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"When" and "for Whom" Do Genetic Impulsivity Shape Addictive Internet Consumption? A Moderated Mediation Model

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ABSTRACT

Objective: This study investigates the relationship between genetic impulsivity and addictive internet use, while examining the role of self-control as a mediating variable. Additionally, it explores the effects of parenting quality and personal ethics as moderating variables to determine when and under what conditions the impact of genetic impulsivity on internet addiction is mitigated or exacerbated.

Methods: The statistical population of this study includes all students enrolled in the Islamic Azad University branches of East Azerbaijan province during the 2025–2026 academic year. Using stratified random sampling, 387 students were selected as the sample. Data regarding genetic impulsivity, self-control, parenting quality, personal ethics, and addictive internet use were collected through standardized questionnaires, whose validity and reliability were verified following back-translation. Data analysis was conducted using Hayes' Model 21 conditional process analysis to examine the direct, indirect (mediating), and moderating effects of the variables.

Results: The results indicate that genetic impulsivity increases addictive internet use both directly and indirectly (by weakening self-control). Furthermore, parenting quality and personal ethics moderate the detrimental effects of impulsivity; when these factors are at higher levels, the probability or severity of internet addiction is reduced.

Conclusions: It can be concluded that internet addiction is not solely a product of individual factors but is shaped by the interaction between bio-genetic predispositions, psychological self-control processes, and familial/value-based contexts. Therefore, preventive and intervention strategies should simultaneously focus on strengthening self-control and improving environmental factors (parenting quality and the cultivation of ethical values).

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Introduction

Over the past two decades, Internet addiction has emerged as one of the most significant psychological challenges among young adults, particularly university students. With the rapid expansion of digital technologies and the ubiquity of online platforms, excessive Internet use has increasingly been conceptualized as a behavioral impulse-control disorder that can impair individuals' academic performance, social functioning, and emotional well-being (Kuss & Griffiths, 2023). University students represent a particularly vulnerable population due to their extensive access to the Internet, academic pressures, and developmental transitions that may heighten susceptibility to maladaptive coping strategies and addictive behaviors.

From a biopsychological perspective, one of the most prominent predictors of problematic Internet use is impulsivity, a personality trait characterized by a tendency toward rapid, unplanned reactions to internal or external stimuli without adequate consideration of potential negative consequences (Yang et al., 2022). Accumulating evidence suggests that impulsivity is partly rooted in genetic predispositions, which influence neurobiological systems responsible for reward processing, motivation, and behavioral inhibition (Dick et al., 2021; Goldman & Bilakova, 2022). Genetic variations affecting neurotransmitter systems—particularly dopaminergic pathways associated with reward sensitivity and serotonergic systems involved in behavioral inhibition—have been linked to heightened impulsive tendencies and difficulties in executive functioning.

Individuals with stronger genetic tendencies toward impulsivity are more likely to seek immediate rewards and stimulating experiences, making them particularly vulnerable to reinforcing digital environments such as social media, online gaming, and endless web browsing (Kim-Spoon et al., 2023). Consistent with this perspective, previous research has reported a positive association between impulsivity and a variety of addictive behaviors, including substance abuse, gambling, compulsive buying, and problematic Internet use (Yao & Potenza, 2015; Paris, 2018). Studies conducted among university students have similarly found that impulsivity significantly predicts the severity of Internet addiction symptoms (Li et al., 2021; Yang et al., 2022). Accordingly, it can be hypothesized that:

H1: Genetic impulsivity is positively and significantly associated with addictive Internet consumption.

However, the relationship between impulsivity and Internet addiction is neither direct nor deterministic. Contemporary behavioral models emphasize that biological predispositions often influence behavior through psychological mediating mechanisms. One such key mechanism is self-control, defined as the capacity to regulate impulses, delay gratification, and maintain goal-directed behavior despite immediate temptations (Tangney et al., 2020). Self-control is closely associated with executive functions—such as inhibitory control, working memory, and cognitive flexibility—primarily governed by the prefrontal cortex (Hofmann et al., 2022).

Empirical studies consistently demonstrate a negative relationship between impulsivity and self-control. Individuals with high impulsivity typically exhibit weaker behavioral inhibition, poorer planning abilities, and greater difficulty regulating emotions and resisting temptations (Kor, 2023). Developmental research further suggests that genetic vulnerabilities related to impulsivity may hinder the maturation of self-regulatory capacities throughout childhood and adolescence (Belsky & Van IJzendoorn, 2017; Thompson et al., 2023). Therefore, individuals with stronger genetic impulsivity tendencies are likely to exhibit lower levels of self-control.

H2: Genetic impulsivity is negatively and significantly associated with self-control.

Self-control also plays a crucial role in preventing maladaptive digital behaviors. According to self-regulation and behavioral control theories, individuals with strong self-control are better able to resist immediate online rewards—such as social validation on social media, rapid progress in online games, or constant information access—and instead prioritize long-term goals and responsibilities (Kuss & Griffiths, 2023; Montag & Elhai, 2022). Conversely, individuals with low self-control often experience difficulties in regulating online engagement, leading to excessive and compulsive Internet use.

Recent empirical findings support this perspective. For instance, lower levels of self-control have been associated with problematic social media use, excessive online gaming, and compulsive web browsing (King et al., 2023; Andersen et al., 2024). These findings highlight the critical role of self-control in predicting Internet addiction.

H3: Self-control is negatively and significantly associated with addictive Internet consumption.

Integrating these perspectives suggests that self-control may function as a mediating mechanism through which genetic impulsivity influences Internet addiction. Rather than exerting a direct

effect, impulsivity may first weaken self-regulatory capacities, which in turn increases vulnerability to addictive digital behaviors. This mediating pathway is consistent with contemporary biopsychological models suggesting that genetic predispositions shape behavioral outcomes through psychological processes (Kim-Spoon et al., 2023; Wills et al., 2020).

H4: Genetic impulsivity indirectly increases addictive Internet consumption through reduced self-control.

Beyond individual psychological factors, environmental influences also play a critical role in shaping self-regulation. According to the gene–environment interaction framework, genetic predispositions do not operate in isolation; rather, their behavioral expression is shaped by environmental conditions (Turkheimer, 2019). One of the most influential environmental factors during development is parenting quality.

High-quality parenting—characterized by emotional support, consistent structure, and guidance in developing behavioral regulation—has been shown to promote the development of self-control and emotional regulation in children and adolescents (Hostinar & Miller, 2022; Thompson et al., 2023). Supportive parenting environments can therefore buffer the negative effects of impulsive tendencies by fostering stronger self-regulatory capacities.

H5: Parenting quality moderates the relationship between genetic impulsivity and self-control.

In addition to early environmental influences, individual moral values may shape behavioral outcomes during adolescence and adulthood. Personal morality, conceptualized as an internalized system of ethical principles guiding responsible decision-making, can act as a cognitive–value filter in regulating behavior (Bandura, 1991; Rest & Narvaez, 1994). Individuals with strong moral values are more likely to evaluate the ethical and personal consequences of their actions and thus avoid harmful behaviors even when experiencing weak self-control.

Recent research suggests that strong internalized moral standards can function as an internal inhibitory mechanism, discouraging problematic digital behaviors and reducing the likelihood that self-control deficits translate into addictive Internet use (Tirosh & Badas, 2024).

H6: Personal morality moderates the relationship between self-control and addictive Internet consumption.

Despite the growing body of literature on Internet addiction, several important research gaps remain. First, many previous studies have examined simple bivariate relationships, such as the direct association between impulsivity and Internet addiction, without considering mediating or moderating mechanisms (Li et al., 2021). Second, some studies have focused solely on psychological predictors while neglecting biological predispositions or family-environment factors (Lee & Park, 2022). Third, many empirical investigations—particularly in regional contexts—have relied on simple correlational approaches rather than integrated analytical frameworks capable of capturing complex interactions among multiple variables.

To address these limitations, the present study adopts Hayes' (2022) PROCESS Model 21, which allows for the simultaneous examination of mediation and moderation effects within a single analytical framework. Specifically, this model tests whether the indirect effect of genetic impulsivity on Internet addiction through self-control varies depending on both parenting quality and personal morality.

Therefore, the central hypothesis of the study is as follows:

H7: The indirect effect of genetic impulsivity on addictive Internet consumption through self-control is simultaneously moderated by parenting quality and personal morality (conditional indirect effect).

Through this integrative framework, the present study aims to provide a more comprehensive understanding of how biological predispositions, psychological self-regulation, family environment, and moral values interact in shaping Internet addiction behaviors among university students.

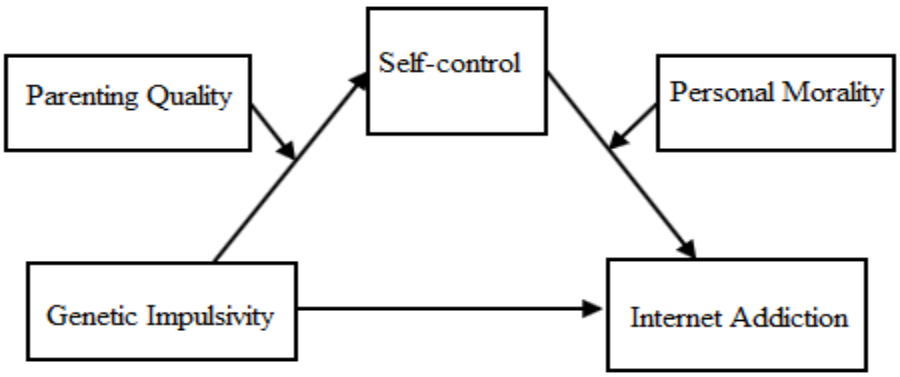

Figure 1. Modified mediator model in conceptual form

Material and Methods

Measurement of Constructs

In the present study, all primary constructs—genetic impulsivity, self-control, parenting quality, personal morality, and addictive Internet consumption—were assessed using standardized and validated questionnaire measures. In order to reduce respondent fatigue while maintaining adequate reliability and construct validity, brief or short-form versions of established scales were employed.

Genetic Impulsivity

Genetic impulsivity was measured using the genetic predisposition subscale derived from a widely used impulsivity measure (1995). This subscale specifically captures hereditary and biologically grounded aspects of impulsive tendencies and has been extensively applied in international research on impulsivity. The genetic component enables differentiation between inherited impulsive traits and other behavioral dimensions, which is essential for the present study's emphasis on biological foundations. The subscale consists of four items.

Self-Control

Self-control was assessed using the short form of the Grasmick et al. (1995) Self-Control Scale, which measures individuals' capacity for impulse regulation, long-term planning, and resistance to temptation. The scale has demonstrated strong psychometric properties across diverse populations and maintains conceptual proximity to impulsivity and addictive behaviors. The short version used in this study comprises 10 items.

Parenting Quality

Parenting quality was measured using a shortened version of the Parent–Child Relationship Quality Questionnaire (2004) or a parenting styles inventory emphasizing supportive and structured parenting dimensions. The instrument assesses key components of parenting quality, including emotional support, consistent structure and discipline, and healthy parent–child communication. Consistent with the theoretical framework of this study, priority was given to subscales reflecting *structure and regulation* as well as *supportive environment*. The selected version includes eight items.

Personal Morality

Personal morality was assessed using a short form of the Moral Development Assessment Scale or the Moral Judgment Scale (1999). These instruments are grounded in moral development theories (e.g., Kohlberg's theory) and evaluate individuals' ability to reason about complex moral dilemmas and make principle-based ethical decisions. The short form employed in this study consists of six items and retains strong validity despite its brevity.

Addictive Internet Consumption

Addictive Internet consumption was measured using a brief version of Young's Internet Addiction Questionnaire or a condensed Internet Use Assessment Scale (2009). While Young's original scale is widely recognized, its full version is relatively lengthy. The version used in this study contains eight items, capturing core features of compulsive and addiction-like Internet use, including loss of control, excessive time investment, and functional impairment.

All items were rated on Likert-type scales, with higher scores indicating greater levels of the respective construct.

Population and Sample

The statistical population of this study comprised all undergraduate and master's students enrolled at the Islamic Azad University branches in East Azerbaijan Province during the 2025–2026 academic year (1404–1405). According to official statistics from the central administration of Islamic Azad University, the total population was approximately 42,000 students.

Given the heterogeneity across university branches and academic levels, a stratified random sampling method was employed based on university unit and degree level.

Sample size was calculated using Cochran's formula:

n=Nz2p(1−p)e2(N−1)+z2p(1−p) n = \frac{N z^2 p (1-p)}{e^2 (N-1) + z^2 p (1-p)} n=e2(N−1)+z2p(1−p)Nz2p(1−p)

Where:

- N=42,000N = 42{,}000N=42,000 (population size)
- e=0.05e = 0.05e=0.05 (margin of error)
- zzz corresponds to the confidence level
- p=0.50p = 0.50p=0.50 (estimated population proportion)

Substituting these values yielded a required sample size of 381 participants. To increase statistical precision and compensate for potential incomplete responses, 400 questionnaires were distributed. A total of 387 valid questionnaires were returned and included in the final analysis.

Data Analysis Procedure

To test the study hypotheses, Hayes' PROCESS macro (Model 21) was employed to examine a moderated mediation model.

The analytical framework was specified as follows:

- Genetic Impulsivity (GI) was entered as the independent variable.
- Self-Control (SC) functioned as a mediator between genetic impulsivity and addictive Internet consumption (IA).
- Parenting Quality (PR) moderated the relationship between genetic impulsivity and self-control (first-stage moderation).
- Personal Morality (PM) moderated the relationship between self-control and addictive Internet consumption (second-stage moderation).

Prior to analysis, all predictor and moderator variables were mean-centered to reduce multicollinearity and facilitate interpretation of interaction effects.

A bias-corrected bootstrap procedure with 5,000 resamples was used to generate 95% confidence intervals for indirect and conditional indirect effects. This approach allows robust estimation of moderated mediation effects and conditional indirect effects at ±1 standard deviation of the moderator variables.

The regression equations estimated using ordinary least squares (OLS) were specified as:

SC=a1GI+a2PR+a3(GI×PR) SC = a_1 GI + a_2 PR + a_3 (GI \times PR) SC=a1GI+a2PR+a3 (GI×PR)

IA=c′GI+b1SC+b2PM+b3(SC×PM) IA = c' GI + b_1 SC + b_2 PM + b_3 (SC \times PM) IA=c′GI+b1SC+b2PM+b3(SC×PM)

Model significance was evaluated using 95% confidence intervals and the statistical significance of interaction terms. This integrated analytical framework enabled simultaneous testing of mediation and moderation processes within a unified conditional process model (Hayes, 2018; Preacher et al., 2007).

Results

Demographic Characteristics of Respondents

The study sample consisted of students from Islamic Azad University branches in East Azerbaijan Province. Among the respondents, 56.3% were female (n = 218) and 43.7% were male (n = 169). The average age of participants was approximately 21.9 years.

Regarding educational level, the majority of respondents were undergraduate students (76.5%, n = 296), while 23.5% (n = 91) were enrolled in master's degree programs. In terms of academic discipline, the largest proportion of students belonged to engineering fields (38.5%), followed by humanities (27.9%), basic sciences (20.2%), and art and architecture (13.4%).

With respect to marital status, 89.1% of participants were single (n = 345), whereas 10.9% were married (n = 42). Concerning Internet usage habits, more than one-third of respondents (33.8%) reported using the Internet 4–6 hours per day, while approximately 15.8% reported using the Internet less than two hours daily. These characteristics provide an overview of the demographic profile of the study sample (Table 1).

Table 1. Demographic Characteristics of the Sample

Variable	Category	Frequency	Percentage
Gender	Female	218	56.3
	Male	169	43.7
Mean Age	21.9 years	—	—
Educational Level	Bachelor's	296	76.5
	Master's	91	23.5
Field of Study	Humanities	108	27.9
	Engineering	149	38.5
	Basic Sciences	78	20.2
	Art & Architecture	52	13.4
Marital Status	Single	345	89.1
	Married	42	10.9
Daily Internet Use	Less than 2 hours	61	15.8
	2–4 hours	112	28.9
	4–6 hours	131	33.8
	More than 6 hours	83	21.5

Construct Reliability and Validity

Confirmatory factor analysis (CFA) and Cronbach's alpha tests were conducted to evaluate the reliability and validity of the measurement scales used in the conceptual model, including genetic impulsivity, parenting quality, self-control, personal morality, and addictive Internet consumption.

The results indicated that all constructs demonstrated acceptable reliability and validity. All questionnaire items loaded significantly on their respective latent constructs ($p < 0.001$), confirming the suitability of the measurement model for structural equation modeling and conditional process analyses, including mediation and moderated mediation.

The use of short-form scales successfully reduced respondent burden while maintaining satisfactory construct validity (see Table 2).

Table 2. Results of Reliability and Validity Tests

Item	Factor Loading	t-value	Cronbach's α	Composite Reliability	AVE	Source
GI1: I make decisions without thinking.	0.81	16.45	0.89	0.91	0.62	Barratt et al., 1995
GI2: I act faster than others.	0.84	17.32				
GI3: I don't plan for the future.	0.82	16.88				
GI4: I react immediately when faced with a problem.	0.78	16.10				
SC1: I am good at controlling my impulses.	0.79	15.28	0.94	0.94	0.68	Boone et al., 1995
SC2: I usually resist temptation.	0.82	16.12				
SC3: When I have a goal, I can wait to achieve it.	0.80	15.75				
SC4: I am easily distracted (inverted).	0.78	15.90				
SC5: I can control my impulsive behaviors.	0.81	16.05				
SC6: I easily plan my tasks.	0.79	15.88				
SC7: I have trouble managing my time (inverted).	0.77	15.72				
SC8: I don't let my emotions control my decisions.	0.76	15.65				
SC9: I persevere in difficult tasks.	0.75	15.55				
SC10: I easily give in to difficult situations (reverse).	0.74	15.50				
IA1: How much do you feel like you should spend more time online?	0.87	19.72	0.92	0.94	0.70	Garretsen et al., 2009
IA2: How much do you think about going online when you are not online?	0.86	20.14				
IA3: How much have you neglected important tasks because of your internet use?	0.89	21.01				
IA4: How much have you tried to reduce your time online, but failed?	0.85	19.50				
IA5: How much do you see internet use as a way to escape problems or stress?	0.82	19.20				
IA6: How much have you had arguments with people or family because of your excessive internet use?	0.81	19.15				
IA7: How much do you feel restless or overwhelmed when you cannot use the internet?	0.83	19.40				
IA8: How much has internet use prevented you from getting enough sleep or rest?	0.80	19.10				
PR1: My parents provided me with adequate emotional support when I was having problems.	0.79	15.36	0.87	0.89	0.61	Williams-Wheeler et al., 2004
PR2: My parents valued my opinions and feelings.	0.82	16.09				

PR3: I could always count on my parents' love.	0.80	15.78				
PR4: Our home atmosphere was full of understanding and empathy.	0.77	15.65				
PR5: My parents had clear rules for my behavior.	0.78	15.60				
PR6: My parents were persistent in fulfilling my homework and responsibilities.	0.76	15.55				
PR7: My parents' expectations of me were always clear and reasonable.	0.75	15.50				
PR8: My parents applied consequences if I broke the rules.	0.74	15.45				
PM1: When making decisions, justice and fairness take priority for me.	0.81	16.45	0.89	0.91	0.62	Rest, 1999
PM2: I prioritize the collective good over my own.	0.84	17.32				
PM3: Adherence to ethical principles is important to me, even in difficult situations.	0.82	16.88				
PM4: I always try to respect the rights of others.	0.78	16.10				
PM5: Honesty in behavior and speech is the foundation of my relationships with others.	0.73	15.90				
PM6: I weigh the ethical consequences of every action before it.	0.71	15.85				

Note: All factor loadings are significant (**p < 0.001**). Some items were reverse-coded to reduce response bias.
GI = Genetic Impulsivity, PR = Parenting Quality, SC = Self-Control, PM = Personal Morality, IA = Addictive Internet Consumption.

Hypothesis Testing

All hypotheses were tested using conditional process analysis with Hayes' PROCESS macro (Model 21) (Hayes, 2018). This approach allows simultaneous estimation of the mediating effect of self-control and the moderating effects of parenting quality (first stage) and personal morality (second stage). A bootstrap procedure with 5,000 resamples was used to generate bias-corrected confidence intervals (Table 3).

Table 3. Results of Conditional Process Analysis (PROCESS Model 21)

Hypothesis	Path	β	t-value	p-value	Result
H1	GI → IA	0.38	5.92	<0.001	Supported
H2	GI → SC	0.42	6.15	<0.001	Supported
H3	SC → IA	0.45	7.01	<0.001	Supported
H4	Indirect effect (GI → SC → IA)	0.19	—	95% CI [0.12, 0.27]	Supported
H5	PR × GI → SC	—	—	—	Supported
	High PR	0.57	6.85	<0.001	
	Low PR	0.28	3.92	<0.001	
H6	PM × SC → IA	—	—	—	Supported
	High PM	0.56	6.77	<0.001	
	Low PM	0.33	4.18	<0.001	
H7	Conditional indirect effect	0.29	—	95% CI [0.19, 0.41]	Supported

Note: GI = Genetic Impulsivity, PR = Parenting Quality, SC = Self-Control, PM = Personal Morality, IA = Addictive Internet Consumption

Interpretation of Hypothesis Testing

The results indicate that genetic impulsivity positively predicts addictive Internet consumption ($\beta = 0.38$, $t = 5.92$, $p < 0.001$), supporting H1.

Genetic impulsivity also positively predicts self-control ($\beta = 0.42$, $t = 6.15$, $p < 0.001$), confirming H2.

Furthermore, self-control significantly predicts addictive Internet consumption ($\beta = 0.45$, $t = 7.01$, $p < 0.001$), supporting H3.

The mediation analysis revealed that self-control significantly mediates the relationship between genetic impulsivity and addictive Internet consumption ($\beta = 0.19$; 95% CI [0.12, 0.27]), confirming H4.

Regarding moderation effects, parenting quality significantly moderated the relationship between genetic impulsivity and self-control. The effect of genetic impulsivity on self-control was stronger at high levels of parenting quality ($\beta = 0.57$, $t = 6.85$) compared with low levels of parenting quality ($\beta = 0.28$, $t = 3.92$), supporting H5.

Similarly, personal morality significantly moderated the relationship between self-control and addictive Internet consumption. This relationship was stronger at high levels of personal morality ($\beta = 0.56$, $t = 6.77$) than at low levels ($\beta = 0.33$, $t = 4.18$), confirming H6.

Finally, the conditional indirect effect analysis showed that the indirect effect of genetic impulsivity on addictive Internet consumption through self-control was strongest when both parenting quality and personal morality were high ($\beta = 0.29$; 95% CI [0.19, 0.41]). Therefore, H7 was supported.

Overall, these findings provide strong support for the moderated mediation model (PROCESS Model 21). The results suggest that the effect of genetic impulsivity on addictive Internet consumption is largely transmitted through self-control, and this process is strengthened by higher levels of parenting quality and personal morality. These findings highlight the dynamic interaction between individual personality traits and relational or moral mechanisms in translating genetic impulsivity into addictive Internet behavior.

Discussion

The present study examined the mediating role of self-control and the moderating roles of parenting quality and personal morality in the relationship between genetic impulsivity and addictive Internet consumption. The findings provide several important insights. Overall, the results indicate that genetic impulsivity not only has a direct effect on addictive Internet consumption but also exerts a substantial indirect effect through the weakening of self-control (Hayes, 2018). In other words, individuals with higher levels of genetic impulsivity tend to exhibit lower levels of self-regulatory capacity, which in turn increases their vulnerability to addictive patterns of Internet use.

Importantly, this process does not occur in isolation. The results show that parenting quality and personal morality significantly moderate this mechanism, such that higher levels of these protective factors reduce the harmful impact of impulsivity and help prevent addictive Internet consumption. These findings highlight the importance of considering both individual predispositions and contextual influences when explaining problematic Internet behaviors.

The findings of this study are consistent with prior research emphasizing the relationship between genetic factors, personality traits, and addictive behaviors (Walsh & Gdfruid, 2015). Previous studies have demonstrated that impulsivity, as a genetically influenced personality trait, is associated with a wide range of risky behaviors, including substance abuse and Internet addiction (Daoust et al., 2017). In addition, numerous studies have confirmed the mediating role of personality characteristics—particularly self-control—in explaining the link between impulsivity and problematic behaviors (Tangney et al., 2020).

However, the simultaneous inclusion of environmental moderators—specifically parenting quality and personal morality—within a comprehensive moderated mediation framework represents a key contribution of this study. Parenting quality is widely recognized as one of the most influential factors in the development of personality and self-regulatory skills. Supportive and structured parenting environments can significantly reduce impulsive tendencies while fostering stronger self-control capacities (Baumrind, 1991). Similarly, personal morality functions as an internal value framework that guides behavior and decision-making, enabling individuals to resist impulsive tendencies and external pressures (Schwartz, 2012). The findings of the present study confirm the protective role of both factors in the context of Internet addiction.

Practical Implications

Based on the findings of this study, several practical recommendations can be proposed:

Given the key role of parenting quality, providing parenting education programs and workshops can help parents strengthen communication skills, create supportive and structured family environments, and teach self-control strategies to their children. Such initiatives may reduce the likelihood of Internet addiction among adolescents and young adults.

Schools and educational institutions should incorporate training programs designed to enhance self-control, ethical decision-making, and impulse regulation among students. Programs grounded in positive psychology and life-skills education may serve as effective protective factors against addictive behaviors.

Promoting ethical values within society, through media, educational systems, and positive role models, may strengthen individuals' internal moral frameworks and increase their ability to resist addictive behaviors.

For individuals already struggling with addictive Internet use, therapeutic interventions that extend beyond cognitive-behavioral techniques may be particularly beneficial. Approaches that simultaneously address self-control development, family relationship improvement, and the strengthening of personal moral values may produce more sustainable outcomes.

Limitations

Like most studies in the field of behavioral research, the present study has several limitations.

First, the research employed a cross-sectional design, which limits the ability to draw definitive causal conclusions. Understanding how these relationships evolve over time requires longitudinal investigations.

Second, all variables—including impulsivity, self-control, parenting quality, personal morality, and Internet consumption—were measured using self-report questionnaires, which may be influenced by response biases.

Third, the study sample consisted exclusively of university students, which may limit the generalizability of the findings to other age groups or social populations.

Finally, the model examined only parenting quality and personal morality as moderating variables, whereas other contextual factors—such as socioeconomic status, peer pressure, and Internet accessibility—may also influence addictive Internet behavior.

Directions for Future Research

In light of these limitations, several directions for future research are suggested:

Conducting longitudinal studies to examine how the relationships among impulsivity, self-control, and addictive Internet consumption evolve over time and to better establish causal pathways.

Combining self-report measures with additional assessment methods, such as behavioral observations, clinical interviews, and reports from parents or teachers, to enhance measurement validity.

Replicating the study with larger and more diverse samples in terms of age, gender, cultural background, and socioeconomic status to improve generalizability.

Exploring the role of additional psychological and environmental factors, such as anxiety, depression, social support, adverse childhood experiences, and different motivations for Internet use.

Conducting cross-cultural comparative studies to better understand how cultural contexts shape the relationships between impulsivity, self-control, and addictive Internet behavior.

Designing and empirically evaluating intervention programs based on the findings of this study, particularly those aimed at strengthening self-control and improving parenting quality, which may represent effective strategies for reducing Internet addiction.

Overall, the results of this research underscore the dynamic interaction between biological predispositions, personality mechanisms, and social environments in shaping addictive Internet behavior. Understanding these interactions can contribute to the development of more comprehensive prevention and intervention strategies.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

The studies involving human participants were reviewed and approved by ethics committee of Islamic Azad University.

Author contributions

All authors contributed to the study conception and design, material preparation, data collection and analysis. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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