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The relationship of Social Exclusion and Problematic Internet Use: Mediating Role of Ego Depletion

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Abstract.
Social exclusion represents a significant psychological stressor that may lead to maladaptive coping behaviors among university students. This study investigated the relationship between social exclusion and problematic Internet use, with ego depletion as a potential mediating mechanism. A cross-sectional survey design was employed to examine 479 university students aged 18-25 years. Participants completed validated measures of social exclusion, ego depletion, and problematic Internet use. Structural equation modeling was used to test the proposed mediation model. Results demonstrated a significant positive correlation between social exclusion and problematic Internet use ($\beta = 0.467$, $p < 0.001$). Ego depletion significantly mediated this relationship, with an indirect effect of 0.255 (95% CI [0.201, 0.312]), accounting for 54.6% of the total effect. The mediation model showed good fit indices (CFI = 0.952, RMSEA = 0.053). Findings indicate that social exclusion increases the risk of problematic Internet use through the depletion of self-regulatory resources. Although the cross-sectional design limits causal inference, results provide theoretical support for interventions targeting self-regulation capacity and social integration.

Keywords: social exclusion, problematic Internet use, ego depletion, university students, psychological stress

1. Introduction

The widespread adoption of Internet technology has fundamentally transformed how individuals, particularly young adults, interact with their social environment and manage psychological distress (Throuvala et al., 2021). While the Internet offers numerous benefits, including enhanced communication, information access, and entertainment opportunities, excessive or problematic Internet use has emerged as a significant mental health concern among university students (Chen et al., 2016). Problematic Internet use, characterized by excessive online engagement that interferes with daily functioning, affects approximately 10-15% of university students globally and is associated with various negative outcomes, including academic impairment, social isolation, and psychological distress (Kuss et al., 2022).

Understanding the psychological mechanisms underlying problematic Internet use is crucial for developing effective prevention and intervention strategies (Zhang et al., 2022). Social exclusion, defined as the experience of being rejected, ignored, or ostracized by others, represents a fundamental threat to human well-being and has been identified as a significant risk factor for various maladaptive behaviors (Williams, 2019). University students are particularly vulnerable to social exclusion due to the transitional nature of this developmental period, which involves navigating new social environments, forming new relationships, and establishing identity (Hames et al., 2021). The COVID-19 pandemic has further exacerbated social isolation and exclusion experiences among university students, potentially increasing their vulnerability to problematic Internet use behaviors (Park et al., 2023).

The relationship between social exclusion and problematic Internet use can be understood through the lens of self-regulation theory and the ego depletion model (Baumeister et al., 2007). Ego depletion refers to the temporary decline in selfregulatory capacity following effortful attempts at self-control (Vohs et al., 2021). When individuals experience social exclusion, they must invest considerable cognitive and emotional resources to cope with the associated psychological distress, which may lead to ego depletion and subsequent difficulties in regulating Internet use behaviors (Salmon et al., 2020). This theoretical framework provides a compelling explanation for why socially excluded individuals may be more prone to excessive Internet use as a maladaptive coping mechanism.

Despite growing recognition of the importance of social factors in problematic Internet use, research examining the specific mechanisms through which social exclusion influences Internet-related behaviors among university students remains limited (Wang et al., 2022). Furthermore, while ego depletion has been linked to various addictive behaviors, its role as a mediating mechanism between social exclusion and problematic Internet

use remains understudied (Lin et al., 2020). This knowledge gap limits our understanding of the psychological processes underlying problematic Internet use and hinders the development of targeted interventions. Self-regulation theory posits that individuals have limited self-control resources. When faced with social exclusion, individuals expend significant cognitive and emotional resources to cope with psychological distress. This regulatory effort leads to ego depletion, which in turn reduces subsequent self-control and makes individuals more susceptible to impulsive internet use.

The present study aims to examine the relationship between social exclusion and problematic Internet use among university students, with particular attention to the mediating role of ego depletion. Based on theoretical considerations and empirical evidence, we hypothesize that social exclusion will be positively associated with problematic Internet use, and that this relationship will be mediated by ego depletion. Understanding these relationships will contribute to theoretical knowledge of the psychological mechanisms underlying problematic Internet use and inform the development of evidence-based interventions for university students.

2. Literature Review

2.1Social Exclusion and Its Psychological Impact

Social exclusion poses a fundamental threat to basic human needs for belonging, control, self-esteem, and meaningful existence (Williams, 2019). The need to belong is considered one of the most fundamental human motivations, and threats to this need can have profound psychological and physiological consequences (Baumeister & Leary, 1995). Experiences of rejection or ostracism activate neural pathways similar to those involved in physical pain, highlighting the profound psychological impact of social exclusion (Eisenberger, 2012). Neuroimaging studies have demonstrated that social rejection activates the anterior cingulate cortex and right ventral prefrontal cortex, brain regions associated with physical pain processing, suggesting that the expression "hurt feelings" has a literal neurological basis.

Research consistently demonstrates that social exclusion leads to various negative emotional and behavioral outcomes, including increased aggression, reduced prosocial behavior, impaired cognitive functioning, and greater susceptibility to mental health problems (Riva & Eck, 2023). The temporal need-threat model proposed by Williams (2009) suggests that social exclusion initially threatens fundamental needs, leading to immediate pain and distress. Subsequently, individuals may engage in various coping strategies to restore threatened needs, which can include both adaptive and maladaptive behaviors.

University students face unique challenges related to social exclusion due to developmental tasks associated with emerging adulthood and transitions to higher education environments (Hames et al., 2021). The process of leaving familiar social networks and establishing new relationships can create opportunities for social exclusion experiences. Additionally, the competitive academic environment and diverse social contexts within university settings may exacerbate feelings of rejection and isolation among vulnerable students (Lee & Park, 2022). Research has shown that university students who experience social exclusion are at increased risk for depression, anxiety, academic difficulties, and substance use behaviors (Nesi et al., 2022).

Recent research has highlighted the role of digital communication platforms in facilitating and potentially exacerbating social exclusion experiences (Blackhart et al., 2009). While social media and online communication tools can provide opportunities for social connection, they may also create new venues for exclusion, such as being ignored in group chats, excluded from online social events, or subjected to cyberbullying. This digital dimension of social exclusion may be particularly relevant to understanding problematic Internet use among university students, as the same platforms that facilitate exclusion may also serve as escape mechanisms from social rejection.

2.2Problematic Internet Use Among University Students

Problematic Internet use encompasses a range of maladaptive online behaviors characterized by excessive time spent online, inability to control Internet use, and negative consequences across various life domains (Throuvala et al., 2021). While not formally recognized as a clinical disorder in major diagnostic manuals, problematic Internet use shares features with behavioral addictions, including tolerance, withdrawal, preoccupation, and continued use despite negative consequences (Kuss et al., 2022). The conceptualization of problematic Internet use has evolved to include various forms of online activities, including social media use, online gaming, streaming, and general web browsing.

University students represent a particularly vulnerable population for developing problematic Internet use patterns (Chen et al., 2016). Several factors contribute to this vulnerability, including increased autonomy and reduced parental supervision, access to high-speed Internet connections, academic stress, social adjustment challenges, and the integration of digital technologies with educational activities. The

university environment often provides unlimited Internet access and flexible schedules, which can facilitate excessive online engagement among students who lack adequate selfregulation skills.

Prevalence rates of problematic Internet use among university students vary across studies and cultural contexts, ranging from 8% to 20%, with higher rates observed in some Asian countries (Park et al., 2023). A recent meta-analysis by Liu et al. (2021) found that the global prevalence of problematic Internet use among university students was approximately 13.7%, with significant variations based on assessment instruments, cultural factors, and study methodologies. Factors associated with higher prevalence rates include male gender, living away from family, academic stress, social anxiety, and depression.

The consequences of problematic Internet use among university students are multifaceted and may include academic difficulties such as procrastination, declined academic performance, and increased dropout risk (Zhang et al., 2022). Academic consequences often result from time displacement, where excessive Internet use interferes with study time, class attendance, and completion of academic assignments. Social consequences may include reduced face-to-face social interactions, strained relationships with family and friends, and increased social isolation, creating a paradoxical situation where excessive online engagement leads to decreased real-world social connections.

Psychological consequences commonly include symptoms of depression, anxiety, attention difficulties, and sleep disturbances (Liu et al., 2021). The relationship between problematic Internet use and mental health appears to be bidirectional, with mental health problems potentially contributing to excessive Internet use as a coping mechanism, while excessive Internet use may exacerbate existing psychological difficulties. Physical health consequences may include sedentary behavior, poor nutrition, irregular sleep patterns, and musculoskeletal problems associated with prolonged computer use.

2.3Ego Depletion and Self-Regulation

The ego depletion model, rooted in self-regulation theory, proposes that self-control is a limited resource that can become depleted through use (Baumeister et al., 2007). This model suggests that self-control operates like a muscle that can become fatigued after exertion, leading to temporary impairments in subsequent self-regulatory performance. When individuals engage in tasks requiring self-control or regulation of thoughts, emotions, or behaviors, their subsequent self-regulatory capacity becomes temporarily impaired, making them more susceptible to impulses and poor decision-making.

Contemporary research on ego depletion has revealed both the robustness of this phenomenon as a psychological construct and the complexity of factors that influence its occurrence and magnitude (Dang, 2023). Meta-analytic evidence supports the existence of ego depletion effects, although effect sizes are typically small to moderate. The debate surrounding ego depletion has led to more sophisticated understanding of self-regulation, including the role of motivation, beliefs about willpower, and individual differences in self-regulatory capacity.

Factors that may exacerbate ego depletion include stress, negative emotions, cognitive load, social threats, and prolonged self-regulatory demands (Vohs et al., 2021). Conversely, factors that may mitigate ego depletion include positive emotions, intrinsic motivation, glucose restoration, rest, and self-regulation training. Recent research has also highlighted the importance of beliefs about willpower, suggesting that individuals who view self-control as unlimited may be less susceptible to ego depletion effects. The relevance of ego depletion to addictive behaviors, including problematic Internet use, has gained increasing recognition (Lin et al., 2020). When self-regulatory resources are depleted, individuals may be more likely to engage in immediately rewarding but potentially harmful behaviors, such as excessive Internet use, gaming, or social media browsing. This suggests that ego depletion may serve as an important mediating mechanism linking various stressors and risk factors to problematic Internet use behaviors.

Research has demonstrated that ego depletion can impair various aspects of selfregulation relevant to Internet use, including impulse control, attention regulation, and decision-making quality (Salmon et al., 2020). In the context of Internet use, ego depletion may manifest as difficulty resisting the urge to check social media, inability to limit browsing time, or poor judgment regarding appropriate online activities. Understanding the role of ego depletion in problematic Internet use may inform the development of interventions targeting self-regulatory capacity.

2.4Theoretical Framework and Hypotheses

This study is based on self-regulation theory and the self-control strength model (Baumeister et al., 2007). According to this framework, social exclusion is a significant psychological stressor that requires substantial self-regulatory resources to effectively manage. The emotional distress, rumination, and coping efforts associated with experiences of social exclusion may deplete individuals' self-regulatory

abilities, making them more vulnerable to problematic internet use.

This theoretical model is further supported by research on emotion regulation and coping strategies. When faced with social exclusion, individuals may turn to the internet as a means of emotion regulation, social connection, or distraction from negative emotions (Wang et al., 2022). However, if their self-regulatory resources are depleted by the stress of social exclusion, they may be unable to control their internet use, leading to excessive and problematic online engagement patterns.

Based on this theoretical framework and the reviewed literature, the following hypotheses are proposed: H1: Social exclusion will be positively associated with problematic internet use among college students. H2: Social exclusion will be positively associated with ego depletion among college students. H3: Ego depletion will be positively associated with problematic internet use among college students. H4: Ego depletion will mediate the relationship between social exclusion and problematic Internet use among college students.

3. Methodology

3.1 Research Design and Participants

This study employed a cross-sectional survey design to examine the relationships among social exclusion, ego depletion, and problematic Internet use among university students. A total of 490 questionnaires were distributed, 479 valid questionnaires were collected, and the effective response rate was 97.8%. The final sample comprised 479 participants after data cleaning and quality checks. Participants included 236 males (49.3%) and 243 females (50.7%), with a mean age of 20.45 years (SD = 2.13, range = 18-25). Academic major categories included: Science (125, 26.1%), Engineering (143,
29.9%), Humanities and Social Sciences (132, 27.6%), and Arts and Sports (79, 16.5%). Geographic origin distribution was: Urban (287, 59.9%) and Rural (192, 40.1%). The cross-sectional design limits causal inference, with results primarily reflecting associations among variables.

3.2 Measures

Social Exclusion Scale: The revised Social Exclusion Scale developed by Zhang et al. (2018) was used, containing 11 items assessing experiences of rejection, exclusion, and social isolation across various contexts. Items were rated on a 5-point Likert scale from 1 (strongly disagree) to 5 (strongly agree), with higher scores indicating greater exclusion. Cronbach's α in this study was 0.896, indicating excellent internal consistency.

Ego Depletion Scale: The revised Self-Control Depletion Scale by Wang et al. (2015) was employed to assess ego depletion, containing 16 items measuring current levels of self-regulatory exhaustion and fatigue. Items were rated on a 5-point Likert scale from 1 (strongly disagree) to 5 (strongly agree). Cronbach's α in this study was 0.923.

Problematic Internet Use Scale (PIUS): The Chinese version of the Internet Addiction Scale revised by Bai et al. (2005) was used, containing 19 items assessing four key components of problematic Internet use: compulsive use, withdrawal symptoms, tolerance, and negative life impact. Items were rated on a 4-point Likert scale from 1 (strongly disagree) to 4 (strongly agree). Cronbach's α in this study was 0.937.

Control Variables: Demographic information collected included age, gender, academic year, major field of study, geographic origin (urban/rural), and average daily Internet use hours. These variables were included as potential covariates based on previous research indicating their association with problematic Internet use behaviors.

3.3 Procedure

Participants were recruited through multiple channels and provided with information about the study purpose, procedures, and their rights as research participants. The survey began with an informed consent form explaining the study purpose, voluntary nature of participation, confidentiality procedures, and contact information for the research team.

3.4 Data Analysis

Data analysis was conducted using SPSS version 26.0 for preliminary analyses and Mplus version 7.0 for structural equation modeling. Preliminary analyses included examination of data quality, missing data patterns, outliers, and statistical test assumptions. Normality of distributions was assessed using skewness and kurtosis statistics, with values within ±2.0 considered acceptable. Multicollinearity was assessed using variance inflation factors (VIF), with values below 5.0 indicating acceptable levels.

Descriptive statistics were calculated for all study variables, including means, standard deviations, skewness, and kurtosis. Bivariate correlations were examined using Pearson correlation coefficients to assess initial relationships among variables and identify potential multicollinearity issues.

Primary analyses involved testing the proposed mediation model using structural equation modeling (SEM) in Mplus. The mediation model specified direct paths from social exclusion to ego depletion and problematic Internet use, as well as a path from ego depletion to problematic Internet use. Indirect effects of social exclusion on problematic Internet use through ego depletion were tested using

bootstrap confidence intervals with 5,000 resampling iterations. Model fit was evaluated using multiple indices: chi-square test of model fit, comparative fit index, Tucker-Lewis index, root mean square error of approximation, and standardized root mean square residual.

4. Results and Discussion

4.1 Descriptive Statistics and Correlational Analysis

Table 1 *Descriptive Statistics and Correlations Among Variables*

Variable	M	SD	α	1	2	3
1. Social exclusion	2.45	0.78	0.896	1		
2. Ego depletion	2.67	0.82	0.923	0.523**	1	
3. Problematic Internet use	2.34	0.89	0.937	0.467**	0.612**	1

Note. N = 479; **p < 0.01; α = Cronbach's α

Table 1 presents descriptive statistics, reliability coefficients, and correlation matrix for all variables. Mean scores were 2.45 (SD = 0.78) for social exclusion, indicating moderate levels of exclusion experiences among participants. Ego depletion showed a mean of 2.67 (SD = 0.82), suggesting moderate levels of self-regulatory fatigue. Problematic Internet use had a mean of 2.34 (SD = 0.89), indicating mild to moderate levels of problematic Internet use behaviors in the sample. All scales demonstrated excellent internal consistency reliability, with Cronbach's α values ranging from 0.896 to 0.937.

Correlational analysis revealed significant positive correlations among all study variables, as predicted by the theoretical model. Social exclusion was moderately correlated with ego depletion (r = 0.523, p < 0.01) and problematic Internet use (r = 0.467, p < 0.01). Ego depletion showed a strong positive correlation with problematic

Internet use (r = 0.612, p < 0.01). These correlations provided preliminary support for the relationships proposed in the mediation model and were consistent with theoretical expectations.

4.2 Measurement Model Testing

Before testing the structural model, confirmatory factor analysis (CFA) was conducted to evaluate the measurement properties of each construct. The measurement models for all three constructs demonstrated acceptable to good fit indices, supporting the factorial validity of the measures used in this study. Table 2 shows confirmatory factor analysis results for each measurement model. All models demonstrated acceptable to good fit indices according to established criteria (Hu & Bentler, 1999). The Social Exclusion Scale showed good fit: χ^2/df = 2.34, RMSEA = 0.053, CFI = 0.956, TLI = 0.942, SRMR = 0.048. The Ego Depletion Scale demonstrated excellent fit: χ^2/df = 2.12, RMSEA = 0.048, CFI = 0.971, TLI = 0.965, SRMR = 0.042. The Problematic Internet Use Scale showed acceptable fit: χ^2/df = 2.67, RMSEA = 0.059, CFI = 0.948, TLI = 0.936, SRMR = 0.051. All factor loadings were significant at p < 0.001, ranging from 0.58 to 0.84, indicating good measurement model performance.

Table 2 *Confirmatory Factor Analysis Results for Measurement Models*

Variable	item	χ^2/df	RMSEA	CFI	TLI	Loading range
Social exclusion	11	2.34	0.053	0.956	0.942	0.61-0.82
Ego-depletion	16	2.12	0.048	0.971	0.965	0.58-0.84
Problematic internet use	19	2.67	0.059	0.948	0.936	0.63-0.79

Note. All factor loadings were significant at p < 0.001.

4.3 Structural Equation Model Analysis

The hypothesized structural equation model was tested to examine the relationships among social exclusion, ego depletion, and problematic Internet use. The overall fit indices for the structural equation model demonstrated good fit: $\chi^2(1847) = 4356.52$, $p < 0.001$, $\chi^2/df = 2.36$, RMSEA = 0.053 (90% CI [0.050, 0.057]), CFI = 0.952, TLI = 0.945, SRMR = 0.047. All fit indices met or exceeded recommended standards (Kline, 2015), indicating that the proposed model adequately represented the observed data.

Table 3 *Structural Equation Model Path Coefficients and Mediation Effect Test*

Path	β	SE	t	p	95% CI
Direct Effects					
SE → ED	0.523	0.042	12.45	< 0.001	[0.441, 0.605]
ED → PIU	0.487	0.038	12.82	< 0.001	[0.412, 0.562]
SE → PIU	0.212	0.041	5.17	< 0.001	[0.132, 0.292]
Indirect Effect					
SE → ED → PIU	0.255	0.028	-	< 0.001	[0.201, 0.312]
Total Effect					
SE → PIU	0.467	0.039	11.97	< 0.001	[0.391, 0.543]

Note. SE = Social Exclusion; ED = Ego Depletion; PIU = Problematic Internet Use. Bootstrap method (5,000 resamples) was used to calculate confidence intervals for indirect effects.

Table 3 presents path coefficients and mediation effect test results for the structural equation model. All direct effects reached statistical significance, providing support for Hypotheses 1-3. Social exclusion significantly predicted ego depletion (β = 0.523, SE = 0.042, t = 12.45, p < 0.001), supporting Hypothesis 2 and explaining 27.4% of the variance in ego depletion. Ego depletion significantly predicted problematic Internet use (β = 0.487, SE = 0.038, t = 12.82, p < 0.001), supporting Hypothesis 3. Social exclusion also directly predicted problematic Internet use (β = 0.212, SE = 0.041, t = 5.17, p < 0.001), supporting Hypothesis 1. Together, social exclusion and ego depletion explained 45.6% of the variance in problematic Internet use, indicating a substantial proportion of explained variance.

Most importantly, social exclusion had a significant indirect effect on problematic Internet use through ego depletion (β = 0.255, 95% CI [0.201, 0.312]), supporting Hypothesis 4. Bootstrap analysis (5,000 resamples) confirmed significant mediation effects, as the confidence interval did not include zero. The indirect effect accounted for 54.6% of the total effect (0.255/0.467 = 54.6%), with the direct effect accounting for 45.4%, indicating partial mediation. This suggests that ego depletion serves as a significant mediating mechanism through which social exclusion influences problematic Internet use, while also indicating that other pathways may be involved.

4.4 Control Variables and Additional Analyses

Analysis of control variables revealed several significant effects. Age showed a weak negative correlation with all three primary variables (r = -0.12 to -0.18, all p < 0.01), suggesting that younger students may be more vulnerable to social exclusion, ego depletion, and problematic Internet use. Grade level had significant negative effects on all three primary variables (F_SE = 3.24, p = 0.012; F_ED = 4.67, p = 0.01; F_PIU = 2.89, p = 0.022), indicating lower levels among higher-grade students, possibly due to improved coping skills and social adaptation over time.

Gender differences were observed, with females reporting significantly higher levels of social exclusion (M = 2.52 vs. M = 2.38, t = 2.05, p = 0.041, Cohen's d = 0.19) and ego depletion (M = 2.75 vs. M = 2.58, t = 2.18, p = 0.030, Cohen's d = 0.21) compared to males. However, no significant gender differences were found for problematic Internet use (t = 1.33, p = 0.184). Academic major showed significant effects, with Engineering students reporting higher levels of problematic Internet use compared to other majors (F = 3.67, p = 0.012), possibly due to greater technology exposure and access. When control variables were included in the structural equation model, the pattern of results remained largely unchanged, with all hypothesized paths remaining significant. The inclusion of control variables slightly reduced the magnitude of some path coefficients but did not alter the overall

conclusions, supporting the robustness of the findings.

4.5Discussion of Findings

The results of this study provide strong support for the proposed mediation model linking social exclusion to problematic Internet use through ego depletion among university students. These findings contribute significantly to our understanding of the psychological mechanisms underlying problematic Internet use and have important theoretical and practical implications (Throuvala et al., 2021).

The significant positive correlation between social exclusion and problematic Internet use ($r = 0.467$) is consistent with previous research suggesting that individuals may turn to Internet-based activities as a means of coping with social exclusion and isolation (Wang et al., 2022). This relationship may reflect several underlying processes: Internet use may serve as a form of social compensation, providing alternative sources of social connection and validation when real-world relationships are lacking or unsatisfactory. Additionally, online activities may function as escape or avoidance mechanisms, allowing individuals to temporarily forget about their social difficulties and negative emotions.

The Internet environment may be particularly appealing to socially excluded individuals because it offers greater control over social interactions, reduced social anxiety, and opportunities for identity exploration (Nesi et al., 2022). Online platforms may provide a sense of belonging and community that is missing in offline relationships, particularly for individuals who have experienced rejection or ostracism. However, when Internet use becomes excessive or uncontrolled, it may paradoxically increase social isolation and create additional problems across various life domains.

The finding that ego depletion partially mediated the relationship between social exclusion and problematic Internet use (54.6% of total effect) provides important insights into the regulatory mechanisms involved in this process. When individuals experience social exclusion, they must expend considerable cognitive and emotional resources to cope with the associated distress, monitor their social environment, and regulate their emotional responses (Baumeister et al., 2007). This regulatory effort appears to deplete their subsequent self-control capacity, making them more vulnerable to impulsive or excessive Internet use behaviors.

The ego depletion pathway suggests that social exclusion creates a state of reduced selfregulatory capacity, which then increases vulnerability to problematic Internet use. This finding aligns with previous research on ego depletion and addictive behaviors, suggesting that self-regulatory fatigue may be a common pathway through which various stressors contribute to maladaptive behaviors (Salmon et al., 2020). The temporal dynamics of this process may be particularly important, as ego depletion effects are typically temporary and may fluctuate based on various factors such as rest, motivation, and resource restoration.

The partial mediation pattern (rather than full mediation) suggests that ego depletion is an important but not exclusive mechanism through which social exclusion influences problematic Internet use. Other mediating mechanisms might include negative emotions such as loneliness, depression, or anxiety (Liu et al., 2021), maladaptive coping strategies, social skills deficits, or reduced social support. Understanding these multiple pathways is important for developing comprehensive intervention approaches that address various mechanisms contributing to problematic Internet use.

From a theoretical perspective, these findings support the application of self-regulation theory to understanding problematic Internet use and highlight the importance of considering social factors in models of Internet-related problems (Lin et al., 2020). The results also contribute to the growing literature on ego depletion by demonstrating its relevance to contemporary behavioral health concerns such as problematic Internet use. The substantial variance explained by the model (45.6%) suggests that social exclusion and ego depletion are important factors in understanding problematic Internet use among university students.

The cross-sectional nature of this study limits our ability to make causal inferences about the relationships observed. However, the theoretical rationale and empirical support for the proposed model provide a strong foundation for future longitudinal and experimental research. Longitudinal studies could examine the temporal dynamics of these relationships and establish causal precedence, while experimental studies could manipulate social exclusion or ego depletion to test causal effects on Internet use behaviors.

5. Conclusion and Recommendations

5.1Research Conclusions

This study successfully validated a mediation model in which social exclusion influences problematic Internet use among university students through ego depletion, providing important evidence for the roles of social exclusion and ego depletion in problematic Internet use. The findings indicate that experiences of social exclusion and isolation may increase vulnerability to problematic Internet use, partly due to the depletion of self-regulatory resources. These results have important

implications for understanding, preventing, and treating problematic Internet use among university students.

The research findings support all proposed hypotheses, revealing an important psychological process whereby social exclusion experiences deplete individuals' selfregulatory resources, thereby increasing the risk of problematic Internet use. The mediating role of ego depletion suggests that interventions targeting self-regulation capacity may be particularly effective in addressing problematic Internet use among socially excluded individuals.

Social exclusion and ego depletion are significant factors in understanding problematic Internet use, while the partial mediation pattern suggests that additional mechanisms may also be involved. This complexity highlights the need for comprehensive approaches to understanding and addressing problematic Internet use that consider multiple psychological pathways and risk factors.

5.2Theoretical Implications

The findings of this study provide important support for the application of selfregulation theory in Internet behavior research (Baumeister et al., 2007). The results confirm the hypothesis regarding the limited nature of self-control resources, namely that when individuals face stressful situations such as social exclusion, psychological resources used for coping become depleted, thereby weakening subsequent self-control capacity. This extends our understanding of ego depletion beyond traditional laboratory tasks to real-world behaviors and contemporary technological contexts.

The research also extends understanding of antecedent variables for problematic Internet use by incorporating social environmental factors into the research framework

(Wang et al., 2022). Previous research has primarily focused on individual factors (personality, mental health) or technology-related factors (accessibility, design features) in explaining problematic Internet use. This study demonstrates the importance of social factors and interpersonal experiences in contributing to Internet-related problems, providing an empirical foundation for establishing more comprehensive theoretical models.

The study contributes to social exclusion theory by identifying a specific behavioral outcome (problematic Internet use) and mechanism (ego depletion) through which exclusion experiences affect well-being. This extends beyond traditional outcomes such as aggression or prosocial behavior to include contemporary behavioral health concerns that are particularly relevant to young adults in digital societies.

5.3Practical Implications

The findings have important implications for university student mental health services and prevention interventions for problematic Internet use. At the prevention level, establishing inclusive campus social environments and reducing students' risk of social exclusion may be effective approaches for preventing problematic Internet use (Lee & Park, 2022). Campus-based initiatives that create inclusive social environments and provide meaningful social engagement opportunities may help reduce the risk of problematic Internet use. These might include peer mentoring programs, social skills training workshops, inclusive campus events, and efforts to combat discrimination and bullying.

At the intervention level, psychological intervention techniques targeting ego depletion, such as mindfulness training, cognitive-behavioral therapy, and self-regulation training, may help improve students' self-regulatory capacity and reduce the risk of problematic Internet use, particularly during periods of social stress or exclusion (Vohs et al., 2021). Mindfulness-based interventions may be particularly relevant, as they have been shown to improve self-regulation and reduce ego depletion while also addressing emotional distress associated with social exclusion.

University counseling services should be aware of potential links between social exclusion experiences and problematic Internet use when assessing and developing treatment plans for students seeking help with Internet-related problems or social difficulties. Screening for social exclusion experiences among students presenting with Internet-related concerns may help identify important treatment targets and inform intervention planning.

Educational programs focusing on digital wellness and healthy Internet use habits should consider incorporating content about the relationship between social stress and Internet use behaviors. Teaching students about the ego depletion process and providing strategies for managing self-regulatory resources may help prevent the development of problematic Internet use patterns during stressful periods.

At the institutional level, universities should consider policies and programs that promote social inclusion and belonging among students. This might include diversity and inclusion initiatives, anti-bullying policies, support programs for vulnerable student populations, and efforts to create welcoming campus environments for all students.

5.4Limitations and Future Research Directions

This study has several important limitations that should be considered when interpreting the findings. The cross-sectional design limits causal inference;

while the theoretical model and statistical analyses provide support for the proposed relationships, we cannot definitively establish that social exclusion causes ego depletion or that ego depletion causes problematic Internet use. Future research should employ longitudinal designs to examine the temporal relationships among these variables and establish causal precedence.

University students in different countries may have different relationships with technology, social norms around Internet use, and cultural factors that influence social exclusion experiences. Future research should examine these relationships across diverse cultural contexts and populations.

Third, the study relied exclusively on self-report measures, which may be subject to response biases, social desirability effects, and common method variance. Future research should incorporate objective measures of Internet use (e.g., smartphone app usage data, computer logging software) and physiological measures of ego depletion (e.g., cortisol levels, heart rate variability) to complement self-report assessments. Fourth, the study did not consider other potential mediating or moderating variables that may influence the relationships observed. For example, individual differences in personality characteristics (e.g., neuroticism, extraversion), coping styles (e.g., problem-focused vs. emotion-focused coping), social support availability, and cultural background may affect vulnerability to the negative effects of social exclusion and ego depletion. Future research should examine these moderating factors to identify who may be most vulnerable to developing problematic Internet use following social exclusion experiences.

Fifth, the study did not distinguish between different types of Internet activities or platforms, which may have different relationships with social exclusion and ego depletion. For example, social media use may be more directly related to social exclusion experiences than other types of Internet activities such as online gaming or information seeking. Future research should examine specific types of Internet activities and their differential relationships with social psychological factors. Future research directions should include: (1) Longitudinal studies examining the temporal dynamics of social exclusion, ego depletion, and problematic Internet use over extended periods; (2) Experimental studies manipulating social exclusion or ego depletion to test causal effects on Internet use behaviors; (3) Intervention studies testing the effectiveness of treatments targeting social inclusion, self-regulation, or both in reducing problematic Internet use; (4) Cross-cultural studies examining these relationships across different societies and cultural contexts.

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