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## ARTICLE REVIEW

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### Understanding Internet Addiction and its Associated Factors Among Children and Adolescents: A review of literature

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#### ABSTRACT

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Internet Addiction (IA) is becoming increasingly recognized as a serious public health issue, particularly for children and adolescents. This review article discussed the complexity of IA diagnostic criteria and IA-related risk factors from a public health perspective with the intention of fostering a better understanding of IA in adolescents and children. The entire discussion pointed out how the epidemiological triad of disease framework helps to explain the IA associated factors among adolescents. This framework emphasises the agent (Internet characteristics and its content), host (e.g., self-personality, comorbidity, psychological status, inter- and intrapersonal relationship), and environment as extrinsic factors (i.e., physical pollution, socioeconomic status, availability, and accessibility of the Internet) that facilitate interaction between the agent and the host. Evaluation of all three components and their association with IA is essential as it allows for a more comprehensive understanding of how the issues arise, which can be useful in developing future effective public health measures for IA.

**Keywords** Internet addiction - Adolescents - Diagnostic criteria - Self-personality - Environmental influences.

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### INTRODUCTION

Young people born in generations Z and Alpha have had access to the Internet since childhood. In fact, access to the Internet is no longer a luxury, but a basic requirement for children and adolescents seeking general education information. Age-appropriate, family-friendly, and purposeful viewing of web content with boundaries can result in immersive, educational screen experiences.<sup>1</sup> Previous research has demonstrated that Internet-based learning can improve children and adolescent's grades, academic performance and their literacy skills,<sup>2</sup> enhance learning motivation,<sup>3</sup> and foster good relationships with teachers and peers.<sup>2,4</sup> When compared to not using a screen at all, recreational screen usage at modest levels —1 hour per day—have been linked to a lower risk of depression.<sup>5</sup> Essentially, it is believed that an individual's quality of life impacted if they lack Internet access.<sup>6</sup>

While Internet use is viewed as a positive phenomenon, empirical evidence reveals a number of negative effects associated with excessive and uncontrolled Internet use, which can lead to Internet Addiction (IA). This addiction is characterized as uncontrolled or excessive Internet use preoccupation, which is associated with the development of tolerance and withdrawal symptoms.<sup>7</sup> Despite the lack of standardised diagnostic criteria for Internet Addiction, a number of studies have measured its prevalence. A systematic review and meta-analysis of 113 epidemiological studies published between 1996 and 2018 involving 693,306 participants indicates that the average prevalence of Internet addiction is 7%. with a rising rate over time<sup>8</sup>. According to another global study, the prevalence rate of Internet addiction among European children ranges from 1% to 9%,<sup>9-10</sup> between 1.0% - 22.0% in the Middle East,<sup>10,11</sup> and a prevalence in Asia ranging from 2.0% - 21.0%.<sup>9,12</sup>

Meanwhile, according to the recent research evidence from Southeast Asia, the prevalence of IA among students aged 11 to 26 years ranges between 7.4% and 46.4%.<sup>13</sup> Another meta-analysis of seven Southeast Asian nations revealed a combined IA prevalence rate of 20.0%.<sup>14</sup> It should be noted that the variety of research findings with varying prevalence rates is due to the use of different screening assessment tests, varying criteria for defining Internet addiction, different sample age groups, and varying cultural backgrounds for each studied population. There are at least 21 different assessment tests used worldwide to determine the prevalence and severity of Internet addiction, including the Young Internet Addiction Test and the Chen Internet Addiction Test.<sup>15</sup>

IA is increasingly recognised as a serious public health issue, especially when it has negative effects on children and adolescents, causing

researchers and medical professionals to be concerned.<sup>16-17</sup> This is due to the fact that negative impact is a prerequisite for the emergence of a disease state.<sup>18</sup> When a person is "addicted" to the Internet, they will spend excessive time on Internet-related activities at the expense of other important aspects of their lives, such as their basic needs for food and water, personal hygiene, adequate sleep, and intimate relationships, among others.<sup>15</sup>

Additionally, those who are addicted to the Internet experience detrimental physical and psychosocial effects from a clinical and public health perspective, including an unhealthy diet, physical inactivity, skeletal muscle issues like back pain, poor posture, signs of social withdrawal, family conflict, and poor academic performance, among others.<sup>15</sup>

Many personality and psychiatric disorders, including low self-confidence, impulsivity, poor sleep quality, mood disorders, and suicide, are associated with IA.<sup>19</sup> Moreover, IA is associated with numerous neuroanatomical and neurochemical alterations, such as the thinning of the cortex and the modification of the dopaminergic reward circuit.<sup>19</sup> In fact, neuroimaging studies conducted on adolescents indicate that Internet addiction is associated with structural and functional changes in regions of the brain responsible for attention span, decision-making, emotional processing, cognitive control, and behavioural disorders.

Besides, excessive Internet use is viewed as a form of addiction that is closely associated with substance and behavioural responses.<sup>3</sup> In an earlier report, K.S. Young<sup>20</sup> asserted that IA results in the same academic, social, and employment decline as drug or alcohol addiction. This assertion is supported by the findings of neuroimaging experiments and neurological studies indicating that individuals with IA exhibit biological changes in the prefrontal cortex and share similar neuronal biological mechanisms with other addictive syndromes, such as substance addiction and behavioural addiction.<sup>21,22</sup>

Adolescents are regarded as a vulnerable group that is more susceptible to the risk of Internet addiction due to early Internet exposure, personality, and individual risk factors, as well as environmental factors that heighten their level of vulnerability. This generation has been using digital devices and the Internet since they were young due to the technological age, they are living in. In fact, it was discovered in 2015 that a 15-year-old child's propensity to use digital devices and the Internet as early as 10 years of age and the amount of time spent surfing the Internet had increased significantly, particularly in countries belonging to the Organization for Economic Co-operation and Development.<sup>23</sup> This study aims to explain the

Internet Addiction among children and adolescent with their associated factors in this country.

## METHODS

In this narrative review, databases like PubMed, Web of Science, and Google Scholar were used. Keywords such as ("Internet Addiction" OR "Problematic Internet Use" OR "Internet Addiction Disorder" OR "Pathological Internet Use" OR "Problematic Internet Use" OR "Excessive Internet Use" OR "Compulsive Internet Use" OR "Internet Dependence" OR "Virtual Addiction") AND ("determinants" OR "risk factors" OR "predictors") AND ("adolescents" OR "children") were used. In addition to the aforementioned databases, the search was carried out using the snowballing technique, which involved looking for references from the first search.

All study types, including cohort, case-control, clinical trial, and retrospective record review studies, were eligible for inclusion in the selection criteria. The articles cover a wide range of research topics and include reports written in both Malay and English. The years covered in this article's publishing dates range from 2005 to 2022. Following evaluation of the entire document, selected papers were imported into Mendeley version 1.19.8.

## RESULTS

According to the search strategy, publications on Internet Addiction and its associated factors among adolescents and children as well as the IA criteria and terminology produced a total of 68 articles, including reports and research articles. The information obtained from the literatures was then divided into the following headings.:

- IA Criteria and Terminology
- Factors Contributing to Internet Addiction among Adolescents and Children in the Context of Public Health (Epidemiology Triad)

## DISCUSSION

### IA Criteria and Terminology

The American National Psychiatric Association (APA) has omitted the term "addiction" in the Diagnostic and Statistical Manual of Mental Disorders (DSM) for four consecutive editions because it is stigmatising, viewed as a general term rather than a scientific one, and is too difficult to define. A new category of "Substance and Addiction Related Disorders" was created by the term's introduction in the DSM-5. The term was, however, added to the DSM-5 and developed into a new category of "Substance and Addiction Related Disorders".<sup>24</sup>

The expansion of the definition of "addiction" to include non-substance-related

behavioural disorders that result in deterioration and cause problems has piqued the interest of numerous researchers and medical experts working in the field of behavioural addiction. This interest is also influenced by the inclusion of more specific Internet Gaming Disorder (IGD) criteria in the DSM-5 appendix. Due to the fact that the diagnostic criteria for IGD place the behaviour in the category of "non-substance addiction," it is possible that IA is also one of the candidates for this category, along with "Gambling Disorder".<sup>25</sup>

There have been continuous efforts since the 1990s to define Internet addiction, leading to heated discussion in the process. Finding common ground on terminology to infer the broader meaning of Internet addiction is the most challenging task. The terms "Internet Addiction Disorder (IAD)", "Pathological Internet Use (PIU)", "Problematic Internet Use", "Excessive Internet Use," "Compulsive Internet Use," "Internet Dependence," and "Virtual Addiction" have been commonly used for decades.<sup>26</sup>

If a person is said to be addicted to the Internet, this argument seems equivalent to stating that an alcoholic is addicted to a store selling alcohol. Consequently, the term "Internet addiction" is imprecise or inappropriate.<sup>27</sup> Nevertheless, a similar method is used to study widespread Internet use around the world, and most authors, including the authors of the reviewed models, continue to use the term "Internet addiction" in general to describe the various behavioural addictions connected to Internet use.

IA can thus be described as a persistent pattern of maladaptive behaviour, characterised by preoccupation, insistence, or uncontrolled or excessive Internet use associated with the development of tolerance, withdrawal symptoms, and unsuccessful attempts to reduce or stop, resulting in clinically significant functional decline or impairment.<sup>15,7,28-29</sup>

There are few well-known diagnostic criteria and models for IA that have ever been created and put forth by prior researchers (Table 1). These models were chosen in accordance with previously developed criteria for IA that have been widely or frequently cited by other researchers. The three models of Internet addiction criteria highlighted by K.S. Young,<sup>20</sup> Griffiths,<sup>30</sup> and Tao et al<sup>31</sup> share similarities in that all sets of criteria describe a lack of control over Internet use, which leads to psychological, social, or professional conflict or problems (including excessive use) and mental preoccupation.

Meanwhile, other related characteristics, including mood management, tolerance, withdrawal, and desire or anticipation, are stated inconsistently by all three models.<sup>18</sup> Internet activity is frequently viewed as a single entity by researchers of all three models. There is a strong correlation

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between Internet addiction and the amount of time spent engaging in online activities like social media, online shopping, and online gaming.<sup>32</sup>

Hence, there are recommendations for compulsive "processes" or "behaviours" based on a variety of themes, including shopping, physical activity, and online video games, social media, and various sexual behaviours.<sup>18,33,34</sup> However, it should

be noted that the DSM-5 still does not include subcategories for "sex addiction," "exercise addiction," or "shopping addiction" because at this time, the reassessment review lacks the necessary data to establish diagnostic criteria and detailed descriptions are required to classify this behaviour as a mental disorder.<sup>35</sup>

**Table 1** Comparison of the descriptive diagnostic criteria for Internet addiction based on assessment instruments

Criteria	K.S. Young <sup>20</sup>	Griffiths <sup>30</sup>	Tao et al <sup>31</sup>
Preoccupation	Feel absorbed and distracted by the Internet when offline or fantasise about being online.	The Internet dominates thoughts (complacency, cognitive impairment), feelings (addiction, desire) and behaviour.	Thinking about previous online activity
Mood management (negative)	Attempting to stop using the Internet causes mood changes.	Mood alterations	Functional deterioration Utilize the Internet to alleviate or escape depressive feelings.
Tolerance	Utilizing the Internet for longer than intended.	It is necessary to increase the number of certain activities to achieve the same effect as before.	At least three-month usage period. Spend at least six hours on non-business-related activities. Significant increase in satisfaction-related Internet usage.
Withdrawal	Attempts that failed to stop Internet usage. Feeling anxious or depressed while offline, but these feelings disappear when online.	Unpleasant feelings and / or physical effects that occur when certain activities are stopped or abruptly reduced	Manifested by mood dysphoria, anxiety, irritability and boredom after a few days without the Internet
External consequences / conflicts	Affect important relationships, jobs or opportunities. Choose to spend more time online as opposed to socialising with others, completing homework, and getting enough sleep. Others express concern regarding the amount of time spent online. Shout, yell, or become enraged if people interrupt while online.	Conflict between Internet addicts and those around them (interpersonal conflict) or from within (intrapsychic conflict) regarding particular activities.	Loss of interest, hobbies, and entertainment is a direct result of Internet use, with the exception of fraudulent cost/real-time involvement in the Internet from family members, therapists, and others. Using the Internet excessively despite being aware of having persistent or recurrent physical or psychological problems resulting from Internet use.
Relapse / control	Failed to decrease online usage.	The propensity to repeatedly regress on an initial pattern of a particular activity.	Constant desire and/or unsuccessful attempts to limit, reduce, or halt Internet usage
Addiction / anticipation	Find yourself anticipating when online.	-	Anticipate the next online session or have an intense desire to access the Internet
Lying / hiding use	Be defensive or secretive when questioned about online activities Attempt to hide how long you've been spent online.	-	-

Source <sup>18,26</sup>

Factors Contributing to Internet Addiction among Adolescents and Children in the Context of Public Health (Epidemiology Triad)

#### Internet characteristics (Agent)

The characteristics of the Internet and its effects on addictive behaviour serve as 'agents' in the causes of IA. Several previous works have attempted to explain IA by examining the Internet-specific factors responsible for increasing or decreasing consumer overuse patterns on the Internet, such as captivating and satisfying features that appear to be appealing to users.<sup>16,36,37</sup>

Multiple prior studies have concluded that Internet users are driven by various satisfaction factors including information seeking, escapism, relationship building, self-development and anonymity. Other factors include entertainment, environmental and social factors.<sup>16,36,37</sup>

According to the theory of consumption and satisfaction, one medium is chosen and utilised over another because it is believed to be able to satisfy the desires of users. This gives users perceptions of the Internet's usefulness and ease of use, which in turn influences their media choices and Internet usage tendencies<sup>37</sup>. Therefore, adolescents who are more interested in social satisfaction and entertainment are more susceptible to IA. On the other hand, adolescents who actively seek knowledge and have specific intentions when using the Internet, for instance to gather information, have a lower risk of developing IA.<sup>37,38</sup>

Internet use is found to be more prevalent among adolescents who view the Internet as a way to socialize or build interpersonal relationships. This illustrates that the Internet is particularly appealing to some individuals, as noted earlier, individuals who have difficulty socializing in other ways. In addition, IA is more prevalent among adolescents who believe that the Internet's ability to act independently without revealing one's identity is one of its alluring features.<sup>16,36</sup>

Perceived pleasure is another major driver for continued Internet usage through various mechanisms. This factor refers to the positive experience response that occurs when an individual uses the Internet, resulting in the individual's actions to continue their activities becoming stronger, which ultimately leads to addictive behaviour.<sup>39</sup> Similarly, the Internet has increased user satisfaction with technology and fostered the development of stronger Internet use habits.<sup>40</sup> If individuals have a favourable Internet experience, they are more likely to continue spending additional time and effort to satisfy cravings.

#### Individual factors (Host)

Regarding 'host', the term refers to adolescent who is vulnerable to IA. Numerous intrapersonal and interpersonal risk factors have been identified as

influencing an individual's level of vulnerability, exposure, or response to a causative agent (Internet feature).<sup>41,42</sup> Individual intrapersonal and interpersonal variables, such as personality traits and psychosocial well-being have received the most attention in the existing literature on IA among adolescents.<sup>16,43,44</sup>

#### a. Intrapersonal

It has been demonstrated that the Big Five Personality Traits, which are made up of the five fundamental personality dimensions of openness to experience, conscientiousness, social nature, extraversion, and agreeableness, are either negatively or positively associated with IA.<sup>42</sup> Openness, prudence, extraversion, and consent have been shown to have an inverse or negative relationship with IA in previous research. Contrary to this, neuroticism is positively correlated with IA.<sup>42,45</sup>

Individuals who are open are more independent and less reliant on external factors such as the Internet. Due to their high level of curiosity and interest, open individuals prefer real-world activities over virtual realms.<sup>42,45</sup> Individuals with a high level of attention to detail are cautious, organised, self-controlled, and goal oriented. Due to this trait, individuals of this type are unlikely to spend extended periods of time on the Internet.<sup>42,45</sup>

The nature of extraversion indicates that a person likes to be actively involved with other people in order to build friendships, gain admiration, and enhance their status; this suggests whether the person is competitive and self-confident. Thus, individuals with a greater level of social interaction, competitiveness, and self-esteem tend to have a lower level of IA.<sup>42,46</sup>

Individuals who are agreeable, empathetic, trustworthy, tolerant, and forgiving dislike using force and avoid placing themselves under pressure. Moreover, agreeable attitudes are negatively correlated with negative emotions and stress, both of which are known predictors of Internet addiction. Thus, consenting attitudes have been identified as a predictor factor of protection against IA.<sup>42,47</sup> Compared to other traits, neurotics experience negative emotions and profound guilt and often use the Internet to escape negative emotions and stress and gaining social support. Therefore, individuals with high levels of neuroticism are more susceptible and likely to develop an Internet addiction than their peers.<sup>42,48</sup>

Other intrapersonal risk factors include psychological factors such as depression, Attention Deficit Hyperactivity Disorder (ADHD), anxiety, impulsivity, lack of self-confidence, and withdrawal symptoms, to name a few, which frequently coexist with IA.<sup>15,16,44,49</sup> Pre-existing psychosocial problems are likely to increase an individual's risk of developing maladaptive cognition as a result of

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Internet use. Because they share a common aetiology, there is also a reasonable possibility that IA and mental disorders co-occur.<sup>50</sup>

Moreover, excessive Internet users are more likely to have homozygous short alleles in the serotonin transporter-related promoter region (5-HTTLPR), which is linked to depressive disorders.<sup>50,51</sup> Despite this, it is difficult to establish a causal relationship between Internet addiction and psychological problems due to the lack of longitudinal data. In addition, there is an ongoing debate as to whether IA should be considered a major disease disorder or whether participation in Internet activities is merely one way for individuals with gambling issues, compulsive shopping, and pornography addiction to manifest their disease problems. Regardless of whether IA is a major disorder or not, the negative relationship between IA and overall psychological well-being has been clearly demonstrated in previous scientific literature.<sup>50</sup>

### b. Interpersonal

Numerous researchers have identified conflict between parents and children, the functioning of family institutions, parental protection, and school involvement as factors influencing IA in children and adolescents.<sup>16,44,52-53</sup>

In addition, a study conducted among adolescents in Hong Kong revealed that adolescents from parents and divorced families, families experiencing conflict, and families with severe dysfunction exhibited and positively predicted IA.<sup>54</sup> In a large-scale local study, it was also discovered that adolescents whose parents were married but lived apart were more likely to have IA issues.<sup>28</sup> It is understood that divorced or cohabiting parents will have limited time with their children when juggling work, family management and maintaining relationships with their children. While it was also discovered that children use the Internet to reduce the psychological insecurity inherent in a single-parent family environment.<sup>54</sup> Furthermore, families with emotionally friendly parenting styles can reliably predict adolescent self-regulatory strategies, an important factor given that Internet use and other forms of misbehaviour depend on these adolescents' capacity for self-control.<sup>53</sup>

In the meantime, some researchers highlight the importance of school involvement in IA occurrence, as schools are a crucial environment for children's development and also promote healthy lifestyles.<sup>53,55</sup> Due to the negative relationships formed with teachers and peers, adolescents who are emotionally affected and poor participation in school activities are more likely to develop IA.<sup>56</sup>

### Environmental factors

Environmental factors, which are extrinsic factors that influence 'agents' and exposure opportunities,

are the third and final component of the epidemiological triad. In contrast to the other variables mentioned earlier, environmental factors received less attention. Environmental factors in the context of IA may include physical factors such as pollution exposure, socioeconomic factors such as housing condition, Internet accessibility, as well as exposure to advertising.<sup>16,41</sup>

### a. Environmental pollution

According to the results of a meta-analysis involving 31 countries from seven different regions of the world, the prevalence of IA is higher in countries with higher emotional stress status due to traffic congestion and commute times, worries about air pollution, lower national income, and general life dissatisfaction.<sup>57</sup>

The presence of mentally taxing environmental conditions, such as poor air quality, traffic congestion, and loud noise, can be stressful for those in the area. Due to the unfavourable, unsuitable environment or the possibility of being exposed to harmful contaminants, people prefer to relieve stress by browsing the Internet rather than engaging in outdoor activities.<sup>57</sup> As people's stress levels increase, they are more likely to turn to the Internet as a means of escape, which increases their susceptibility to IA due to prolonged Internet use.<sup>50</sup>

Moreover, the direct effects of air pollutants on humans can manifest in numerous ways. The World Health Organization (WHO) released a report on six major air pollutants including lead as a neurobehavioral substance affecting more younger generation. Lead pollution derived from the use of fuel in transportation and engines, paints, electronic waste, incinerators (burners), water pipes, particularly in developing countries, is a threat to public health due to its negative neurobehavioral effects on humans, animal life, and the environment.<sup>58,59</sup>

### b. Lead (Plumbum) exposure

Children are particularly susceptible to lead exposure due to its neurotoxic properties, which can impair learning, memory, hyperactivity, and, in extreme cases, result in mental retardation.<sup>58</sup> It has also been found in pre-clinical research that brain areas associated with addiction circuits have been enhanced as a result of lead-induced modifications of neurotransmitter receptors, which are known to facilitate the course of illicit substance activity into the brain during adolescence. This period is when adolescents are most exposed to addictive behaviors such as lead exposure, as well as the appearance of psychiatric problems in individuals.<sup>60</sup>

Similarly, the researchers discovered a similarity between neuro image scanning of adolescents with IA and substance dependence, suggesting that the two share similar neurobiological mechanisms.<sup>21</sup> Interestingly, there

is increasing evidence that early exposure to Pb2+ is a risk factor for psychiatric disorders and substance abuse. Current evidence also suggests that early exposure to Pb2+ during early childhood is associated with poor neural development outcomes, with effects varying with exposure magnitude and duration.<sup>60</sup> However, assumptions about whether IA shares the same pathway as other addictive behaviours must be clarified in future research.

c. Housing conditions and household count  
The findings of a study conducted in Spain on 1,509 individuals between the ages of 18 and 78 seated at home (when the movement control phase was implemented due to the COVID-19 pandemic) revealed that those living in smaller houses and with fewer children are more likely to use the Internet than those living in larger houses with terraces and more children. It is highly probable that many of them use the Internet in an unhealthy, excessive, and compulsive manner in an attempt to alleviate the negative emotions they experience as a result of being confined to a small space at home.<sup>61</sup>

This assertion is in line with a study of 220 parents who had children in Japan during the COVID-19 outbreak, which discovered that having fewer rooms at home was linked to higher IA scores.<sup>62</sup> According to the Ministry of Internal Affairs and Communications of Japan, the number of persons renting housing is highest among those in their 20s, and the proportion of people living in their own properties rises with age. Hence, IA is a severe problem among young people if the number of rooms in the house rises with age, money, and other markers of social standing. Additionally, if there are many rooms, the lives of the roommates can have some influence on how much time is spent online.<sup>62</sup>

d. Household income  
Low family income was found to be a predictor of IA.<sup>54,63,64</sup> The low-income group was shown to be much more addicted to the internet than other groups, and this addiction lessened as wealth increased. This may be because those coming from low-income family frequently choose to spend their

time, relieve stress, and have fun on the internet rather than on activities that need financial resources.<sup>64</sup>

It was also found that adolescents from low-income households are more likely to receive less information and assistance for their needs, making Internet use a cost-effective alternative activity for them. In addition, low-income families tend to have lower educational attainment, which decreases their likelihood of being aware of the negative effects of Internet addiction and the preventative measures available to avoid them, such as positive parent-child relationships and effective communication.<sup>54</sup>

e. Internet availability and Internet advertising  
When discussing Internet advertising, for instance, in the context of alcohol-related research, availability and exposure to alcohol are well-known environmental factors that influence the alcohol consumption of young people.<sup>16,65</sup> Given that neural abnormalities (e.g., atrophy of the dorsolateral prefrontal cortex) and cognitive dysfunction (e.g., memory impairment) associated with IA are similar to substance abuse and addictive behaviour problems, it is reasonable to believe that Internet availability and accessibility may also influence IA.<sup>21,57,66</sup>

A study conducted in Korea found that adolescents who are exposed to more Internet game advertising and who are more susceptible to being misled or influenced by advertisements are more likely to develop a video game addiction.<sup>16,67</sup> In order to prevent problems related to alcohol, the WHO has emphasised the significance of regulating the availability and marketing of alcohol.<sup>68</sup> The same logic can be applied to the problem of IA. To date, many countries lack regulations or policies governing advertising content (especially those containing violence, adult viewing material or pornography). Consequently, adolescents are often exposed to Internet game advertisement with inappropriate sexual and violent content. Table 2 provides a summary of the general overview of factors related to IA.

**Table 2** Summary of Factors Associated with Internet Addiction

Factors associated with IA		Description	Author
Agent	Internet Characteristics	Internet users are driven by various satisfaction factors including information seeking, escapism, relationship building, self-development and anonymity. Other factors include entertainment, environmental and social factors.	16,36,37
		Positive experience response that occurs when an individual uses the Internet fostered the development of stronger Internet use habits, which leads to addictive behaviour	37,39,40

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Host	Intrapersonal		
	Personality trait	Openness, prudence, extraversion, and consent have been shown to have an inverse or negative relationship with IA.	42,45
		Neuroticism is positively correlated with IA.	42,45
	Psychological factors	Depression, Attention Deficit Hyperactivity Disorder (ADHD), anxiety, impulsivity, lack of self-confidence, and withdrawal symptoms, to name a few, frequently coexist with IA. Pre-existing psychosocial problems are likely to increase an individual's risk of developing maladaptive cognition as a result of Internet use.	15,16,44,49
	Interpersonal		
	Adolescent – family relationship	Adolescents from parents and divorced families, families experiencing conflict, and families with severe dysfunction exhibited and positively predicted IA.	54
		Adolescents whose parents were married but lived apart were more likely to have IA issues.	28
	Adolescent – teacher & peers' relationship	Adolescents who are emotionally affected and poor participation in school activities are more likely to develop IA due to the negative relationships formed with teachers and peers.	56
Environment	Environmental pollution	Prevalence of IA is higher in countries with higher emotional stress status due to traffic congestion and commute times, worries about air pollution, lower national income, and general life dissatisfaction.	57
		People prefer to relieve stress by browsing the Internet rather than engaging in outdoor activities due to unfavourable, unsuitable environment or the possibility of being exposed to harmful contaminants.	57
	Lead exposure	Brain areas associated with addiction circuits have been enhanced as a result of lead-induced modifications of neurotransmitter receptors, which are known to facilitate the course of illicit substance activity into the brain during adolescence.	60
		There is similarity between neuro image scanning of adolescents with IA and substance dependence, suggesting that both share similar neurobiological mechanisms and there is increasing evidence that early exposure to Pb <sup>2+</sup> is a risk factor for psychiatric disorders and substance abuse.	21, 60
	Housing conditions and household count	Those living in smaller houses and with fewer children are more likely to use the Internet than those living in larger houses with terraces and more children.	61
		Having fewer rooms at home was linked to higher IA scores.	62
	Household income	Low family income was found to be a predictor of IA.	54,63,64



Internet availability and Internet advertising	The low-income group was shown to be much more addicted to the internet than other groups, and this addiction lessened as wealth increased	64
	Availability and exposure to alcohol are well-known environmental factors that influence the alcohol consumption of young people. Given that neural abnormalities (e.g., atrophy of the dorsolateral prefrontal cortex) and cognitive dysfunction (e.g., memory impairment) associated with IA are similar to substance abuse and addictive behaviour problems, it is reasonable to believe that Internet availability and accessibility may also influence IA.	16,65,21,57,66
	Adolescents who exposed to more Internet game advertising and who are more susceptible to being misled or influenced by advertisements are more likely to develop a video game addiction.	16,67

**CONCLUSION**

This review article discussed the complexity of IA diagnostic criteria, and it is evident that children and adolescents are susceptible to IA due to a variety of variables, including internet characteristics that appear enticing to users, individual factors, and environmental circumstances that encourage them to engage with the internet. There have been several significant issues revealed that necessitate the recommendations as follows.

1. For a comprehensive approach to be implemented, future research should address environmental elements that may have a significant association with IA.
2. With multi-stakeholder involvement, starting with the person, the family unit, the local community, the national level, and relevant non-governmental organisations, focus can be placed largely on the young generation in the prevention of IA.
3. People can be made aware of the negative effects that excessive internet use can have on one's psychological well-being, physical health, interpersonal relationships, and educational opportunities.

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