 0.313, remaining significant ($p < .001$) within a 95% confidence interval (Bias-corrected: 0.262 ~ 0.364; Percentile: 0.262 ~ 0.365). The total effect is 0.491, also significant ($p < .001$) within a 95% confidence interval (Bias-corrected: 0.451 ~ 0.528; Percentile: 0.452 ~ 0.529). These findings suggest that after introducing social anxiety as a mediator, the direct effect of internet addiction on psychological depression decreases from 0.491 to 0.313, supporting the partial mediation hypothesis.

To further validate this mediation effect, a four-step regression analysis was conducted. Results in Table 5 show that internet addiction significantly predicts social anxiety ($\beta = 0.492$, $p < .001$), internet addiction significantly predicts psychological depression ($\beta = 0.445$, $p < .001$), and social anxiety significantly predicts psychological depression ($\beta = 0.451$, $p < .001$). When both internet addiction and social anxiety were included in the model, their predictive effects remained significant (Internet Addiction → Psychological Depression: $\beta = 0.294$, $p < .001$; Social Anxiety → Psychological Depression: $\beta = 0.306$, $p < .001$), indicating that social anxiety partially mediates the relationship between internet addiction and psychological depression, aligning with Baron and Kenny [19] mediation criteria.

To further confirm the robustness of the mediation effect, the Bootstrap method in SPSS Process Macro (Version 4.2) developed by Hayes [20] was applied. The analysis was conducted with 5,000 bootstrap samples, a 95% confidence interval, and a bias-corrected method. The independent variable (X) was internet addiction, the mediator (M) was social anxiety, the dependent variable (Y) was psychological depression, and grade level was included as a covariate. The results, as presented in Table 5, further support the partial mediation effect of social anxiety in the relationship between internet addiction and psychological depression.

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Table 5.
Mediating Effect Regression Analysis of Internet Addiction, Social Anxiety, and Psychological Depression.

Model hypothesis	Step	Independent Variable	Dependent Variable	β	t	F	Adjusted R2
Internet addiction → Social anxiety → Psychological depression	Step1	Internet addiction	Social anxiety	0.492	28.746***	826.336***	0.242
	Step2	Internet addiction	Psychological depression	0.445	25.265***	638.321***	0.198
	Step3	social anxiety	Psychological depression	0.451	25.688***	659.890***	0.203
	Step4	Internet addiction	Psychological depression	0.294	15.234***	F75.484***	0.269
		social anxiety		0.306	15.840***		

Note: $^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$.

According to Table 6, social anxiety plays a partial mediating role in the relationship between internet addiction and psychological depression. The indirect effect of social anxiety is 0.180, with a 95% confidence interval (LLCI = 0.181 ~ ULCI = 0.294) that does not contain 0, and p < .001, confirming the significance of the mediation effect. The direct effect of internet addiction on psychological depression is 0.353, also significant (p < .001) within a 95% confidence interval (LLCI = 0.307 ~ ULCI = 0.398). The total effect is 0.532, with a 95% confidence interval (LLCI = 0.491 ~ ULCI = 0.574), and remains significant (p < .001).

In summary, after introducing social anxiety as a mediator, the direct effect of internet addiction on psychological depression decreases from 0.532 to 0.353, indicating a substantial reduction. The mediation effect is significant within the 95% confidence interval, further confirming that social anxiety serves as a partial mediator in the relationship between internet addiction and psychological depression. This finding validates the partial mediation hypothesis once again.

Table 6.
Bootstrap Test Results of the Mediating Effect of Social Anxiety Using Process Macro.

Mediation Effect	Effect	SE	95% Confidence Interval	
			LLCI	ULCI
Indirect effect of Internet addiction → Psychological depression	0.180***	0.015	0.152	0.211
Direct effect of Internet addiction → Psychological depression	0.353***	0.023	0.307	0.398
Total effect of Internet addiction → Psychological depression	0.532***	0.021	0.491	0.574

Note: $^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$.

3.2.3. Testing the Moderating Effect of Social Support

The moderating effect was tested using hierarchical regression analysis in SPSS. Following the methods proposed by James and Brett [21] and Baron and Kenny [19] the moderation effect was verified through the following three steps:

A. The independent variable must have a significant regression coefficient for the dependent variable.

B. When both the independent variable and the moderating variable are included in the regression model, the moderating variable should ideally not have a significant regression coefficient for the dependent variable. However, in social science research, significance often occurs.

C. If the interaction term (independent variable × moderating variable) shows a significant regression coefficient for the dependent variable, it confirms that the moderating variable exerts an effect.

A hierarchical regression analysis was conducted (using third-year students as the reference group), and the results are presented in Table 7:

Regarding the explanatory power of the model (R^2) and collinearity diagnostics:

Model 1 (Control Variables + Internet Addiction): The explanatory power is $R^2 = .201$, indicating that internet addiction and control variables together explain 20.1% of the variance in psychological

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depression.

Model 2 (Adding Social Support): The explanatory power increases to $R^2 = .248$, with an additional 4.7% explanation ($\Delta R^2 = .047$, $p < .001$), suggesting that social support independently explains psychological depression.

Model 3 (Adding Interaction Term: Internet Addiction × Social Support): The explanatory power slightly increases to $R^2 = .249$, with an additional 0.2% explanation ($\Delta R^2 = .002$, $p < .01$). Although the contribution of the interaction term is small, it is statistically significant, supporting the presence of a moderation effect.

Regarding collinearity diagnostics (VIF), all variables have VIF values below 2, far below the critical threshold of 10. This indicates that the model does not suffer from severe multicollinearity (especially, the VIF value of the interaction term is 1.011, meeting the low multicollinearity standard).

Regarding the effects of control variables, grade differences were analyzed (with third-year students as the reference group):

First-year students: Significantly positively predicted psychological depression in Models 2 and 3 ($\beta = .042$, $p < .05$).

Second-year students: Effects were not significant ($\beta = .019 \sim .031$, $p > .05$).

Fourth-year students: Effects were also not significant ($\beta = .018 \sim .020$, $p > .05$).

Compared to third-year students, first-year students showed clear grade differences in psychological depression.

Regarding the main effect and moderation effect:

Internet addiction significantly affects psychological depression ($\beta = .393 \sim .444$, $p < .001$) in a positive direction, consistent with previous research. A one-standard-deviation increase in internet addiction raises depression levels by approximately 0.4 standard deviations, highlighting the severe impact of internet addiction on students' mental health.

Social support significantly affects psychological depression ($\beta = -.223 \sim -.225$, $p < .001$) in a negative direction, supporting the "buffering effect." A one-standard-deviation increase in social support decreases depression levels by approximately 0.22 standard deviations, indicating its direct alleviating effect.

Table 7.
Analysis of the Moderating Effect of Social Support on the Relationship Between Internet Addiction and Psychological Depression.

Item	Depressive Symptoms			VIF
	Model 1	Model 2	Model 3	
Control variable[2]	*β*	*β*	*β*	
Freshman	0.042	0.042*[1]	0.042*	1.530
Sophomore	0.019	0.030	0.031	1.414
Senior	- 0.018	- 0.020	- 0.020	1.454
Independent variable				
Internet addiction	0.444***	0.393***	0.396***	1.068
Moderator				
Social support		- 0.223***	- 0.225***	1.060
Interaction term				
Internet Addiction * Social support			- 0.044**	1.011
R^2	0.201	0.248	0.249	
$\triangle R^2$	0.201	0.047	0.002	
$\triangle F$	162.004***	160.632***	6.607**	

Note: $^*p < .05$; $^{**}p < .01$; $^{***}p < .001$.
The "Big Three" is the reference group.

The moderation effect (Internet Addiction × Social Support) is significant ($\beta = -.044$, $p < .01$), supporting the existence of a moderation effect.

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Thus, Hypothesis H3 is supported: Social support moderates the effect of internet addiction on psychological depression among Chinese university students. In other words, higher levels of social support weaken the impact of internet addiction on psychological depression, demonstrating that social support mitigates the negative effects of internet addiction.

Figure 3 illustrates the moderating effect of social support on the relationship between internet addiction and depressive symptoms through a simple slope analysis. The x-axis represents the level of internet addiction (low vs. high), and the y-axis represents the level of depressive symptoms. Two lines are shown in the figure: the dashed line represents low social support, while the solid line represents high social support.

As seen in Figure 3, regardless of the level of social support, an increase in internet addiction is associated with higher levels of depressive symptoms. However, the slopes of the two lines differ. Under low social support (dashed line), the slope is steeper than that under high social support (solid line). This suggests that the positive effect of internet addiction on depressive symptoms is stronger when social support is low.

When internet addiction is low, individuals with low social support report higher levels of depressive symptoms compared to those with high social support. When internet addiction is high, the gap in depressive symptoms between the two groups widens, with the low social support group continuing to show higher levels of depressive symptoms.

These findings highlight the important moderating role of social support in the relationship between internet addiction and depressive symptoms. Higher levels of social support weaken the impact of internet addiction on depressive symptoms. This suggests that educational administrators should pay special attention to providing social support when addressing the negative mental health impacts of internet addiction among students.

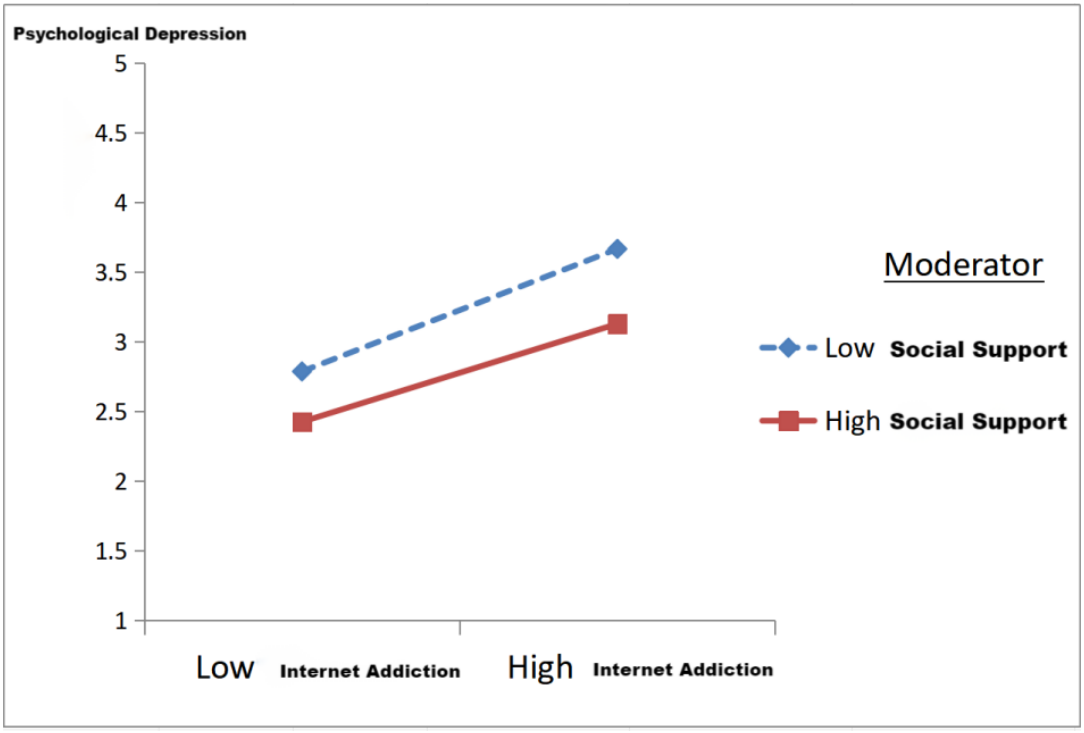

Figure 3.
Moderating Effect of Social Support.

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The present study further examined the moderating effect using the Bootstrap method in PROCESS macro version 4.2 for SPSS, developed by Hayes [20]. In the analysis, internet addiction was selected as the independent variable (X), depressive symptoms as the dependent variable (Y), social support as the moderator (W), and academic year as the covariate. Model 1 was chosen, with a bootstrap sample size of 5,000 and a 95% confidence interval. The conditional effects were estimated at the mean and ±1 standard deviation of the moderator (M and M ± 1SD). The bias-corrected bootstrap method was applied to test the specific moderating role of social support in the relationship between internet addiction and depressive symptoms.

As shown in Table 8, the overall model fit was satisfactory, with $R^2 = .249$ and $p < .001$, indicating that the model accounted for 24.9% of the variance in depressive symptoms. Among the control variables, freshman students reported significantly higher levels of depressive symptoms compared to juniors (reference group) ($\beta = .054$, $p < .05$). No significant differences were observed between sophomores and juniors ($\beta = .047$, $p = .127$), or between seniors and juniors ($\beta = -.030$, $p = .322$).

With respect to the main effects, internet addiction was a significant positive predictor of depressive symptoms ($\beta = .785$, $p < .001$), suggesting that higher levels of internet addiction were associated with increased depressive symptoms. However, the direct effect of social support on depressive symptoms was not statistically significant ($\beta = -.046$, $p = .515$). The interaction between internet addiction and social support was significant ($\beta = -.081$), with the 95% confidence interval excluding zero (LLCI = −.156, ULCI = −.012), and p values less than .05.

Simple slope analyses further revealed that under low levels of social support, the effect of internet addiction on depressive symptoms was $\beta = .523$ (LLCI = .466, ULCI = .581, $p < .001$). Under moderate levels of social support, the effect was $\beta = .474$ (LLCI = .433, ULCI = .516, $p < .001$), and under high levels of social support, the effect was $\beta = .425$ (LLCI = .371, ULCI = .479, $p < .001$). These results confirm that social support significantly moderates the relationship between internet addiction and depressive symptoms ($\Delta R^2 = .002$, $p < .01$), such that the higher the level of social support, the weaker the positive association between internet addiction and depressive symptoms.
This finding provides further support for Hypothesis 3.

Table 8.
Results of Moderation Analysis Using the Bootstrap Method in PROCESS Macro: The Moderating Effect of Social Support.

Level of Social support	Effect	Boot SE	*t*	95% Confidence Interval	
				LLCI	ULCI
Low social support（M-1SD）	0.523	.029	17.799***	0.466	0.581
Moderate social support	0.474	.021	22.449***	0.433	0.516
High social support（M+1SD）	0.425	.028	15.392***	0.371	0.479

Note: $^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$.

3.2.4. Hypothesis Testing Results

After conducting individual analyses of the proposed research hypotheses using the statistical software AMOS (Version 21) and SPSS (Version 25), the results are presented as shown in Table 9 below:

Table 9.
Summary of Hypothesis Testing Results of This Study.

Research Hypothesis	Result
H1 : Internet addiction has a significant positive effect on psychological depression among Chinese college students.	Supported
H2 : Social anxiety plays a mediating role in the effect of internet addiction on psychological depression among Chinese college students.	Supported
H3 : Social support plays a moderating role in the effect of internet addiction on psychological depression among Chinese college.	Supported

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4. Discussion

4.1. Internet Addiction Has a Significant Positive Effect on Psychological Depression Among College Students

This study verified the significant positive effect of internet addiction on psychological depression through structural equation modeling ($\beta = .489$, $p < .001$), which supports the findings of Zhang, et al. [22] and Chen, et al. [23] and is consistent with the unidirectional causal model proposed by Young [9]. The results reveal a gradient effect of internet addiction on psychological depression. Among the subdimensions, "compulsive internet use and withdrawal symptoms" ($\beta = .782$) and "tolerance" ($\beta = .836$) showed the most significant impact. These findings extend [24] stratified theory of addictive behaviors [24] while challenging the internet use alleviation hypothesis by Ferguson, et al. [25]. The discrepancies may stem from the deterioration of real-life social functioning due to compulsive internet use [11] increased tolerance intensifying digital dependence and imbalance with real life [26] and emotional fluctuations from withdrawal symptoms heightening susceptibility to depression [27].

Among the dimensions of psychological depression, "depressed mood" ($\beta = .913$) and "psychomotor retardation" ($\beta = .794$) were most significantly influenced by internet addiction. This supports the depression-aggravation theory by Hu, et al. [28] while revising the internet use alleviation hypothesis by Przepiorka, et al. [29]. The possible reasons include disrupted time management caused by internet addiction, leading to increased academic stress, or over-reliance on digital socialization weakening real-life social skills [30]. These findings provide new intervention strategies for college psychological counseling.

4.2. Social Anxiety Mediates the Relationship Between Internet Addiction and Psychological Depression

Using structural equation modeling and bootstrapping, this study revealed that social anxiety plays a partial mediating role in the relationship between internet addiction and psychological depression ($\beta = .178$, $p < .001$). This finding aligns with Bu [31] chained mediation theory Bu [31] and supports Young's "stress-adaptation" model [39]. The study found that internet addiction influences psychological depression by inducing social anxiety, with "social avoidance" ($\beta = .822$) and "fear of negative evaluation" ($\beta = .787$) showing the strongest mediating effects. This extends [15] social compensation theory, while challenging Kraut, et al. [32] internet use alleviation hypothesis [15].

The difference may be due to a dual mechanism: internet addiction exacerbates the decline in real-life social skills, forming a vicious cycle of "digital dependence–real-world avoidance," and the superficial interaction in virtual communication reduces the effectiveness of emotional support [14]. On the direct effect level, internet addiction still maintained a significant impact on depression ($\beta = .313$, $p < .001$), supporting [26] multi-path theory Kumar, et al. [26] while modifying Caplan, et al. [33] single-mediation hypothesis [33]. Possible explanations include sleep deprivation from internet addiction exacerbating emotional dysregulation [34] identity crises triggered by over-investment in digital identities [35] and time displacement effects reducing access to positive coping resources [36].

The strength of the mediating effect (36.25%) found in this study is notably higher than in similar Western studies [15] which may reflect the unique context of China's educational environment: the higher social value placed on real-life social competence under collectivist culture [14] family interaction patterns shaped by the one-child policy [12] and the increasing emphasis on social performance within university evaluation systems [31]. These findings suggest that educational administrators should develop a localized "internet-social-psychological" triadic intervention model, integrating digital literacy with social skills training through curriculum reform.

4.3. Social Support Moderates the Relationship Between Internet Addiction and Psychological Depression

This study used hierarchical regression analysis and bootstrapping to demonstrate that social support significantly moderates the relationship between internet addiction and psychological depression ($\beta = -.081$, $p < .05$). This finding corroborates the research by Ye, et al. [37] and confirms Cohen and Wills [38] "buffering model" [38]. The moderating effect of social support showed a

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gradient pattern: under high levels of social support, the effect of internet addiction on depression was significantly weakened ($\beta = .425$, $p < .001$). This extends the protective factor theory proposed by Sun, et al. [39] while challenging [11] isolation hypothesis of internet use [11].

The reason may be that social support provides alternative real-life social resources [40] enhances emotional regulation [35] and alleviates negative cognitions associated with internet dependence [41]. In terms of moderation, internet addiction had a particularly strong effect on individuals with low social support ($\beta = .523$, $p < .001$), supporting the resource-depletion theory [42] while revising [43] linear moderation hypothesis [43]. These findings offer a theoretical basis for building more precise intervention systems.

5. Conclusion

This study, in response to the growing concern over excessive internet use, systematically reviews and synthesizes literature on internet addiction, social anxiety, social support, and psychological depression. It incorporates the mediating mechanism of social anxiety and the buffering role of social support into an integrated analytical framework, constructing a four-dimensional model of the influence of internet addiction. Using Structural Equation Modeling (SEM) and Bootstrap methods for empirical analysis, the study enhances the credibility of the findings and reveals the psychological adjustment mechanisms of individuals under stress and crisis conditions. These findings carry significant implications for understanding dynamics within the field of psychology.

5.1. Implications

5.1.1. Enhancing Digital Literacy for Healthy Internet Behavior

Develop differentiated curricula tailored to students' internet use patterns across academic years:

For first-year students, offer a "Digital Adaptation Training" course that uses simulated social environments to cultivate healthy internet habits.

For second-year students, introduce a "Time Management Sandbox" system to balance academic tasks and entertainment through virtual scenario rehearsals.

For third-year students (peak period for internet addiction), provide a "Career-Oriented Internet Withdrawal Workshop" integrating career planning with behavioral correction.

For fourth-year students, implement a "Real-World Scene Transfer Training" program to strengthen restraint in job-hunting social interactions.

Curriculum content should integrate Cognitive Behavioral Therapy (CBT), focusing on core addiction dimensions such as compulsive internet use and tolerance.

An intelligent "Family-Campus Internet Behavior Interaction System" should be developed, integrating students' campus network usage data with home device activity logs. The system should feature a tiered warning mechanism: if excessive gaming time or abnormal nighttime social media use is detected, an administrative intervention is triggered. For students from rural areas, the system will recommend offline club activities to compensate for a lack of real-life social resources. A parent-accessible "Digital Literacy Resource Library" can provide communication strategies and alternative activity plans.

5.1.2. Optimizing Social Anxiety Intervention Mechanisms

Introduce VR-based multidimensional social scenario simulations encompassing 20 high-anxiety situations such as academic presentations, job interviews, and intercultural communication. The system adapts difficulty based on students' backgrounds: urban students focus on "elite social etiquette simulations," while rural students undergo "urban culture adaptation training."

Real-time training data syncs with counseling centers—if persistent social avoidance is detected (e.g., eye contact rate < 30% in VR), professional appointments are automatically scheduled.

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Establish a "Rural-Urban Cultural Exchange Fund" to support rural students in attending museum tours and open enterprise days in cities, reducing "invisible social barriers." Simultaneously, conduct "Local Culture Week" encouraging rural students to organize folk culture projects to boost confidence. A "Peer Mentorship Program" recruits senior urban students as cultural adaptation mentors, sharing experiences to reduce freshmen's fear of social failure.

5.1.3. Building a Social Support Ecosystem

Construct a four-party linkage system:

Universities should regularly hold digital literacy workshops for parents, teaching them how to establish "internet contracts."

Communities can set up "Youth Digital Health Stations" offering addiction counseling and alternative activity spaces.

Companies may develop "Virtual Internship Platforms" to help third-year students gain a sense of achievement in simulated workplace settings.

At the government level, promote legislation requiring social media platforms to include a "Campus Mode" to automatically filter addictive content.

Include social support utilization in students' comprehensive evaluations, using multidimensional metrics: awareness of support resources, frequency of help-seeking, and crisis resolution efficiency.

For science students, establish a "Tech Community Incubation Program" to turn academic projects into mutual-aid learning groups. For humanities students, set up a "Cultural Communication Workshop" to expand the reach of support networks. A "Support Effectiveness Leaderboard" can publicly recognize effective support cases.

5.2. Limitations and Future Research Directions

Like other studies, this research has some limitations. Although the sample includes five regions in mainland China (East, Central, South, etc.), it does not cover Hong Kong, Macao, Taiwan, or minority-dominated areas, which may limit cultural generalizability. Future research should expand the sample to include universities in Northeast, Southwest, and Hong Kong/Macau/Taiwan regions to ensure broader applicability and more comprehensive understanding of internet addiction, social anxiety, social support, and psychological depression among college students. Additionally, future studies may include graduate students to explore differences across educational levels.

Methodologically, future research may adopt diverse measurement tools, such as experiments and observational methods. For instance, experiments can explore how internet addiction affects cognitive functions, while observations may assess how social anxiety manifests in daily student life. Longitudinal designs could track participants over four years to analyze the spiral intensification mechanism between internet addiction and depression. Moreover, comparative studies, case studies, and mixed-methods approaches can deepen the understanding of the dynamic interactions among variables.

Transparency:

The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

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