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RESEARCH ARTICLE

A Scoping Review of Intervention Strategies for Internet Behavioral Addiction among Chinese Adolescents

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ABSTRACT

With the pervasive penetration of the internet, internet addiction among adolescents has become an increasingly prominent issue, posing a significant challenge to public health and the education sector. This study utilized a Scoping Review methodology to systematically examine empirical research on intervention measures for adolescent internet addiction in Mainland China published between 2015 and 2025. The primary aim was to analyze the types, theoretical underpinnings, efficacy, and maintenance mechanisms of existing interventions, alongside discussing their limitations and future directions. The review reveals that physical exercise interventions, family-based interventions, and group psychological counseling/therapy constitute the principal intervention pathways. All have demonstrated positive immediate effects in improving addictive behaviors and associated psychological symptoms, yet they differ in terms of long-term maintenance mechanisms and the stability of their efficacy. Furthermore, current research faces limitations concerning sample representativeness, intervention standardization, and long-term effect follow-up. Future research should prioritize constructing a multidimensional, collaborative intervention system that integrates family, school, community, and social resources to establish a comprehensive intervention network. This is crucial for enhancing the stability and sustainability of intervention outcomes. Additionally, emerging technologies, such as artificial intelligence and virtual reality, should be leveraged to innovate intervention models, thereby increasing the specificity and effectiveness of the treatments.

Keywords: Chinese adolescents; internet addiction; internet behavioral addiction; intervention measures; literature review

1. Introduction

The rapid advancement of the internet, coupled with the deep integration of networks and smartphones into modern life, has profoundly facilitated people's lives and learning. However, in this era of universal connectivity, the potential negative effects are also becoming increasingly evident. [3] This is particularly true among adolescents, whose minds are not yet fully mature, where the phenomenon of internet behavioral addiction has emerged as a major public health concern. [10,13,14,21,22]

According to the 56th Statistical Report on Internet Development in China, released by the China Internet Network Information Center (CNNIC) up to June 2025, the number of internet users in China has

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reached 1.123 billion, with an internet penetration rate of 79.7%. Within this demographic, the usage rate among minors continues to climb and exhibits a trend toward younger ages. [6] The 2024 China Youth Internet Use Survey Report by Beijing Normal University indicated that there are approximately 185 million internet users aged 6–18 (accounting for 16.5% of the total netizens). Of these, about 13.6% reported daily internet usage exceeding three hours, and 28.9% reported experiencing physical discomfort symptoms, such as pain and numbness, over the past year. [1]

Other studies have consistently shown that excessive reliance on the internet can lead to individual alienation. At the physiological level, long-term immersion in the virtual world impairs physical health, causing issues such as dry eye syndrome, cervical spine pain, sleep disturbances, and impaired brain function. Psychologically, excessive screen time is closely associated with increased anxiety, depression, and loneliness, which subsequently weaken social functioning and interpersonal relationships, decrease self-satisfaction and psychological role cognition, and may even incite aggressive behavior, potentially leading to criminality in severe cases. [12,18,33] Furthermore, adolescents, due to their incomplete cognitive and personality structures, are highly susceptible to the dual drive of reward mechanisms and social feedback. [11] The persistent algorithmic push of high-stimulation, low-cognitive-load content exacerbates the risk of addiction, making it difficult for individuals to maintain focus. This results in decreased motivation for learning, reduced academic and work performance, and interferes with the formation of adolescents' values.

Internet Addiction (IA) is defined as a behavioral addiction syndrome where an individual, without the influence of addictive substances, develops a strong psychological dependence on specific online activities, such as gaming, social media, short videos, or shopping, due to prolonged and high-intensity exposure to interactive network information environments. This dependence is characterized by withdrawal symptoms and significant impairment in academic, occupational, and social functioning. [10,11] In the study of internet behavioral addiction, it is commonly categorized into four dimensions: internet gaming addiction, internet social media addiction (including short videos), internet information addiction, and internet shopping addiction. Although internet shopping addiction has garnered attention as an independent topic in some international research, intervention studies specifically targeting this type of addiction have not yet appeared in Mainland Chinese academic journals.

In conjunction with the definition framework established by the World Health Organization (WHO, 2025) and the Chinese research context, this study defines "adolescents" as students aged 6–24 who are enrolled in the general or higher education system within Mainland China. From a developmental psychology perspective, individuals in this phase possess incompletely matured cognitive and personality structures, often exhibiting insufficient inhibitory control and self-regulation capabilities, and struggling to establish a stable internal evaluation system for coping with setbacks. Consequently, they are more susceptible to immediate reward mechanisms and tend to use online behaviors as psychological compensation to alleviate negative emotions. Simultaneously, this age group is easily influenced by peer effects and social feedback, seeking social support and group belongingness online, thereby escalating the risk of internet addiction. [8,9,37] Given these factors, internet addiction among Chinese adolescents represents an issue of critical research value and high relevance, demanding focused attention and intervention from all sectors of society, including family, school, and the community. [19]

1.1. Research gaps

Over the past decade, research on internet addiction among the 6–24 age group has formed an interdisciplinary system encompassing scientific, social, and educational perspectives. Interventions have progressed along multiple theoretical and technological pathways: physical exercise interventions (such as

aerobic exercise interventions and exercise combined with psychological counseling), family interventions (involving parental monitoring and parenting behaviors), and group counseling/psychological consultation (including mindfulness training). However, existing studies still suffer from two major limitations: (1) a lack of systematic integration and quality appraisal of all empirical studies conducted between 2015 and 2025; and (2) a deficiency in integrating and comparing follow-up data spanning three months or longer. This latter limitation means that the sustained maintenance mechanisms and pathway differences among interventions remain unclear. This paper employs the Scoping Review methodology to address these gaps. Furthermore, it attempts to integrate the micro- and macro-level mechanisms of intervention measures and proposes subsequent optimization recommendations.

1.2. Research objectives

Based on the World Health Organization [37] definition framework and the Chinese research context, this study focuses on intervention measures for internet behavioral addiction among Chinese adolescents (aged 6–24). This classification adheres to internationally recognized standards (e.g., UNICEF definitions) and China's Medium- and Long-Term Youth Development Plan (2016–2025), avoiding conflation with younger elementary school-aged children or adult populations. Specifically, it seeks to compare the applicability and efficacy differences among various intervention pathways and to explore and innovate more adaptive intervention strategies and practical approaches. The ultimate goal is to optimize the prevention and treatment system for internet addiction among Chinese adolescents. This research intends to provide reproducible and scalable operational guidelines for parents, teachers, and frontline social workers. By helping adolescents correct cognitive biases toward the virtual world, mitigate addictive behaviors, and restore social functioning, the study ultimately aims to promote the healthy, autonomous, and scientific use of the internet among young people.

Based on the research objectives stated above, this study focuses on the following two research questions:

RQ1: What are the principal types and theoretical orientations of internet addiction interventions for adolescents aged 6–24 in Mainland China between 2015 and 2025?

RQ2: What are the immediate and long-term follow-up effects, maintenance mechanisms, and potential limitations of these intervention pathways?

2. Research design

2.1. Research methodology

This study employs the Scoping Review methodology to systematically survey the literature related to "Intervention Measures for Internet Addiction among Chinese Adolescents." A Scoping Review is a comprehensive literature synthesis method that systematically organizes and presents evidence relevant to a specific research topic, field, or problem based on predetermined inclusion criteria. The specific process involves: defining the research questions; identifying relevant literature; selecting core studies; charting the data; and finally, synthesizing the results and preparing the final report. [36]

2.2. Literature search and identification of relevant studies

This study conducted a systematic screening of literature pertaining to intervention measures for internet behavioral addiction among Chinese adolescents. A rigorous two-stage screening process: initial screening followed by detailed screening, was strictly adhered to ensure the scientific rigor and specificity of the included studies.

Initial Screening Phase

1.1 Search Strategy and Data Sources

To ensure the systematic and transparent nature of this review, the study strictly adheres to the Scoping Review methodology framework (Arksey & O'Malley, 2005) and is reported in accordance with the PRISMA-ScR extension statement. Although this study focuses on empirical intervention research within the Mainland China context, which theoretically should encompass multiple Chinese academic databases (e.g., Wanfang, VIP), CNKI (China National Knowledge Infrastructure) was selected as the sole search source for two reasons: (1) CNKI indexes the vast majority of CSSCI and Peking University Core Journals, covering the primary high-quality research outcomes in psychology, education, and public health within China; (2) Preliminary searches revealed that empirical studies on "adolescent internet addiction intervention" in Wanfang and VIP were highly duplicated in CNKI, and most non-core journals lacked methodological rigor. Nevertheless, we acknowledge this choice may introduce publication bias, particularly potentially omitting findings from regional or emerging journals not indexed by CNKI. This limitation will be addressed in the discussion section.

The search strategy employed a combined search of three fields, title, abstract, and keywords rather than limiting to titles alone, to enhance recall. The specific Chinese search terms are as follows:

・**Target Condition:** ("short video addiction" OR "internet addiction" OR "social media addiction" OR "online addiction" OR "gaming addiction" OR "media dependency" OR "mobile phone addiction")

・**Intervention:** ("intervention" OR "psychological counseling" OR "family therapy" OR "exercise therapy" OR "digital mental health")

1.2 Inclusion and Exclusion Criteria

The timeframe was restricted to January 1, 2015, through December 31, 2025, aligning with the study objective's definition of "the past decade." The initial search yielded 182 documents, followed by a two-stage screening process:

• **Initial Screening:** Two independent reviewers excluded clearly irrelevant literature based on titles and abstracts;

• **Refined Screening:** Full texts were obtained and independently assessed against predefined inclusion/exclusion criteria;

Disagreements were resolved through discussion or adjudication by a third researcher.

Inclusion Criteria:

Evidence-based studies (including experimental, quasi-experimental, or single-group pre-post designs);

Participants were school-aged students aged 6–24 in mainland China;

Clearly described intervention content, implementation process, and outcome assessment.

Exclusion Criteria:

Non-empirical studies (theoretical discussions, reviews, policy commentaries, etc.);

Subjects outside the adolescent age range;

Studies describing addiction prevalence without actual interventions;

Interventions targeting clinically diagnosed mental disorders (e.g., comorbid major depression) to avoid confounding primary addiction intervention effects.

Screening results are as follows (PRISMA flowchart, see *Figure 1*):

Initial literature identified: 182 articles

Duplicates removed: 23 articles → 159 articles remaining

Initial exclusion (non-thematic/non-empirical): 98 articles

Full-text assessment: 61 articles

Reasons for exclusion:

• Age mismatch: 12 articles

• Lack of clear intervention measures: 28 articles

• Non-mainland China samples: 6 articles

Final inclusion: 15 studies

Additionally, this study did not conduct formal quality assessment (e.g., Cochrane Risk of Bias (RoB) tool), as scoping reviews typically focus on "evidence scope mapping" rather than "effect size synthesis." However, we provided descriptive annotations on study design strength (e.g., randomization status, presence of control groups) in the results analysis.

To enhance transparency and reproducibility, *Table 1* summarizes key characteristics of the 15 included studies. All information was independently extracted and cross-checked by two authors.

Table 1. Basic Characteristics of Included Studies (n=15)

Author (Year)	Sample Size	Age Range	Gender Composition (Female %)	Location/Educational Stage	Study Design	Intervention Type
Zhu (2017)	60	18–22	50%	A University / University	One-group Pre-test-Post-test	Physical Exercise (standalone)
Wu J. et al. (2024)	62	18–23	48%	A University / University	RCT	Physical Exercise (standalone)
Yu L. et al. (2023)	60	18–21	100%	A University / University	Quasi-experiment	Physical Exercise + Psychological Counseling
Zhao Y.X. et al. (2021)	148	18–22	52%	A University / University	Three-arm RCT	Physical Exercise + Psychological Counseling
Zhang J.R. et al. (2022)	54	18–22	50%	A University / University	RCT	Physical Exercise + Biofeedback
Fang X.Y. et al. (2015)	48	12–16	45%	Beijing / Junior High School	Quasi-experiment	Family Intervention
Ding Q. et al. (2019)	320	13–17	51%	Multi-province / Middle School	Follow-up Survey + Intervention Subsample	Family Intervention

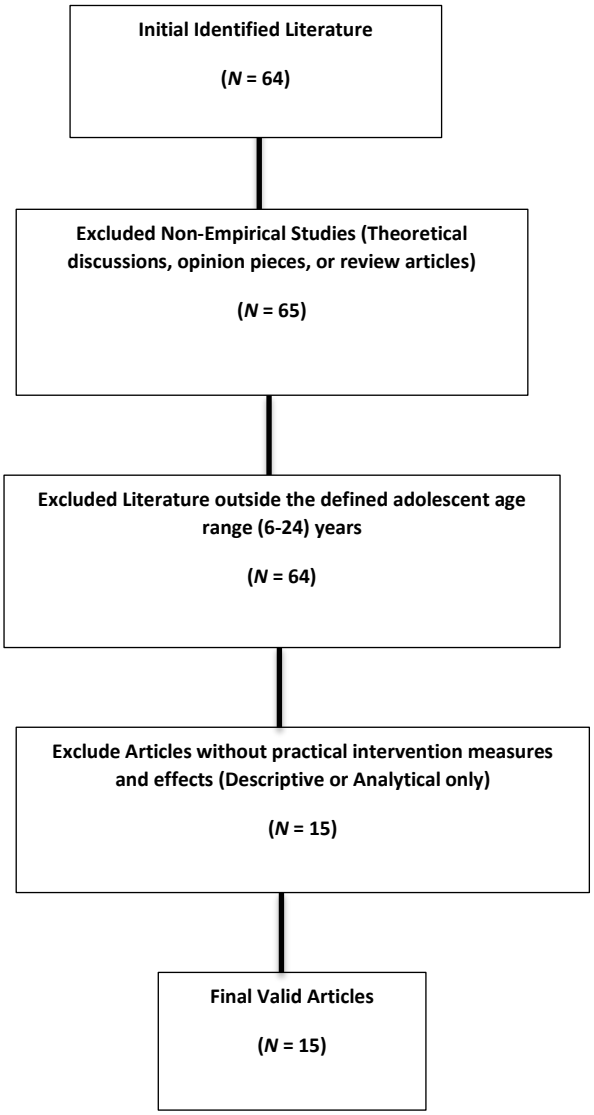
Author (Year)	Sample Size	Age Range	Gender Composition (Female %)	Location/Educational Stage	Study Design	Intervention Type
Ma R.Z. et al. (2021)	National N=2100 (Intervention Subsample n=60)	10–18	49%	National Sampling / Primary and Secondary Schools	Quasi-experiment	Family Intervention
Chen Y. (2021)	150	14–17	53%	A City / Senior High School	Quasi-experiment	Family Intervention
Ning K. et al. (2021)	200	15–18	50%	A Province / Senior High School	Quasi-experiment	Family Intervention
Du M.J. et al. (2024)	40	19–23	60%	A Medical University / University	One-group Pre-test-Post-test	Group Psychological Counseling
Wang X. et al. (2024)	50	18–22	55%	A University / University	RCT	Group Psychological Counseling
Ren J. et al. (2022)	36	18–21	100%	A University / University	Quasi-experiment	Group Psychological Counseling
Zhao Y.X. et al. (2022)	50	12–15	48%	Rural Areas of Henan / Junior High School	Quasi-experiment	Group Psychological Counseling
Mao B. (2025)	1 (Case)	17	Male	A Senior High School	Case Study	Group Psychological Counseling

Table 1. (*Continued*)

Detailed Screening Phase

To ensure the high relevance of included literature to the research topic, this scoping review established rigorous inclusion and exclusion criteria and carried out the screening process according to standardized procedures. The specific exclusion criteria were as follows:

1. Non-Empirical Studies: Literature solely involving theoretical discussion, viewpoint elaboration, or classified as review articles was excluded.
2. Age Mismatch: Literature whose research subjects did not fall within the defined adolescent age range (6–24 years) was excluded.
3. Lack of Intervention Focus: Literature that failed to explicitly address practical intervention measures for adolescent internet behavioral addiction and their effects, but instead merely described or analyzed the phenomenon of internet addiction, was excluded.



Based on the aforementioned criteria, a detailed review of the full text of the 61 initially identified articles was conducted, leading to the exclusion of non-conforming literature. Ultimately, a total of 15 valid studies were strictly selected and included in this research, providing a solid literary foundation for the subsequent review and analysis.

3. Analysis of intervention types and theoretical orientations for adolescent internet addiction

Research Progress and Distribution of Intervention Measures

This review analyzed 15 empirical studies on adolescent internet addiction interventions published in PKU-Core and CSSCI core journals indexed by CNKI between 2015 and 2025. The focus was primarily on Mobile Phone Addiction (MPA), Internet Gaming Addiction, and Internet Addiction Disorder (IAD). Given the high degree of theoretical and empirical overlap among these three forms of addiction, they are collectively referred to as Internet Addiction Disorder (IAD) in this paper.

Among the 15 included studies (see Table 2), family intervention and group psychological counseling/therapy were the most frequently adopted standalone measures by researchers, with both categories accounting for 33.3% (5 articles) of the total. Physical exercise intervention followed, accounting for 13.3% (2 articles). Furthermore, combined intervention measures, such as exercise combined with psychological counseling (2 articles) and exercise combined with biofeedback (1 article), collectively contributed 20.0% of the research sources. This distribution indicates that domestic intervention practices targeting adolescent internet addiction have converged on a three-dimensional orientation: Physical Activity Regulation, Family System Improvement, and Group Support Empowerment.

However, according to Piaget's theory of cognitive development, adolescents at different ages are in distinct cognitive stages, and their responses to intervention measures may vary. To meet the needs of different age groups more precisely, future interventions should fully consider the stage-specific nature of cognitive development and formulate more targeted protocols.

Table 2. Distribution of Intervention Components Across Included Studies

Intervention Category	Included Studies (Author, Year)	n	%
Standalone Physical Exercise	Zhu (2017), Wu J. et al. (2024)	2	13.3%
Standalone Family Intervention	Fang X.Y. et al. (2015), Ding Q. et al. (2019), Ma R.Z. et al. (2021), Chen Y. (2021), Ning K. et al. (2021)	5	33.3%
Standalone Group Counseling	Du M.J. et al. (2024), Wang X. et al. (2024), Ren J. et al. (2022), Zhao Y.X. et al. (2022), Mao B. (2025)	5	33.3%
Combined Interventions	Yu L. et al. (2023), Zhao Y.X. et al. (2021), Zhang J.R. et al. (2022)	3	20.0%

Note. *One study may include more than one intervention component; therefore, the total percentage exceeds 100%.*

Note. This table adheres to mutually exclusive categorization based on the primary or comprehensive intervention model utilized in each research article, ensuring rigorous total count of the 15 included studies. Compound intervention measures (e.g., "Exercise Combined with Psychological Counseling") were treated as distinct research categories to prevent duplicate counting in the statistical analysis.

4. Physical exercise intervention

Physical exercise has emerged as a key intervention pathway for adolescent internet addiction due to its advantages of being "easy to implement and low risk." Exercise interventions operate primarily through two distinct mechanisms: First, exercise is inherently enjoyable and social, offering adolescents an alternative source of gratification. This promotes real-world interpersonal communication and enhances social adaptability, thereby reducing dependence on virtual networks [2,24,27,31,34]; Second, the release of neurotransmitters, such as endorphins, during physical activity effectively alleviates negative emotions like anxiety and depression. This reduces the compensatory behavior of "escaping negative emotions via mobile phones. [26] In recent years, exercise interventions for adolescent internet addiction have shown a trend toward diversification. Beyond singular exercise interventions, comprehensive interventions that combine physical activity with psychological counseling are increasingly becoming a major direction of exploration.

4.1. Singular exercise intervention

Zhu's (2017) study utilized the "self-efficacy–reinforcement" framework from the theory of behavioral change to design an 8-week physical exercise intervention for 60 university students with mobile phone addiction tendencies. [34] This theory posits that the vicious cycle of addictive behavior can be effectively disrupted by "enhancing self-efficacy through controllable behavioral training" and "reinforcing healthy habits with positive outcomes." The experimental group participated in three organized exercise sessions per

week, each lasting over 60 minutes, which incorporated both energy-consuming activities (e.g., fast running, ball games) and regulatory exercises (e.g., Tai Chi, yoga).

Building on this, research into exercise interventions has begun to move toward more precise explorations. Background non-intervention studies have already revealed significant gender differences in the level of mobile phone addiction (for instance, female students tend to exhibit higher addiction levels in the social soothing dimension). [25] However, empirical support is currently lacking regarding whether the gender factor interacts with specific exercise intervention methods.

Wu et al.'s study filled this gap by proposing a new intervention type: specialized, customized exercise intervention. [24] They conducted a 12-week intervention involving 62 university students with internet addiction, dividing the exercise intervention into fitness running (an endurance-based category of physical conditioning), badminton (a skills-based net-opposition category), and basketball (a skills-based field-opposition category). The purpose was to explore how different specialized sports interact with gender. The theoretical foundation of this intervention model stemmed from the **Event-group training theory** (项群训练理论). The researchers argued that variations in exercise form and content influence the intrinsic preference and adaptability of male and female students to exercise types, which in turn dictates the choice of the intervention model. For example, the intervention design must be matched to gender differences in addiction dimensions and triggers (e.g., female students tend to use their phones for interpersonal interaction, while male students are more adapted to confrontational and competitive projects). Consequently, this research significantly contributed by proposing a specialized exercise customization model for internet addiction intervention, emphasizing the incorporation of subjects' inherent attributes (such as gender) into the core considerations of intervention design to achieve more optimal effects.

4.2. Combined interventions: Exercise and psychological counseling

Building upon singular exercise interventions, scholars have further explored the combined effect of integrating physical activity with psychological counseling. Yu et al. implemented a 4-month intervention program combining "aerobic exercise and psychological counseling" targeting 60 female university students with mobile phone addiction. [26] The design of this program was notably rigorous: the aerobic exercise component utilized a formal exercise prescription, with intensity monitored using a Polar telemetry heart rate monitor; the psychological counseling, delivered by professionals, focused primarily on psychological support in the initial phase, transitioning to cognitive, narrative, and behavioral therapies in the middle and later stages.

Another study by Zhao et al. employed a three-group controlled design, screening 148 individuals with addiction who received either single-component exercise intervention, single-component group psychological counseling intervention, or a combined intervention. [31] The exercise intervention, grounded in behavioral regulation and physiological-psychological mechanisms, aimed to influence cognition, emotion, and behavior. It was designed as moderate-intensity aerobic exercise, performed twice weekly for 60 minutes per session, emphasizing the recreational, social, and physiological regulatory functions of the activity. The 10 sessions of group psychological counseling, each focusing on different themes, were based on cognitive-behavioral and interpersonal interaction theories, seeking to improve participants' social deficits, emotional regulation, and cognitive biases through the group format. The combined intervention integrated physical activity with group interaction, providing participants with a safe, engaging, and socially supportive platform, thereby achieving complementarity between dynamic and static intervention modalities. This finding holds significant theoretical and practical implications for the subsequent design and implementation of intervention programs and for the further investigation of synergistic effects.

4.3. Combined interventions: Exercise and biofeedback

Other research has focused on the comparative effects of biological adjuncts versus exercise intervention. Zhang et al. randomly assigned 54 university students with mobile phone addiction to a biofeedback group, an exercise intervention group, and a control group for an 8-week intervention. Biofeedback therapy aims to guide participants toward physiological and psychological self-regulation through conscious training by collecting and providing real-time feedback on physiological indicators such as skin temperature, relaxation waves (Alpha waves), and sensorimotor rhythm waves (SMR waves). Contrasting the results of exercise intervention (which emphasizes behavior and social aspects) and biofeedback (which emphasizes physiological and psychological regulation) helps researchers gain a deeper understanding of the underlying mechanisms of mobile phone addiction. This comparison elucidates which intervention pathway (physiological regulation or satisfying social needs) is more critical for alleviating the addiction. [27]

5. Family intervention

Secondly, due to their immature self-control capabilities, adolescents are highly susceptible to external environmental influences. As the primary field of socialization for the individual, the family plays a critical role in their development. Consequently, family-level intervention measures are of central importance in the prevention and treatment of internet addiction among adolescents. This section selects five representative empirical studies to compare and summarize the family intervention models, core parenting behavior mechanisms, and efficacy differences in the Chinese context for adolescent mobile phone addiction.

Existing research generally agrees that parental conflict, deficits in family functioning, impaired parent-child communication, and inappropriate parenting styles are significant contributors to mobile phone and internet addiction among adolescents. [5,7,29,30,35] Based on this consensus, family-level interventions primarily include two categories: adjustment of specific parenting behaviors and structured family therapy. In terms of adjusting parenting behaviors, research focuses on parental role modeling, parental monitoring, and qualitative enhancement of parent-child communication patterns. [4,7,15,17] Regarding structured family therapy, Fang et al. proposed the Multi-Family Group Therapy (MFGT) model, which aims to effectively reduce adolescents' online time by improving family relationships, parent-child interaction, and communication skills. [10]

5.1. Parental role modeling

A key branch of the theoretical approach to intervening in adolescent mobile phone addiction is the intergenerational behavior transmission perspective, rooted in socialization theory, which emphasizes the importance of parents setting a good example. Scholars such as Ding et al. regard parental role modeling as a critical factor influencing the formation of adolescent addiction: on the one hand, parents acting as "phubbers" (phone-snubbers) during shared parent-child time constitute a negative model, inducing adolescents to imitate and adopt poor habits (the behavioral pathway); on the other hand, this behavior leads adolescents to experience emotional neglect and indifference, lowering the quality of parent-child communication and prompting adolescents to seek emotional compensation online (the psychological pathway) [7]. Therefore, the core strategy for family interventions based on this theoretical orientation is to emphasize the parents' exemplary role. This means fundamentally interrupting the intergenerational transmission of undesirable behavior and the vicious cycle of compensating for emotional hunger by reducing parents' own mobile phone dependence and increasing high-quality companionship.

5.2. Active mediation (communication)

Scholars such as Ma et al. referenced the Parent Mediation Theory (PMT), which advocates for adopting an egalitarian and friendly interaction model in parent-child communication. [15] This includes, for instance, parents listening attentively to make adolescents feel comfortable and understood, helping adolescents recognize the risks of mobile entertainment so they can rationally plan their usage time. The purpose is not only to help adolescents develop trusting parent-child relationships but also to foster the development of critical thinking, thereby preventing reliance on the internet for compensation due to "emotional hunger." [4,15] More importantly, the positive role of family intervention is also evident in its systemic ability to resist external risks. Research by Ning et al. focused on how family intervention can mediate peer effects, specifically how enhancing internal family emotional support and gentle management can break the vicious cycle of addiction and effectively strengthen adolescents' immunity to negative external influences. This approach aims to achieve a comprehensive improvement in emotional management, interpersonal skills, and self-control ability. [17]

5.3. Restrictive mediation (awareness and monitoring)

PMT posits that restrictive mediation (awareness and monitoring) is also an important strategy for family intervention. This involves intervening in adolescents' online activities through methods such as questioning, paying attention, offering guidance, and imposing constraints. [4,15] Chen et al. primarily examined three specific restrictive models: time restriction (strictly controlling media usage duration), content restriction (controlling media content, such as prohibiting the viewing of certain material), and parental monitoring (tracking the child's online activities and usage history, such as reviewing emails and website visit records). [4] However, it is noteworthy that, according to psychological reactance theory, adolescents highly value their sense of autonomy. Excessive monitoring (especially rule-setting, content restriction, or invasion of privacy) can easily trigger adolescents' desire for autonomy and generate oppositional emotions, thereby exacerbating the risk of addiction. [4,15]

5.4. Systemic family therapy and intervention models

The simple correction of individual parental behaviors is often insufficient to address the complexity of adolescent addiction. Consequently, researchers have shifted their focus to systematic, multidimensional intervention models that integrate family support with professional resources to achieve superior intervention outcomes.

Multi-Family Group Therapy (MFGT) is one such paradigm. Fang et al. (2015) designed this model for adolescents with internet addiction, grounding it in family therapy theory. The core logic of MFGT is to seek satisfaction within the family system that can replace the reliance on the internet. Therefore, the program requires four to eight families to participate in six group sessions together, dedicated to altering family interaction patterns through parent-child communication skills training and the establishment of stronger parent-child relationships. This pioneering work indicates that when the family system is effectively repaired, it holds powerful, long-term value in correcting severe behavioral addiction. [10]

6. Group psychological counseling/therapy interventions

Group Psychological Counseling/Therapy (Group Therapy/Counseling) holds a significant position in interventions for adolescent internet addiction in China due to its unique social support, collective dynamics, and cost-effectiveness. These interventions are typically implemented based on explicit theoretical frameworks, utilizing therapeutic modalities such as mindfulness-cognition and narrative approaches. This section discusses five representative empirical studies.

6.1. Mindfulness-based intervention

Mindfulness-based Cognitive Therapy (MBCT) is a critical group psychological intervention model whose core principle is to improve addictive thought and behavior patterns by cultivating the individual's ability to be aware of and accept present experiences. [23] Du et al. (2021) designed an 8-week mindfulness training protocol for medical students with mobile phone addiction. The content included mindful sitting and stretching exercises, aimed at promoting emotion identification and regulation by enhancing the individual's capacity for self-awareness and self-perception. [9] Wang et al. (2024) further focused on distinguishing between "automatic response mode" and "being mode," using this distinction as the theoretical basis for their intervention design. [23] Their protocol, through attentional bias training and self-awareness exercises, emphasized improving the individual's ability for attentional reorientation and executive function during behavioral regulation. Overall, with "awareness—acceptance—regulation" as its theoretical core, mindfulness intervention systematically trains individuals to reconstruct their cognitive patterns toward internal experiences, representing a pivotal cognitive and emotional regulation approach in recent years' interventions for adolescent internet addiction.

Table 3. Types of Addiction and Measurement Tools in Included Studies

Study (Year)	Type of Addiction	Measurement Tool	Scale Source
Zhang J.R. et al. (2022)	Game Addiction	IAT	Young (1998)
Chen Y. (2021)	Mobile Phone Addiction	SAS-C	Wang et al. (2014)
Zhao et al. (2023)	Short Video Addiction	Newly Developed Scale	Self-developed by the Authors
Fang X.Y. et al. (2015)	General Internet Addiction	MPATS + IAT	Kwon et al. (2013)

Note. *Only representative measurement tools are presented.*

Table 4. Summary of Intervention Types, Theoretical Bases, Effects and Follow-up (n=15)

Intervention Type	Theoretical Foundation	Number of Studies	Number of Follow-up Studies	Follow-up Duration	Immediate Effective Rate	Follow-up Effective Rate	Key Mechanism
Physical Exercise	Ecosystem Theory (Environment-Behavior Interaction)	5	2	1–3 months	80% (4/5)	50% (1/2)	Physical activity enhances self-efficacy
Family Intervention	Family Systems Theory (Communication-Support)	5	3	2–6 months	80% (4/5)	60% (2/3)	Improved family functioning buffers addiction
Group Counseling	Positive Youth Development Theory (Social Support)	5	2	1–3 months	60% (3/5)	40% (1/2)	Team cohesion enhances sense of belonging

Note. *Studies involving exercise components, including combined interventions, were categorized under Physical Exercise.*

6.2. Narrative-oriented group counselling

Narrative-oriented Group Counseling, as a group model that emphasizes self-empowerment and finding positive meaning through self-narration, has been widely applied to improve negative emotions closely associated with mobile phone addiction. [20] Ren et al. conducted a continuous 6-week intervention utilizing techniques such as OH cards, role-playing, and "drawing my story" to help members separate the "person" from the "mobile phone" (externalizing the problem). This allowed participants to realize that addiction is a problem of human-machine imbalance, rather than a personal defect. By sharing and seeking positive

strengths, the intervention enhanced the members' sense of autonomy and self-worth, motivating them to rewrite their "polluted narratives." [20]

6.3. Group psychological counseling

Group psychological counseling is a common measure for intervening in adolescent addictive behaviors, often drawing its theoretical foundation from core psychological frameworks. Among these, Cognitive Behavioral Therapy (CBT) constitutes the main theoretical support for many group intervention models (such as mindfulness-based cognitive therapy). Zhao et al. (2022) investigated the effects of group psychological counseling intervention on improving addictive behaviors, mental health, coping styles, and time management among 50 students from two rural junior high schools in Henan who met the criteria for mobile phone addiction. [32] The study involved eight sessions of group psychological counseling, intervening across multiple dimensions including cognition (improving network-related cognitions), behavior (controlling online impulses and time management), and life skills (emotional management and parent-child relationship adjustment). More recently, a case study by Mao (2025) also employed CBT techniques (such as cognitive restructuring and behavioral activation), focusing on high school students with internet gaming addiction accompanied by depressive symptoms. [16] This demonstrated the core principles and application pathways of CBT in adjusting emotional responses, cognitive patterns, and promoting behavioral change.

The core of this intervention model resides in "cognitive iteration" and "behavioral reconstruction." On one hand, the therapist guides students through the ABC model and cognitive restructuring to challenge catastrophic rumination, such as the thought that "I only have value when I'm playing games." On the other hand, through behavioral activation and exposure and response prevention (e.g., "no-gaming days"), the students are helped to rebuild a sense of achievement and satisfaction in their real lives. Furthermore, the model incorporates mindfulness meditation to enhance emotional awareness and introduces family meetings for emotional response training, forming a systemic intervention loop. This approach aims to facilitate the client's transition from reliance on gaming to active interpersonal engagement and a stable life state.

7. Analysis of efficacy and maintenance mechanisms across different intervention pathways

Intervention pathways for internet addiction can be systematically classified into three categories: physical exercise intervention, family intervention, and group psychological counseling/therapy intervention. While all demonstrate immediate therapeutic efficacy, their maintenance mechanisms diverge across the medium term (1–3 months) and the long term (6 months).

7.1. Physical exercise intervention

Empirical studies consistently indicate that physical exercise has a pronounced immediate effect on improving adolescent mobile phone addiction behaviors and associated psychological symptoms, with efficacy often strengthening as the intervention duration increases. For instance, after an 8-week physical exercise intervention, Zhu (2017) reported a significant reduction in the total mobile phone addiction tendency score among university students in the experimental group. The intervention also significantly improved various dimensions of addiction, including withdrawal symptoms, salience, social soothing, and mood modification. Zhang's study yielded similar score reductions, further confirming the immediate efficacy of exercise intervention across various dimensions of addictive behavior. [27,34]

Studies included in this review also addressed the persistence of the exercise intervention effects after the intervention period concluded, thereby demonstrating their sustained maintenance. Yu et al.'s study

implemented a 4-month exercise intervention for university students and conducted a 2-month follow-up after the intervention ceased. The experimental group maintained significant differences ($P < 0.05$) compared to pre-intervention scores across the total mobile phone addiction score and specific dimensions, including withdrawal, loss of control, and escapism. This suggests that the positive effects of exercise intervention can remain relatively effective over the long term, resisting the risk of addiction induced by the external environment (such as summer vacation). Similarly, Zhao et al.'s study showed a sustained reduction in addiction severity during a 3-month follow-up conducted after their 10-week intervention.

These studies collectively demonstrate that physical exercise intervention can continuously improve adolescent addictive behaviors, with the underlying mechanism stemming from multiple levels, including physiological, behavioral, social, and psychological factors. Firstly, physical activity stimulates the brain to produce neurotransmitters such as endorphins, providing a natural neurobiological compensation that effectively alleviates anxiety, depression, and psychological stress. This inherent, positive emotional experience can directly replace the addict's dependence on the mobile phone's mood-altering function, thereby reducing the likelihood of the individual falling into addiction to seek emotional release. Secondly, the mechanism involves behavioral transfer and habit formation. Exercise, as an active time displacement strategy, effectively fills adolescents' leisure time, diverting their attention away from mobile phones. In the long run, the intervention's core focus is on consolidating the physical exercise behavior, ultimately enabling it to develop into a stable and sustainable healthy habit. Furthermore, the social connection forged through exercise provides crucial social support. Many sports are inherently highly recreational and social; these activities encourage face-to-face communication, helping adolescents mitigate the loneliness that arises from reduced mobile phone use, thereby substituting the need for online social soothing. Finally, exercise significantly promotes the improvement of psychological and cognitive function. Participation in physical activities boosts the individual's self-confidence, pride, and sense of achievement, comprehensively optimizing mental health status.

Even though exercise is proven to be an effective intervention measure, current research still faces limitations. Firstly, the singularity and subjectivity of evaluation metrics are a pervasive issue. The assessment of exercise intervention effects primarily relies on subjective self-report scales (such as mobile phone addiction scales) and generally lacks high-validity objective physiological indicators (e.g., neural mechanism metrics) or behavioral indicators (e.g., objective monitoring data on mobile phone usage duration and frequency) for corroboration. This singular reliance on subjective scales cannot fully confirm the authenticity or stability of the observed effects. Secondly, the nature of exercise intervention methods also poses practical limitations, namely the high dependence of the intervention effect on subjective individual factors. Although exercise has shown advantages over therapies like biofeedback in some studies, owing to its external participative nature, playfulness, and enjoyment, its efficacy is contingent on the individual's ability to become immersed and gain positive experiences. This mechanism implies that if the selection of the exercise program is inappropriate, the intensity is unsuitable, or if the program lacks sustained interest, the intervention effects will be significantly diminished.

7.2. Family intervention

Family intervention demonstrates value in both the short-term and medium-to-long-term. Regarding immediate efficacy, effective family intervention strategies primarily center on positive and constructive communication and interaction patterns. [17] Comprehensive intervention protocols based on family therapy have been empirically proven to significantly and immediately reduce adolescent internet addiction levels and online time, improve negative emotions and family relationships, and demonstrate prominence in enhancing family functioning, promoting behavioral self-control, and strengthening social adaptability.

[10,15] In contrast, the effects of purely restrictive and monitoring strategies are complex; inappropriate or excessive monitoring may induce higher addiction levels. This suggests that parents should prioritize adopting active, dialogic guidance methods during the intervention process to minimize the risk of addiction in adolescents. [4,7,15]

Regarding sustained effects, the Multi-Family Group Therapy (MFGT) model demonstrated a significant reduction in adolescents' online time after the intervention, with the effect remaining well-maintained at the three-month follow-up. [10] This maintenance mechanism is primarily reflected in three aspects: first, by optimizing the family environment and fostering an open and harmonious communication atmosphere, the risk of emotional dysregulation is continuously lowered; second, positive parent-child interaction and emotional connection substitute the psychological satisfaction that adolescents previously sought online; and third, the intergenerational role-modeling effect (such as improvement in parental self-use patterns and constructive supervision) breaks the cycle of undesirable behavior, promoting the internalization of healthy behavioral norms. Overall, family intervention models achieve a transition path from "short-term behavioral correction" to "long-term functional reconstruction" by integrating mechanisms of emotional support and relational repair.

However, the "effectiveness conclusions" of existing family intervention studies are mostly derived from specific samples and contexts, leading to an undeniable ambiguity regarding their boundaries of applicability. First, most empirical studies (such as the MFGT research by Fang et al., and the nationwide survey by Ma et al.), even when covering different regions, still concentrate samples within public schools in small and medium-sized cities or specific age groups (e.g., 10–16 years). There is insufficient attention paid to "high-risk groups" such as left-behind children, migrant adolescents, and children from single-parent families. The family functioning of these groups often exhibits more complex deficits, such as the "intergenerational parenting vacuum" faced by left-behind children or the "parent-child spatial alienation" in migrant adolescent families. Consequently, existing intervention protocols based on the assumption of a "complete nuclear family" (such as parent-child communication training relying on the joint participation of both parents) struggle to meet the needs of these groups, leading to a noticeable attenuation of intervention effectiveness within them. Second, the maintenance of intervention effects is constrained by "family ecological stability." Most existing studies verify effects through short-term follow-ups, typically "3 months post-intervention," but lack consideration of changes in the family's external environment. For example, when a family encounters major life events (such as parental unemployment or escalating marital conflict), the improved parent-child interaction patterns are easily disrupted, and adolescents may revert to relying on the internet to cope with stress. Furthermore, when there is a lack of synergistic intervention at the school level (such as an environment allowing unrestricted electronic device use on campus or the persistent influence of peer addictive behaviors), the "protective barrier" constructed by family intervention is also weakened. This imbalance between "single-setting intervention" and the influence of the "multi-ecosystem" makes it difficult to solidify intervention effects long-term.

In addition, the intervention logic underpinning core behaviors such as "parental monitoring" and "parent-child communication" involves unresolved mechanistic controversies and is prone to the practical difficulty of "operational bias," which further restricts the widespread application of these intervention protocols. Ding et al. (2019) proposed that "high-level monitoring can counteract poor parental role modeling," but they did not clearly define the specific operational dimensions of "high-level": does it refer to "high-frequency attention" or "moderate constraint on content"? In practice, parents often equate "high-level monitoring" with "high-intensity control," such as frequently checking phone content and strictly limiting usage duration. While this "intrusive monitoring" aligns with the logic of constraint, it triggers the

adolescent's psychological reactance mechanism, thereby reinforcing addictive tendencies. [4] Conversely, the demarcation of "monitoring boundaries" remains ambiguous: how should parents balance "awareness" (e.g., knowing usage duration) of adolescent internet use with "intervention" (e.g., restricting content)? When monitoring involves adolescents' social privacy (e.g., checking chat records), how should the line between "protection" and "infringement" be drawn? This lack of clear definition makes it difficult for intervention protocols to form standardized operational manuals, causing parents to fall into the extremes of being "afraid to intervene" or "over-intervening" in practice.

Simultaneously, systemic interventions face a "high threshold" constraint, making implementation difficult at the grassroots level. Systemic family therapy models, exemplified by MFGT, despite demonstrating robust long-term effects, encounter difficulties in large-scale popularization, thereby restricting their general applicability. Firstly, MFGT requires 4 to 8 families to participate jointly in six group activities. This necessitates that family members have sufficient time and energy and must also bear transportation and time costs, making participation challenging for parents with demanding jobs or families with limited economic resources. Secondly, this model relies on professional personnel with expertise in family therapy theory and group counseling experience to facilitate the sessions. However, current talent reserves of such professionals are inadequate in grassroots communities and schools; most school mental health teachers possess only basic counseling skills, making them unqualified to competently lead systemic family therapy.

Finally, the follow-up periods in existing research are mostly limited to "3 months post-intervention," with the longest not exceeding one year. There is a critical lack of tracking regarding the "long-term stability" and "developmental impact" of the intervention effects (e.g., at 3 years or 5 years). Future research must further expand sample coverage, clarify the operational boundaries of core behaviors, develop more accessible intervention systems, and refine long-term follow-up assessment mechanisms. Only then can family intervention have the opportunity to transition from being "effective" to being "universally accessible," truly realizing the systemic prevention and treatment of adolescent internet addiction.

7.3. Group psychological counseling/therapy interventions

Group psychological counseling/therapy intervention models similarly demonstrate considerable immediate therapeutic efficacy and satisfactory medium-term sustained effectiveness in improving adolescent internet addiction. Mindfulness-based Cognitive Therapy (MBCT) achieves a significant reduction in Mobile Phone Addiction Tendency Scores (MPATS) in the intervention group. The MBCT protocol utilized by Wang et al. (2024) also achieved promising intervention effects regarding the loss of control and withdrawal dimensions of online behavior. [23] Furthermore, the narrative-oriented group counseling reported by Ren et al. (2023) found a significant reduction in the experimental group's Mobile Phone Addiction Scale for College Students (SAS-C) scores, demonstrating immediate efficacy. Follow-up results 3 months post-intervention further confirmed that the improvement in mobile phone addiction remained statistically significant in the experimental group, indicating that the intervention effects can be sustained for at least 3 months. [20]

However, despite high-quality existing literature confirming the positive effects of the aforementioned intervention models on adolescent internet addiction, a comprehensive analysis reveals several limitations across research design, intervention practice, and effect evaluation.

From the perspective of research design limitations, the first issue is sample representativeness and homogeneity: existing studies primarily focus on university students as core participants (e.g., empirical data for MBCT and narrative-oriented group counseling largely originate from college samples. [9,20,23] There is

insufficient coverage of early adolescence (12–15 years), rural adolescents, or groups with special educational needs, making it difficult to ascertain whether the intervention effects are applicable to adolescents of differing developmental stages, regions, or backgrounds. Simultaneously, samples mostly comprise individuals with "moderate addiction tendencies." The intervention efficacy for severely addicted adolescents (e.g., those meeting IAD clinical diagnostic criteria) or those with co-occurring mental health issues (e.g., Attention Deficit Hyperactivity Disorder, ADHD) has not been fully verified. Furthermore, a few studies exhibit imbalances in follow-up duration and frequency: while one CBT case study provided 6-month follow-up data, most group interventions (such as narrative counseling) only track participants for 3 months. Moreover, follow-up relies heavily on participant self-reports, lacking corroboration from objective indicators (such as objective monitoring data of mobile phone usage behavior), which hinders the full confirmation of the authenticity and stability of the effects. [16]

Regarding controversial points in intervention practice, the core focus centers on the standardization and cultural adaptability of the intervention protocols. On one hand, there is "ambiguity" in the operational procedures of similar interventions. For instance, in an MBCT's "8-week training," the duration of mindfulness exercises (e.g., 15 minutes vs. 30 minutes per session), the qualifications of the interventionist (a professional psychotherapist systematically trained in mindfulness vs. a teacher proficient in mindfulness-cognition courses), and the format of the practice (online vs. in-person) vary widely across different studies. This lack of a unified "standardized protocol manual" makes the replication of intervention effects challenging. [9,23] On the other hand, while some intervention techniques originating from the West (such as "problem externalization" in narrative therapy) have shown effectiveness in domestic research, they have not been sufficiently integrated with the Chinese adolescent's family cultural context. For example, adolescents' perception of "autonomy" under the "filial piety culture" may differ from that in Western contexts, and whether the acceptance and mechanism of problem externalization techniques have cultural variations is unclear. This tendency toward "theoretical transplantation with minimal local adaptation" may compromise the efficacy of these interventions when implemented at the grassroots level. [20]

From the perspective of limitations in efficacy assessment, the first issue is the singularity and insufficient association of evaluation metrics: existing research primarily relies on "reduction in addiction scale scores" and "alleviation of negative emotions" as core assessment indicators. There is a lack of long-term tracking regarding the adolescents' "restoration of social functioning" post-intervention (e.g., academic performance, quality of parent-child relationships, frequency of real-life social interactions). This prevents a comprehensive judgment on whether the intervention truly achieved the synergistic goal of "addiction correction and social function improvement." [20,23] Second is the controversy over mechanism explanation: although studies propose that "the depth of cognitive restructuring significantly impacts the persistence of effects," existing mechanism verification mostly relies on "correlation analysis"(e.g., higher mindfulness levels are negatively correlated with lower addiction scores). There is a lack of "causal inference" evidence (e.g., testing to confirm that "the increase in mindfulness level is the core variable driving addiction improvement").

The design of existing long-term effect follow-up also exhibits shortcomings. Taking Ren et al. (2023) as an example, their study explicitly confirmed that the intervention effect could be maintained for at least 3 months. However, from the perspective of the long-term goal of "stable behavioral pattern reconstruction," a 3-month period remains firmly within the category of "medium-term effects," representing a clear gap from genuine long-term improvement. In reality, the formation of addiction is not the result of a single factor but is deeply intertwined with multiple dynamic and persistent factors specific to university students, such as life stressors (e.g., academic competition, interpersonal conflict), characteristics of their

developmental stage (e.g., choices regarding further education, career planning uncertainty), and reliance on specific social patterns (e.g., online social substitution for in-person interaction). Crucially, existing research lacks the tracking necessary to assess the stability of intervention effects when these variables are active. More critically, individuals are prone to reverting to original behavioral patterns due to environmental stimuli or internal psychological fluctuations. For instance, when university students face high-intensity pressure during graduation season, they may relapse into using their mobile phones for emotional regulation, leading to a rebound in internet addiction symptoms. However, this potential risk of relapse cannot be quantitatively assessed due to the lack of long-term follow-up data, ultimately diminishing the persuasiveness of such intervention protocols regarding their "long-term efficacy."

The potential barriers to practical translation also warrant attention. Most existing high-quality research is conducted under "ideal conditions" within university or research institutions (e.g., equipped with professional psychologists, fixed intervention sites). In contrast, real-world application settings in grassroots schools or communities often face issues such as "inadequate facilitator qualifications," "difficulty ensuring intervention frequency," and "low adolescent compliance with participation." Crucially, the current literature provides little verification of the efficacy of "simplified intervention protocols" (such as shortened intervention cycles or online adaptation), resulting in a significant "translational gap" between research findings and practical application.

8. Discussion and future directions

Based on the discussion regarding the current status of internet addiction interventions among Chinese adolescents, future research and practice must move beyond the limitations of singular intervention approaches and advance toward a Synergistic Governance System. The core objective of this system is to follow the Holistic Development Theory, utilizing systematic education and environmental optimization to cultivate and strengthen adolescents' interpersonal skills, environmental adaptability, and individual development capabilities, thereby resisting internet addictive behaviors. [28]

8.1. Macro-Ecological Field: Resource aggregation and construction of environmental immunity

Synergistic governance at the macro level necessitates Cross-Sectoral Cooperation among school, community, and social resources to build a highly cohesive, non-addictive, real-life environment for adolescents. Firstly, cross-sectoral cooperation and life-skills adaptability courses should be institutionalized. Future research and educational practice must view health and well-being as the outcome of a comprehensive societal contribution, expanding collaboration with key sectors such as community services, finance, and legal affairs. Specific measures include: regarding interpersonal and environmental adaptability, social resources must be introduced to offer courses on interpersonal resilience (e.g., workplace communication, social etiquette) and environmental adaptability modules (e.g., legal safety, investment and financial management, employment competitiveness training). By making the pressures and challenges of real-world survival competition tangible, this helps university students re-anchor their self-worth and resist the false sense of achievement offered by the online world. Regarding resource integration and psychological support, a linkage mechanism should be established between on-campus psychological counseling/career guidance and off-campus non-profit organizations/government promotional services to ensure continuous psychological support and adequate professional personnel training for high-risk groups. Secondly, the campus sports field requires refinement and functional optimization. On one hand, there must be a targeted allocation of specialized sports programs to break the traditional unified physical education model. This involves precise configuration based on the specific impact of different sports on various dimensions of

addiction. For example, for students lacking the social soothing dimension, promoting large ball games or collective activities (e.g., basketball, soccer) is recommended to reinforce teamwork and interpersonal connection; for those struggling with withdrawal symptoms and mood modification, promoting low-intensity, awareness-focused exercises (e.g., Tai Chi, yoga, jogging) is advisable. On the other hand, attention should be paid to venue innovation and activity density. Schools should increase the frequency and duration of physical education classes and innovatively carry out mass-participation, high-interest activities (e.g., glow runs, campus cross-country races) to raise the attractiveness and density of non-digital entertainment, achieving effective behavioral transfer of adolescents' attention.

8.2. Micro-Interpersonal system: Intergenerational behavior reconstruction and establishment of supportive relationships

The family and peer environment are critical variables influencing the onset and maintenance of addictive behaviors. The focus of future interventions must shift towards establishing positive communication patterns and blocking the transmission of negative behaviors. Specifically, efforts should be made to enhance family interaction and communication. Parents should actively participate in adolescents' daily lives through regular family meetings, joint activities, and other means to strengthen family cohesion. For example, family game nights and outdoor activities can not only deepen affection among family members but also provide adolescents with alternative forms of entertainment, reducing excessive reliance on the internet. Concurrently, reasonable rules and boundaries need to be established; parents should collaborate with adolescents to develop sensible internet use guidelines, clearly defining usage time, content, and purpose. By using negotiation rather than coercion, adolescents become more willing to adhere to the rules. Furthermore, parents should lead by example, reducing their own excessive use of electronic devices to set a positive model for adolescents. The family also needs to provide psychological support and emotion management, offering adolescents a safe and supportive psychological environment. When adolescents encounter academic pressure or interpersonal issues, parents should provide timely psychological support, helping them acquire effective emotion management skills. For instance, techniques such as emotional journaling and relaxation training can help adolescents alleviate anxiety and depression, reducing the tendency to over-rely on the internet due to emotional distress. With the significant enhancement and iterative development of Artificial Intelligence (AI) technology, we can reasonably apply AI to imbue intervention models with greater vitality, constructing a more efficient and replicable intervention ecosystem.

8.3. AI-Era psychological intervention strategies

In the age of Artificial Intelligence, psychological interventions can innovatively apply technology. Firstly, the implementation of Family-based Gamified Intervention should be promoted. This intervention integrates mental health education with family interaction using game design thinking, aiming to improve parent-child relationships and reduce the isolation and alienation resulting from adolescents' over-reliance on the internet through a relaxed, engaging, and cooperative approach. Specifically, specialized family interaction Apps or mini-programs can be developed to set situational tasks (such as jointly planning a day's offline activity, completing emotional management mini-games together, or mutually challenging each other to a "no-phone night"). These tasks can utilize game mechanics like scoring, rewards, and role unlocking to reinforce positive feedback loops among family members, subtly enhancing adolescents' self-regulation, self-efficacy, and social communication skills during the process. Simultaneously, the gamified approach helps alleviate the common issues of "resistance" and "didactic communication" often encountered in family psychological intervention, allowing the intervention to integrate more naturally into daily life contexts. Secondly, the application of VR-based Immersive Psychological Intervention is recommended. Compared to traditional psychological counseling, VR technology holds unique advantages in the field of mental health

and addictive behavior regulation, including immersion, controllability, and situational repeatability. In the intervention of adolescent internet addiction, VR can be used for: situational exposure and cognitive reconstruction, by simulating high-risk scenarios (e.g., gaming temptation, social pressure) to allow adolescents to practice self-control and emotional regulation strategies in a virtual environment; emotional regulation training, by designing VR experiences based on mindfulness meditation or breathing exercises to guide adolescents in relaxing and focusing within an immersive space; and social skills training, by creating virtual social scenarios to help those with social anxiety-driven addiction practice interpersonal interactions in a safe environment.

9. Conclusion

This study systematically reviewed intervention measures for internet addiction among Chinese adolescents from 2015 to 2025, revealing both the achievements and the deficiencies of existing research. Although physical exercise intervention, family intervention, and group psychological counseling/therapy demonstrate positive effects in the immediate improvement of addictive behaviors and psychological symptoms, their long-term maintenance mechanisms and the stability of their efficacy still warrant further investigation. Future research and practice should commit to constructing a multidimensional, collaborative intervention system that integrates family, school, community, and social resources to form a comprehensive intervention network. Furthermore, emerging technologies, such as Artificial Intelligence and Virtual Reality, should be fully utilized to innovate intervention models, thereby increasing the specificity and effectiveness of the treatments. Through these efforts, we anticipate providing adolescents with more comprehensive and effective support, helping them establish healthy, autonomous, and scientific internet usage habits, and promoting their robust development.

Conflict of interest

The authors declare no conflict of interest.

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