



Anxiety/Depression and Internet Addiction: Directions, Antecedents, and Outcomes

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Abstract

Purpose of Review This paper aims to review the existing literature on the relationships between anxiety/depression and Internet addiction and their common risk factors, protective factors, and developmental outcomes.

Recent Findings In the literature, three types of relationships have been revealed between anxiety/depression and Internet addiction, namely, anxiety/depression → Internet addiction, Internet addiction → anxiety/depression, and the bidirectional directions between them. Some personal characteristics such as neuroticism, shyness, low self-esteem, and low self-control and environmental factors such as childhood maltreatment and peer victimization may place individuals at increased risks of anxiety/depression and Internet addiction, but other psychological factors may prevent individuals from this. Anxiety/depression and Internet addiction exert a negative influence on individuals' development.

Summary Anxiety/depression and Internet addiction have some common risk factors and outcomes and the relationships between them were unidirectional and bidirectional. Longitudinal studies with more time points are needed to examine the relationships between anxiety/depression and Internet addiction.

Keywords Anxiety · Depression · Internet addiction · Antecedents · Outcomes

Introduction

Internet addiction refers to the uncontrollable use of the Internet and may bring harm to individuals' development, which may include online gaming addiction, mobile phone addiction, and so on for they share some common characteristics such as compulsive, excessive, or uncontrollable dependence on the Internet [1–3]. Anxiety/depression are the common negative emotions and they are the risk factors for Internet addiction [4, 5]. One previous study indicated that anxiety/depression and Internet addiction are two types of mental health problems and share some common features

[6••]. It is well documented that these two types of mental health problems have been proven to be associated with a series of negative developmental outcomes, including poor academic performance [1], chronic diseases [7], and poor sleep quality [8]. Given these undesirable outcomes, anxiety/depression and Internet addiction have been the key focus of developmental and clinical psychology.

Researchers have investigated the relationships between anxiety/depression and Internet addiction. The influence of anxiety/depression on Internet addiction is well documented [4, 5], and the reverse direction is also revealed in empirical studies. For instance, Internet addiction can affect emotional states through experiences of loneliness or poor interpersonal relationships [9–11]. Another view combines “anxiety/depression → Internet addiction” with “Internet addiction → anxiety/depression,” considering that anxiety/depression and Internet addiction influence each other in a reciprocal direction over time [9, 12].

Although previous studies have provided evidence on the association between anxiety/depression and Internet addiction, few studies have conducted a review on the directions between anxiety/depression and Internet

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addiction as well as the related theoretical foundations. Furthermore, the risk of high co-morbidity between anxiety/depression and Internet addiction [13–15] indicates that some shared factors may affect anxiety/depression and Internet addiction. However, previous studies have not explored the common antecedents and outcomes for anxiety/depression and Internet addiction. Thus, a review of common risk factors, protective factors, and developmental outcomes for anxiety/depression and Internet addiction is necessary.

In this study, we aimed to conduct a review of the literature on anxiety/depression and Internet addiction and provided directions for future studies. By doing this, we hope to offer a research agenda for future studies on the directions between anxiety/depression and Internet addiction, and provide guidelines for future interventions.

The Directions Between Anxiety/Depression and Internet Addiction

Although previous studies have demonstrated the relationships between anxiety/depression and Internet addiction, some inconsistent findings appeared. To date, three different direction patterns between anxiety/depression and Internet addiction have been reported [9, 16–19]. The directions and the related theoretical models between anxiety/depression and Internet addiction is shown in Fig. 1.

Theories indicate that anxiety/depression are predictors of Internet addiction include interaction of person-affect-cognition-execution [I-PACE] model [20], compensatory internet use model [21], cognitive-behavior model of pathological Internet use [22], emotion enhancement hypothesis [23], and use and gratification theory [24]. The specific proposals for each model are summarized below.

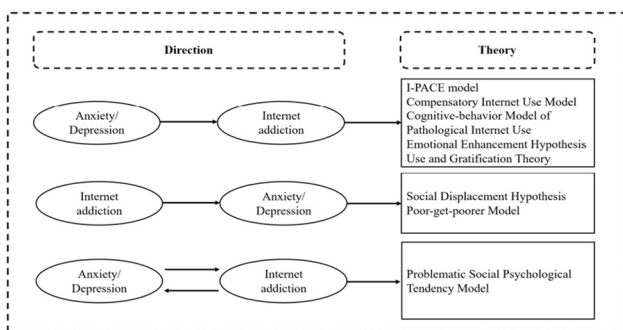


Fig. 1 Theories that support each direction between anxiety, depression, and Internet addiction

Anxiety/Depression → Internet Addiction: The I-PACE Model

The I-PACE model holds that the interactions of individual susceptibility factors, emotional response (such as anxiety and depression) to internal and external stimuli, cognition, and executive function lead to the emergence and maintenance of Internet addiction [25]. People with elevated levels of depression and anxiety are more likely to use the Internet excessively to relieve their negative moods [4, 5], increasing the risk of Internet addiction [26].

Anxiety/Depression → Internet Addiction: Compensatory Internet Use Model

Compensatory internet use model posits that individuals are inclined to turn to the Internet for emotional relief when their basic psychological needs are not met in reality [21]. For example, university students with high levels of stress, anxiety, and depression are more likely to use the Internet excessively to alleviate depression, insomnia, fear, guilt, and despair [27].

Anxiety/Depression → Internet Addiction: Cognitive-Behavioral Model of Pathological Internet Use

Cognitive-behavioral model of pathological Internet use is used to explain the mechanism of emergence and maintenance of problematic Internet use [22]. Davis believes that proximal factors (including maladaptive cognition) play key roles in the development of Internet addiction [22]. Empirical research has shown that anxiety and depression (distal factors) can cause maladaptive cognition (proximal factors), thereby increasing the risk of Internet addiction [28].

Anxiety/Depression → Internet Addiction: Emotion Enhancement Hypothesis

Emotion enhancement hypothesis holds that individuals may choose certain media activities according to their emotional state, and depressed individuals will adjust their negative emotions by watching videos, playing games, and browsing the web, putting them at a higher risk of Internet addiction [25]. According to emotion enhancement hypothesis, internet addiction is the result of adverse emotions (anxiety, depression) and previous studies support this view [29].

Anxiety/Depression → Internet Addiction: Use and Gratification Theory

Finally, the use and gratification theory (UGT) [24] argues that the satisfaction brought by Internet use increases the risk of Internet addiction. Individuals utilize the Internet to meet

their basic unmet needs in real life. Some researchers have investigated the relationship between students' needs and Instagram addiction and the results showed that recognition needs, social needs, and entertainment needs are all causes of Instagram addiction [30]. This predictive relationship emphasizes the motivation for Internet use. Individuals are driven by relieving negative emotions or compensating for unmet needs through Internet use, thus leading to Internet addiction.

Internet Addiction—Anxiety/Depression: Social Displacement Hypothesis and the Poor-Get-Poorer Hypothesis

Theoretical models supporting the predictive effects of Internet addiction on anxiety and depression include the social displacement hypothesis [10] and the poor-get-poorer hypothesis [16]. The social displacement hypothesis holds that individuals spend much time on online social interaction, which may lead to depression [9, 10] by reducing face-to-face communication with their families or friends, hindering the development of their interpersonal relationships and social skills [10]. Similar to the social displacement hypothesis, the poor-get-poorer model posits that individuals with maladjustment issues may suffer more negative effects because of excessive use of the Internet [11]. This predictive relationship focuses on the adverse emotional outcomes of Internet use. Internet addiction can trigger anxiety and depression by preventing realistic communication or the development of social skills.

Bidirectional Association Between Anxiety/Depression and Internet Addiction: The Problematic Social Psychological Tendency Model

Besides, a bidirectional association between anxiety/depression and Internet addiction has been proposed. The problematic social psychological tendency model [31] posits that individuals with social psychological disorders (such as depressive symptoms) may lack social skills; hence, they prefer online interaction to meet their unsatisfied needs offline [32]. This preference for online interaction makes them use the Internet excessively and impulsively, leading to internalizing problems [10]. In addition to the unidirectional relationship between anxiety/depression and Internet addiction, both cross-sectional and longitudinal studies have supported a bidirectional association between anxiety/depression and Internet addiction [33, 34]. For example, depressed individuals are more inclined to use the internet rather than engage in face-to-face communication and interaction, thereby triggering internet addiction [35], and this in turn further leads to higher levels of depression and anxiety [31]. This predictive relationship emphasizes that emotional

problems and Internet addiction are in a dynamic process of ongoing change. Emotional problems and Internet addiction may form a two-way cycle of mutual transformation or even a downward vicious spiral.

Given the high co-morbidity between anxiety/depression and Internet addiction [15], identifying the common risk factors, protective factors, and outcomes of anxiety/depression and Internet addiction is of great significance.

What Are the Common Risk Factors for Anxiety/Depression and Internet Addiction?

What Kind of Personal Traits Are Associated with Anxiety/Depression and Internet Addiction?

Both internal factors (e.g., personal characteristics) and external factors (e.g., environmental factors) can contribute to anxiety/depression and Internet addiction. For personal traits, neuroticism, shyness, low self-esteem, and low self-control are included. For environmental factors, childhood maltreatment and peer victimization are chosen.

Neuroticism has a direct association with negative emotional experiences such as anxiety and depression [36, 37]. Individuals scoring high on neuroticism tend to adopt more maladaptive coping strategies when dealing with negative events, which increases their risks of anxiety and depression [38]. Moreover, on the basis of the I-PACE model [25], neuroticism may be a risk factor for the emergence and maintenance of Internet addiction. Many studies have found that individuals high in neuroticism are more likely to be addicted to the Internet [39–42], and this association has also been verified across cultures [43].

Shyness has been identified as a distal risk factor for Internet addiction, anxiety, and depression [44]. According to the cognitive-behavioral theory of Internet addiction, shyness can be linked to Internet addiction through maladaptive cognition [22]. Shy individuals perceive Internet as attractive because it does not involve face-to-face interaction, making them feel safer and more comfortable. They tend to exaggerate the benefits of Internet (for example, Internet can help them avoid social anxiety and give them a sense of belonging). Thus, shy individuals may overuse Internet as a way to compensate for their unsatisfied offline social activities, and this may further undermine their offline social support system and increase their risks for anxiety and depression [45].

Self-esteem is closely related to mental health, including anxiety and depression [46]. A meta-analysis summarized a large number of longitudinal studies, and the results showed that self-esteem had a significant predictive effect on depression and anxiety [47]. Another meta-analysis showed

that low self-esteem was an important sign of problematic mobile phone use [48]. Individuals with low self-esteem have negative self-cognition, and they perceive more sense of independence and competence when they are on Internet [49], which at the same time put them at higher risk for using Internet excessively and dependently [50].

According to the self-regulation deficit model, self-control plays a key role in Internet addiction [51]. Individuals with low self-control have a limited ability to suppress immediate impulses. As a result, they may be more likely to develop problematic Internet use behaviors [52]. In addition, low self-control is regarded as one of the risk factors of anxiety and depression [52], and the negative predictive effect of self-control on anxiety and depression is consistent across ages [53].

External factors such as childhood maltreatment and peer victimization are common antecedents of anxiety/depression and Internet addiction. Childhood maltreatment has been found to be associated with a series of internalizing problems, including depression and anxiety [6, 54]. Exposure to childhood maltreatment leads to neuroticism [55] and less interpersonal support [56], which may further trigger anxiety and depression. Childhood maltreatment not only has serious emotional consequences but also induces addictive behaviors to some extent. Many studies have found that childhood maltreatment can directly predict Internet addiction [57], and indirectly predict Internet addiction through negative emotions, personality characteristics, and cognitive components [12, 57]. Specifically, Gu et al. found that childhood maltreatment longitudinally predicted Internet addiction and anxiety/depression via the reduced basic psychological needs satisfaction [6••]. In another study, Guo et al. showed that childhood maltreatment predicted Internet addiction and anxiety/depression via maladaptive emotional regulation strategies [58].

Peer victimization may also be a common risk factor for anxiety/depression and Internet addiction. The stress exposure model [59] holds that negative emotions are a passive responses of individuals to stressors. Peer victimization, as an interpersonal relationship stress, may increase the risk of individuals' anxiety and depression [60, 61]. Moreover, the relationship between peer victimization and anxiety and depression is suggested to be stronger in a relatively healthy environment, a phenomenon known as healthy environment paradox [62–64] suggests that individuals who suffer from peer victimization may use Internet to relieve their stress and negative emotions, and regard it as an important way to deal with stress. Empirically, previous studies have found that peer victimization increases adolescents' anxiety and depression symptoms and the risk for Internet addiction [65, 66].

What Are the Common Protective Factors for Anxiety/Depression and Internet Addiction?

Personal characteristics (e.g., growth mindset, optimism, gratitude, and self-compassion) can act as protective factors against anxiety/depression and Internet addiction. According to the mindset theory, a growth mindset refers to one's belief that individual attributes (such as intelligence and ability) may develop and change over time and can be improved through efforts [67]. Individuals with a growth mindset have more positive cognitive, emotional and physiological responses when challenged with stressors [68••]. This positive perception over mindset can effectively reduce the level of anxiety and depression [67, 69] and the possibility of Internet addiction [67, 70]. A meta-analysis showed that growth mindset was negatively correlated with psychological distress [71•] and Internet addiction [67, 70].

In addition, optimistic individuals are more likely to adopt coping strategies to solve problems [72] and optimism is considered a common protective factor for anxiety/depression and Internet addiction [73, 74]. Studies on optimism confirm that optimism is negatively related with Internet addiction [54, 75], and optimism can be used as a mediator or moderator to reduce depression or anxiety [73].

Similarly, gratitude and self-compassion are common protective factors for anxiety/depression and Internet addiction. Gratitude is related to positive attribution, which can guide individuals to explain life stress events more positively [76, 77], reduce personal stress, and relieve anxiety and depression [78]. Moreover, gratitude may moderate the association between stressful life experience and online gaming addiction via school connectedness [2]. A meta-analysis found that gratitude-based intervention programs were an effective way to reduce anxiety and depression [79].

Self-compassion can resist the negative effects of stress events and build psychological resilience against depressive symptoms and related pathologies [80, 81]. In addition, researchers have explored the underlying mechanisms between gratitude and anxiety/depression. Empirical studies have revealed that gratitude was indirectly related to anxiety and depression through other factors such as rumination, social support, hope, and coping style [76, 77]. Likewise, existing meta-analysis and relevant studies have also shown that self-compassion is negatively related to depression [80, 82] and Internet addiction [83].

Environmental factors that can protect individuals from anxiety/depression and Internet addiction mainly include social support, parent–child relationship, teacher–student relationship, and peer relationship. Firstly, social support

can not only foster positive mental health but also mitigate negative psychological outcomes [16, 84]. According to the buffering model of social support, if individuals feel support and understanding from society, they can supplement their internal psychological resources to promote positive behavior and alleviate negative emotional experiences [85]. The model can also be extended based on recent research, where social support can simultaneously alleviate maladaptive behaviors [44, 86–88]. For instance, social support not only has a considerable direct effect on Internet addiction [44, 86, 87] but also indirectly affects Internet addiction through other factors [88].

Secondly, the positive parent–child relationship may be a protective factor against anxiety/depression and Internet addiction. The ecosystem theory holds that the parent–child relationship is an important part of the family ecosystem [89], which is substantially related to depression [90]. Longitudinal studies have found that poor parent–child relationships are related to an increased risk of major depression [90]. As an important interpersonal relationship in individuals' lives, parent–child relationship plays a vital role in the development of individuals' Internet addiction [91]. Thirdly, positive teacher–student relationships may help students who have social withdrawal tendency to alleviate their loneliness through friendly communication with teachers, regain interpersonal energy, and then transform it into self-energy, thus reducing their depression level [92]. There is evidence that a good teacher–student relationship is an important asset, which can improve the psychological resilience of people with distress and reduce their anxiety and depression [93]. Meanwhile, a positive teacher–student relationship is also a protective factor against Internet addiction [94, 95]. Students who have positive relationships with their teachers are less likely to indulge in Internet [94, 96]. Finally, peers are important others who will affect individuals' cognition and behaviors and good peer relationship can effectively reduce anxiety and depression [97, 98] and the risk of Internet addiction [99].

What Are the Developmental Outcomes of Anxiety/Depression and Internet Addiction?

Several shared consequences of both anxiety/depression and Internet addiction have been reported [1, 100, 101], including academic performance, physical health, and mental health. For academic development, several studies have shown that Internet addiction is negatively associated with academic performance [1]. Students with Internet addiction tend to report higher levels of academic procrastination [102], which ultimately results in lower academic performance [30]. Meanwhile, anxiety and depression can also

lead to low academic performance, poor attention, and low levels of academic motivation [100, 101]. Compared with Internet addiction, the links between anxiety/depression and academic development are more complicated and less visible. On the one hand, depression reduces students' approach motivation and anxiety increases their avoidance motivation, which can impair their academic achievement [103]. On the other hand, the cognitive resource allocation model posits that depression and anxiety can reduce the resources available for self-control [104], putting individuals at risk of paying attention to distracting and irrelevant things. This process may impair their ability to acquire knowledge and undermine their academic performance [103].

Anxiety, depression, and Internet addiction are considered risk factors for physical health. Individuals with Internet addiction spend less time on physical activities, and their body muscle contents are less and fat contents are more than those without Internet addiction [105]. This sedentary life style may lead to problems such as hypertension [106], physical pain (e.g., musculoskeletal pain and neck-shoulder pain). Individuals with Internet addiction may also suffer more sleep problems due to their uncontrolled use of electronic devices, because the excessive use of Internet relevant devices can result in sleep procrastination and deficiency [107, 108]. Additionally, exposure to screens for a long time before bedtime may suppress the secretion of melatonin and cause sleep–wake rhythms disorder [3] as well as poor sleep quality [109]. Similarly, individuals with depression or anxiety also report poor sleep–wake rhythms [110]. Moreover, studies have found that anxiety predicts the persistence or development of chronic musculoskeletal pain [111]. Individuals with high levels of depression often hold negative and catastrophizing thoughts about events, which triggers chronic pain [112].

Anxiety/depression and Internet addiction are considered the main components of mental health (e.g., life satisfaction, positive and negative emotions) [113–115]. The dual-factor model of mental health states that mental health contains not only anxiety and depression but also subjective well-being (life satisfaction, positive and negative emotions) [116]. A three-level meta-analysis showed that Internet addiction was moderately negatively associated with subjective well-being [117]. Individuals with higher levels of Internet addiction tend to socialize online and spend less time on face-to-face communication and social interactions with family and friends. However, online interaction does not provide a deep connections or social support with others [118], and individuals are prone to feel social alienation and loneliness, and report low levels of subjective well-being [114, 118]. Furthermore, when individuals with Internet addiction seek satisfaction from the virtual world and find differences between the virtual world and reality, they will believe that the status quo does not meet their expectations and cannot satisfy their

needs, leading to an increase of negative emotions as well as a decrease in life satisfaction [118]. Besides, as important indicators of mental health, higher levels of depression and anxiety represent lower levels of mental health [119]. A study has also found that depression and social anxiety lead to a decrease in life satisfaction [30]. Individuals with high levels of depression are typically more irritable, stressed, and more prone to form negative self-evaluations and worthless thoughts [120], which leads to more negative emotions.

Conclusions

The proposed relationships between anxiety/depression and Internet addiction are complex. This review research shows that there are three types of relationships between anxiety/depression and Internet addiction, including the unidirectional and bidirectional relationships between them. There is more research on anxiety/depression → Internet addiction than research on Internet addiction → Anxiety/depression as well as the bidirectional relationship between anxiety/depression and Internet addiction. This review deepens our understanding to the links between anxiety/depression and Internet addiction and extends the literature on anxiety/depression and Internet addiction and offers new insights on reducing anxiety/depression and Internet addiction. After weighing the literature, we propose that bidirectional relationships between anxiety/depression and internet addiction may better explain the complex associations. Considering the bidirectional relationships between anxiety/depression and Internet addiction, cognitive behavioral therapy (CBT) aiming at reducing negative emotions can be used to reduce the risk of anxiety/depression and Internet addiction [121–123]. In addition, this study reveals that personal traits such as neuroticism, shyness, sense seeking, low self-control, and low self-esteem may increase the risk of anxiety/depression and Internet addiction. Environmental factors such as childhood maltreatment and peer victimization may put individuals at increased risk of anxiety/depression and Internet addiction. Some protective factors that may protect individuals from anxiety/depression and Internet addiction include personal traits (growth mindset, optimism, gratitude, self-compassion) and environmental factors (social support, parent–child relationship, teacher–student relationship, peer relationship). Interventions aimed at improving the protective factors mentioned in this study may help those less affected by anxiety/depression and Internet addiction. Considering the negative influence of anxiety/depression and Internet addiction on academic development, and physical and mental health, it is necessary to take some actions to reduce the risk factors or enhance the protective factors. To advance our understanding, future studies should investigate the causal directions between anxiety/depression and internet addiction and explore the negative effects of different types of

Internet addiction on development outcomes and investigate the underlying mechanisms between them.

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Data Availability No datasets were generated or analysed during the current study.

Declarations

Conflict of Interest The authors declare no competing interests.

Human and Animal Rights and Informed Consent This article does not contain any studies with human or animal subjects performed by any of the authors.

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