

## Attention-deficit/hyperactivity disorder traits: prevalence and differential association with internet addiction

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### Article Info

#### Article history:

Received Apr 10, 2025

Revised Oct 5, 2025

Accepted Nov 16, 2025

#### Keywords:

Attention-deficit/hyperactivity disorder

Differential association

Internet addiction

Prevalence

University student

### ABSTRACT

Attention-deficit/hyperactivity disorder (ADHD) traits in adults have garnered global attention due to their detrimental effects on individuals' daily functioning. To date, there has been a scarcity of studies conducted on adult ADHD traits in Malaysia, particularly among university students. Therefore, this study aimed to explore the prevalence of ADHD, examine the correlation and predictive relationship between ADHD and internet addiction, compare internet addiction between ADHD screen-positive and screen-negative individuals, and determine the gender differences in ADHD. This study adopted a cross-sectional quantitative design, involving 1,204 voluntarily participating respondents. Data were collected using the Internet Disorder Scale (IDS-15) and the Adult ADHD Self-Report Scale (ASRS) v1.1. The findings revealed that more than a quarter (27.80%) of participants screened positive for ADHD traits. Additionally, a significant positive correlation and predictive relationship were identified between adult ADHD traits and internet addiction. Furthermore, internet addiction levels were significantly higher among ADHD screen-positive individuals compared to ADHD screen-negative individuals. However, no significant gender differences were observed in ADHD traits. Effective interventions should be developed to mitigate the adverse effects of ADHD traits on the daily functioning of university students. Moreover, efforts to address internet addiction should consider the presence of ADHD traits in this population.

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## 1. INTRODUCTION

Attention-deficit/hyperactivity disorder (ADHD) is a neurodevelopmental and behavioral disorder that originates in childhood and is characterized by inattention, impulsivity, or hyperactivity [1], [2]. The symptoms must occur before twelve years old, persist for at least 6 months, and cause functional impairments in at least 2 settings to be diagnosed with ADHD [1]. Numerous studies have demonstrated that ADHD symptoms often persist into adulthood [3], [4], with an estimated prevalence of approximately 4.40%-7.00% among adults [4], [5]. Given that traits such as inattention and impulsivity are also observed in the general adult population, it has been suggested that ADHD exists on a continuum, with the disorder representing the extreme end of ADHD-related symptoms [6]. From a neurobiological perspective, this neurodevelopmental disorder is conceptualized as existing on a continuum of behavioral, cognitive, and

biological differences, rather than representing a discrete diagnostic category [7]. In managing their daily routines, adults with ADHD often struggle with following instructions, maintaining concentration, remembering essential details, and completing tasks within designated timeframes [8]–[10]. Moreover, ADHD appears to impair executive functioning, thereby increasing the risk of sleep disturbances, academic failure, occupational underachievement, functional impairments, criminal behavior, accidents, financial difficulties, and marital breakdown [11]–[13]. Even more concerning, previous studies have indicated that ADHD frequently coexists with psychiatric disorders such as anxiety, depression, oppositional defiant disorder, conduct disorder, and substance use disorders [14]–[16]. Additionally, ADHD has been linked to internet addiction [17]–[19], with reported comorbidity rates ranging from 37% to 49% [20], [21].

The internet is a double-edged sword. While its architecture has revolutionized communication and streamlined daily activities, excessive internet use can lead to undesirable consequences, including mental health issues such as depression and anxiety [22], reduced productivity, physical ailments like back and neck pain, and social withdrawal [23]. Although internet addiction is not yet classified as a clinical disorder in the Diagnostic and Statistical Manual of Mental Disorders: fifth edition (DSM-5) [1], it has been a growing global concern for the past two decades due to its detrimental effects on daily functioning [24], [25]. This behavioral addiction and impulse control disorder is characterized by an inability to regulate internet use, prioritizing online activities to the extent that other life domains are neglected, and persisting in excessive internet use despite its negative consequences [25], [26]. Even though general internet addiction is not officially recognized as a clinical disorder in the DSM-5 [1], specific internet-related issues, such as internet gaming disorder and internet gambling disorder, have been identified as conditions warranting further study [27]. Further research on internet addiction should be conducted in Malaysia, as previous studies suggest that the severity of internet addiction is greater in Asian countries compared to the United States [17], [24].

## 2. LITERATURE REVIEW

### 2.1. Prevalence of ADHD traits in adults

In the United States, the prevalence of ADHD in adulthood is estimated at 4.40% [5]. However, in Asian countries, prevalence rates measured using self-reported scales vary significantly. A study conducted in Southern China found that 4.50% of university students met the diagnostic criteria for ADHD [21]. In contrast, studies in Japan by Tateno *et al.* [28], [29] revealed that between 20.90% and 27.00% of college students screened positive for ADHD traits, as measured using the Adult ADHD Self-Report Scale (ASRS) v1.1. These studies focused on general college and university students, whereas research on medical students has yielded different findings. Shen *et al.* [30] reported that the prevalence of ADHD among medical students in China was 3.50%. Meanwhile, a study in India found that more than half of medical students (54.90%) exhibited ADHD symptoms, as assessed using the ASRS v1.2 [31]. These discrepancies suggest that prevalence rates among university students in Asian countries such as China, Japan, and India vary significantly. In Malaysia, previous studies conducted among inmates, mental health inpatients, and working adults have reported adult ADHD prevalence rates ranging from 8% to 30% [15], [32], [33]. The only existing study on local undergraduates indicated that as many as 39% of students exhibited ADHD symptoms [14]. However, this finding reflects data from a single university in Pahang, one of Malaysia's 13 states and 3 federal territories, and does not represent the country as a whole. Additionally, the study's small sample size ( $n=186$ ) limits its generalizability. Given these considerations, this study aimed to explore the prevalence of ADHD traits among university students in Malaysia to raise awareness of ADHD-related characteristics within the general university student population.

### 2.2. Relationship between ADHD and internet addiction

The relationship between non-clinical, trait-level ADHD and internet addiction in adults has gained significant global attention over the past decade. According to dual systems theory, the dominance of the impulsive system is reflected in the hyperactivity and impulsivity observed in the daily functioning of adults with ADHD. Internet environments often offer instant gratification, thereby reinforcing impulsive behaviors and bypassing reflective control [34]. In examining this correlation, an increasing number of cross-sectional studies have reported a significant positive association between ADHD and internet addiction among university students [10], [31], as well as adults [35]. More specifically, both inattention and hyperactivity or impulsivity have been found to be positively linked to online gaming but negatively associated with online learning and information downloading among university students [21]. Additionally, online shopping has been associated with hyperactivity or impulsivity but not inattention [21]. Meta-analysis studies [22], [36] further support the link between ADHD symptoms, including attention deficits, hyperactivity, and impulsivity, and problematic internet use. However, while Augner *et al.* [22] reviewed studies across various age groups, Wang *et al.* [36] focused solely on adolescent and adult samples, excluding children. Although

existing research highlights a correlation between ADHD and internet addiction, further investigation within the Malaysian context is necessary due to the limited number of local studies. A deeper understanding of this relationship is essential before effective interventions can be designed and implemented for university students.

Regarding the role of ADHD traits in predicting internet addiction, previous studies have shown that adult ADHD is a significant predictor of internet addiction [21], [31]. A study found that university students with inattention symptoms were twice as likely to develop internet addiction, whereas those exhibiting hyperactivity symptoms were 2.4 times more likely to experience internet addiction [19]. However, the generalizability of these findings is limited, as the study exclusively surveyed respondents from a public university in Selangor, one of Malaysia's 13 states and 3 federal territories. Research conducted among university students in China and Turkey similarly found that both inattention and hyperactivity or impulsivity significantly predicted internet addiction, with inattention having a greater effect size [21], [37]. Regarding studies on adults, Li *et al.* [38] reported that impulsiveness and behavioral inhibition were significant predictors of internet addiction among individuals with ADHD traits. Conversely, Aydin *et al.* [35] found that inattention but not hyperactivity or impulsivity was a predictor of internet addiction among young adults. These inconsistencies in previous findings highlight the need for further research. Establishing whether ADHD traits serve as risk factors for internet addiction among university students across various institutions in Malaysia would provide valuable insights. Such evidence could enable psychologists and counselors to design and implement more effective strategies and treatment plans to mitigate internet addiction.

Regarding the likelihood of university students with ADHD symptoms developing internet addiction, previous research conducted in Southern China, India, and Japan has shown that these students are significantly more prone to internet addiction compared to their peers without ADHD symptoms. The prevalence rates among university students with ADHD symptoms were reported as 48.90%, 35.70%, and 18.20% in Southern China, India, and Japan, respectively, whereas their counterparts without ADHD symptoms exhibited considerably lower rates of 14.30%, 11.10%, and 1%, respectively [10], [21], [29]. Similarly, Tateno *et al.* [28] found that Japanese college students who screened positive for ADHD scored significantly higher on measures of internet addiction compared to those who screened negative. Specifically, among students who tested positive for ADHD, 67.90% were classified as possible addicts, while 8.30% were categorized as severe addicts. In contrast, among students who screened negative for ADHD, the percentages were lower, with 56.50% identified as possible addicts and only 2% classified as severe addicts [28]. To date, no similar study has been conducted in Malaysia, leaving uncertainty about whether Malaysian university students with ADHD traits are more likely to experience internet addiction.

The underlying reasons why adults with ADHD are more vulnerable to excessive internet usage may stem from impaired inhibition, which leads to a lack of self-control [20], [30], [36], as well as a lack of strategic flexibility, resulting in poor self-regulation [39]. Additionally, individuals with ADHD are prone to boredom and have an aversion to delayed rewards, which further contributes to excessive internet use as they seek immediate gratification and relief from boredom [36], [40]. Furthermore, since individuals with ADHD have a diminished ability to respond to punishment, they tend to disregard the negative consequences of excessive internet usage [10]. They are also more likely to exhibit sensation-seeking personality traits, characterized by a desire for new and varied experiences [20], [41]. As a result, they often browse multiple windows simultaneously and swiftly jump from one online activity to another.

### 2.3. Gender differences in adult ADHD

Gender differences in childhood ADHD have been extensively studied for many years. Studies have generally found that male are 3 to 16 times more likely to be diagnosed with ADHD than female [42]. A meta-analysis conducted by Augner *et al.* [22], which reviewed previous studies on children, adolescents, and adults, revealed significant gender differences in ADHD. Specifically, samples consisting predominantly of male respondents exhibited significantly higher attention deficit and hyperactivity [22]. However, recent studies focusing solely on adult samples have yielded differing results. Several studies [20], [31], [42] found no significant gender differences in ADHD among adults. In Malaysia, no prior studies have examined gender differences in adult ADHD to date. Such research is crucial to better understand the nature of gender differences in adult ADHD and to guide the development of effective treatment approaches for male and female adults in Malaysia.

### 2.4. Present study

The study aimed to i) explore the prevalence of ADHD traits among university students in Malaysia; ii) examine the relationship between ADHD traits and internet addiction; iii) investigate ADHD traits as predictors of internet addiction; iv) compare internet addiction between ADHD screen-positive and ADHD screen-negative individuals; and v) determine the gender differences in ADHD traits among university students in Malaysia. This study is among the first to compare internet addiction between ADHD screen-

positive and ADHD screen-negative individuals, as well as to explore significant gender differences in ADHD traits among Malaysian university students. The findings aim to deepen our understanding of the risk factors for internet addiction and provide valuable insights into interventions designed to mitigate excessive internet use in adults with ADHD traits. Additionally, addressing ADHD traits and internet addiction among Malaysian university students aligns with the United Nations' sustainable development goal (SDG) 3-good health and well-being. Since ADHD traits and internet addiction are associated with negative academic, behavioral, and mental health outcomes, effectively managing these traits and reducing internet addiction can contribute to overall well-being.

### 3. METHOD

#### 3.1. Participants and data collection

A total of 1,204 university students from both public and private universities in Malaysia voluntarily participated in this study. Participants are from four main regions in Peninsular Malaysia: Northern, Central, Southern and Eastern, and East Malaysia. Most participants were female ( $n=864$ ; 71.75%) compared to male participants ( $n=340$ ; 28.25%). The average age of the participants was  $21.8 \pm 2.0$  years. The racial composition was reported as: 61.50% Malays, 17.80% Chinese, 11.80% Indians, and 8.90% Bumiputra groups. Approval for the study was obtained from the Universiti Malaya Research Ethics Committee (UMREC) (UM.TNC2/UMREC\_2785) prior to the data collection. Data collection was conducted using an anonymous online survey form created via Google Forms. Participants were recruited through convenience sampling, with the survey link distributed across social media platforms and online forums affiliated with Malaysian universities. To qualify for participation, individuals had to meet the following criteria: i) be aged 18 years and above; ii) hold Malaysian nationality; and iii) be currently enrolled at a university in Malaysia. Relevant information about the study, including its purpose and assurances of data confidentiality, was provided to participants. Informed consent was obtained prior to survey completion.

#### 3.2. Instruments

This study adopted a cross-sectional quantitative design. The questionnaire included items on demographics, the ASRS v1.1, and the Internet Disorder Scale (IDS-15). The ASRS v1.1 symptom checklist is an 18 items self-report instrument designed to assess ADHD in adults, based on the World Health Organization Composite International Diagnostic Interview and aligned with DSM criteria [43]. Large-scale cross-cultural research involving 42 countries has confirmed that the ASRS v1.1 maintains good internal consistency and partial measurement invariance across diverse languages and nations [44]. In Malaysia, ASRS v1.1 has demonstrated excellent internal consistency and psychometric profiles [32]. The ASRS v1.1 consists of two parts: part A (6 items) and part B (12 items). Participants were asked to indicate how often each symptom occurred over the previous 6 months, using five response options: never, rarely, sometimes, often, or very often. For all 18 items, participants were classified as positive if their responses were "often" or "very often". Additionally, for items 1, 2, 3, 9, 12, 16, and 18, a response of "sometimes" was also scored as positive. Part A is recommended as a screening tool for adult ADHD, and participants are considered positive on the ASRS v1.1 if they endorse 4 or more items in part A at the specified threshold levels. Accordingly, participants in this study were divided into two groups: positive ADHD screen and negative ADHD screen. Although part B is not used for diagnostic purposes, the frequency scores from part B are utilized to compute ADHD subscales among individuals in the positive ADHD screen group. These subscales can assist in identifying ADHD subtypes as defined in the DSM-5. According to Stanton *et al.* [45], there are three ADHD subtypes: inattentive, hyperactive/impulsive (motor), and hyperactive/impulsive (verbal).

For IDS-15, it consists of 15 items grouped into four factors: i) escapism and dysfunctional emotional coping; ii) withdrawal symptoms; iii) impairments and dysfunctional self-regulation; and iv) dysfunctional internet-related self-control [46]. Participants were asked to rate their internet usage over the past 12 months, using a 4-point Likert scale ranging from "strongly disagree" to "strongly agree". Higher scores reflect a greater tendency toward internet addiction. IDS-15 was developed to assess internet addiction according to nine internet gaming disorder (IGD) criteria as suggested by the American Psychological Association in the latest edition of the DSM-5. It reported exhibiting adequate levels of validity and be used in global studies [47]–[49]. A systematic review study indicated that the IDS-15 achieved good results in terms of psychometric properties among children and adolescents [50]. In general, the reliability of the IDS-15 and the ASRS v1.1 was established, demonstrating strong internal consistency, with Cronbach's alpha coefficients of 0.806 and 0.816, respectively.

### 3.3. Data analysis

SPSS statistics version 21.0 was used to analyze the data in this study. Descriptive statistics, including mean, standard deviation, frequency, and percentage, were utilized to explore the prevalence of ADHD traits among university students in Malaysia. Inferential analyses, specifically the Pearson correlation coefficient and regression analysis, were employed to examine the relationship between ADHD traits and internet addiction, as well as to assess ADHD traits as predictors of internet addiction among university students in Malaysia. Additionally, the independent samples t-test was employed to compare internet addiction between ADHD screen-positive and ADHD screen-negative individuals, as well as to analyze gender differences in ADHD traits.

## 4. RESULTS AND DISCUSSION

### 4.1. Prevalence of ADHD traits

As shown in Table 1, the findings indicate that a total of 335 participants (27.80%) screened positive in the present study, comprising 102 males (30.40%) and 233 females (69.60%). The prevalence of ADHD traits found in this study is significantly higher than the global adult prevalence rate of 4.40%, as reported by Kessler *et al.* [5]. However, the prevalence rate observed in this study is lower than the 39% reported among undergraduates at a university in Pahang [14]. It is important to note that this finding is not generalizable, as it focuses on only one of Malaysia's 13 states, specifically one university in Pahang, with a relatively small sample size ( $n=186$ ). In the context of Asian countries, the prevalence of ADHD traits identified in this study is considerably higher than the 4.50% reported among university students in Southern China [21], yet closely aligns with the 27% prevalence observed among college students in Japan [28]. Like the research conducted by Tateno *et al.* [28], this study assessed ADHD traits using the ASRS. Variations in ADHD prevalence across studies may be influenced by differences in self-reported assessment tools used to evaluate ADHD traits among university students. Additionally, stigma and a lack of awareness regarding mental health disorders may discourage Malaysian university students from openly discussing ADHD-related concerns with their peers, parents, lecturers, or mental health practitioners. Consequently, they may attempt to conceal their symptoms in daily interactions, preventing early detection and intervention.

Table 1. Prevalence of ADHD traits

Gender	ASRS-v1.1 Part A screen positive (n=335)		ASRS-v1.1 Part A screen negative (n=869)	
	Frequency	%	Frequency	%
Male	102	30.40	238	27.40
Female	233	69.60	632	72.60

### 4.2. Relationship between ADHD traits and internet addiction

As shown in Table 2, a significant positive relationship was found between ADHD traits and internet addiction ( $r=0.291$ ,  $p<0.01$ ). Additionally, all indicators demonstrated a significant positive relationship, except for the relationship between hyperactive/impulsive (both motor and verbal) traits and factor 1 and factor 4. The magnitude of these relationships ranged from weak to moderate. According to Cohen [51], the effect size of these relationships ranged from small ( $r=0.10$ ) to medium ( $r=0.30$ ). Similarly, previous studies [10], [21], [31] on university students also revealed significant positive associations between ADHD traits and internet addiction. Among ADHD traits, inattention appears to have the strongest correlation with internet addiction, as it was positively associated with all four factors of internet addiction. In contrast, motor and verbal impulsivity or hyperactivity were linked to only 2 out of the 4 factors. A primary characteristic of inattention is a tendency to become easily bored. The internet effectively mitigates boredom by allowing users to engage in multiple activities simultaneously [36], [37]. When browsing the web, students with inattentional traits may open multiple windows at once and rapidly shift from 1 online item to the next.

### 4.3. ADHD traits as predictors of internet addiction

As shown in Table 3, the regression model examining ADHD traits as predictors of internet addiction demonstrated a good fit at the .01 level of significance. The findings revealed that ADHD traits significantly and positively predicted internet addiction among Malaysian university students,  $F(3,1200)=42.856$ ,  $p<0.01$ . However, ADHD traits accounted for only 9.70% of the variance in internet addiction. Effect size for the overall model reported in the level of medium effect,  $f^2=0.107$  [51]. The standardized beta values indicated that inattention ( $\beta=.285$ ,  $t=8.098$ ,  $p<0.01$ ) and verbal traits ( $\beta=.0761$ ,  $t=2.395$ ,  $p<0.05$ ) contributed significantly to internet addiction. Similarly, prior researches [19], [21], [31] also demonstrated that ADHD is

a significant predictor of internet addiction. Moreover, studies indicate that individuals with ADHD are more vulnerable to developing internet addiction compared to those with other behavioral or emotional disorders [37], [52]. Additionally, individuals with high impulsivity are more likely to exhibit symptoms of internet pornography use disorder [53], [54]. Due to cognitive and motivational dysfunction, university students with ADHD traits are particularly drawn to internet activities, which offer abundant stimuli, instant responses, and immediate rewards. These features effectively minimize their aversion to delayed rewards [21]. In the virtual world, adults with ADHD can experience positive emotions and build friendships more easily, which are rarely acquired in real life.

In this study, inattention was found to contribute more to internet addiction than motor and verbal impulsivity or hyperactivity. This finding is supported by Dalbudak *et al.* [37] and Zhang *et al.* [21], who discovered that inattention has a greater effect size in predicting internet addiction compared to hyperactivity or impulsivity. Inattention appears to play a more significant role, as Aydin *et al.* [35] found that, among young adults, inattention but not hyperactivity or impulsivity predicted internet addiction. From a developmental perspective, hyperactivity and impulsivity symptoms tend to diminish over time, whereas attention deficits are more likely to persist into adulthood [35]. Consequently, inattention symptoms may be more prevalent among university students and exert a greater influence on their online behaviors. However, this assumption requires further testing and verification.

Table 2. Relationship between ADHD traits and internet addiction

Indicators	1	2	3	4	5	6	7	8
ADHD								
Inattention	0.908**							
Motor	0.812**	0.591**						
Verbal	0.702**	0.455**	0.456**					
Internet addiction	0.291**	0.304**	0.177**	0.194**				
Factor 1	0.104**	0.119**	0.046	0.071	0.553**			
Factor 2	0.261**	0.243**	0.207**	0.176**	0.792**	0.368**		
Factor 3	0.217**	0.229**	0.113**	0.164**	0.673**	0.011	0.355**	
Factor 4	0.157**	0.191**	0.077	0.074	0.540**	-0.004	0.247**	0.316**

\*\* Correlation is significant at the 0.01 level (2-tailed).

Factor 1 (escapism and dysfunctional emotional coping); factor 2 (withdrawal symptoms); factor 3 (impairments and dysfunctional self-regulation); and factor 4 (dysfunctional internet-related self-control).

Table 3. ADHD traits as predictors of internet addiction

Coefficients	B	$\beta$	t	Sig t	
Inattention	0.069	0.285	8.098	<0.01	
Motor	0.011	0.027	0.761	0.447	
Verbal	0.037	0.076	2.395	0.017	
ANOVA	Sum of square	df	Mean square	F	Sig
Regression	35.996	3	11.999	42.856	<0.01
Residual	335.968	1200	0.280		
Total	371.964	1203			

Note:  $R^2=0.097$  (9.70%)

#### 4.4. Comparison of internet addiction between ADHD screen-positive and ADHD screen-negative individuals

As shown in Figure 1, the findings indicate that the mean internet addiction test score for ADHD screen-positive individuals ( $3.00 \pm 0.59$ ) was significantly higher than that of ADHD screen-negative individuals ( $2.73 \pm 0.52$ ),  $t(1202) = -7.372$ ,  $p < 0.001$ . The effect size, calculated using eta squared, ranged from 0.01 to 0.04, suggesting a small to moderate difference in internet addiction between ADHD screen-positive and ADHD screen-negative individuals. Additionally, each factor of internet addiction was found to differ significantly between ADHD screen-positive and ADHD screen-negative individuals. These findings align with previous studies conducted in Asian countries, which demonstrated that university students with ADHD symptoms are far more likely to develop internet addiction than their peers without ADHD symptoms [10], [21], [29]. Some researchers have suggested that abnormalities in reinforcement mechanisms, such as excessive pursuit of rewards, a heightened preference for instant gratification, and insensitivity to punishment, may contribute to the increased susceptibility to internet addiction in adults with ADHD [10], [36]. Disinhibition is often associated with poor self-control and difficulties in emotional regulation [20], [30]. Thus, internal disinhibition and external impulsive behaviors likely play a significant role in excessive internet use among university students who screen positive for ADHD traits.

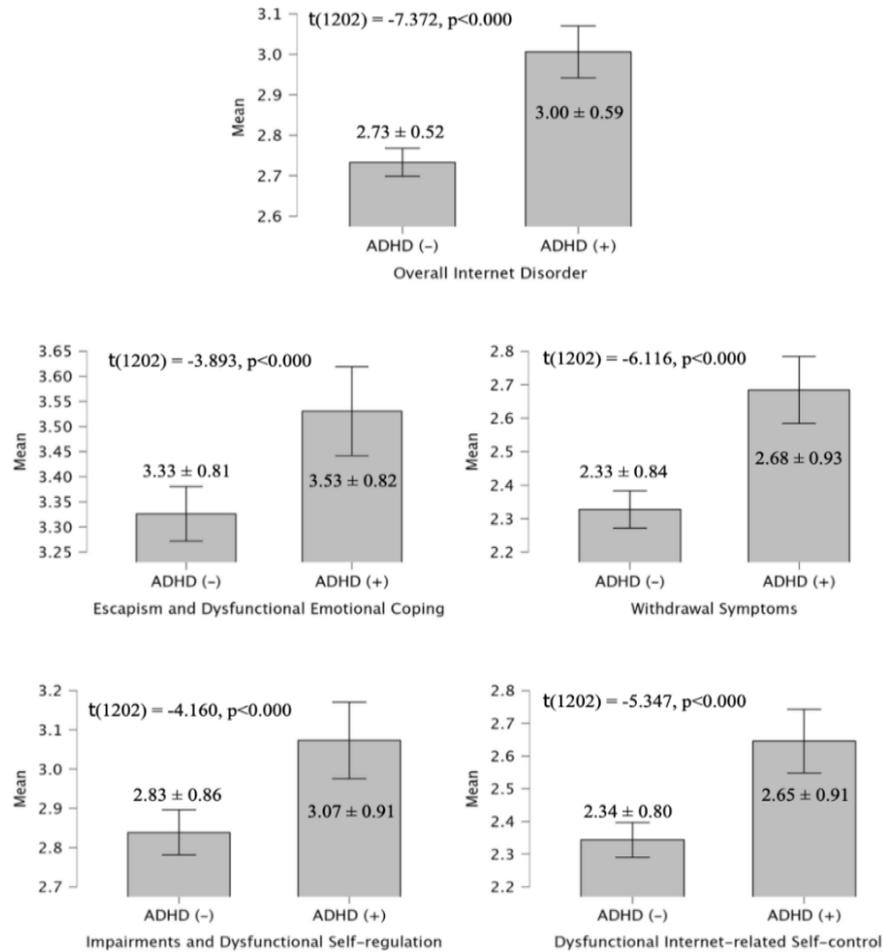


Figure 1. Comparison of internet addiction between ADHD screen-positive and ADHD screen-negative individuals

**4.5. Gender differences in ADHD traits**

As shown in Table 4, the findings indicate that there was no significant gender difference in ADHD traits,  $t(1202)=1.88, p>0.05$ . This suggests that the mean ADHD traits test score for male university students was not significantly higher than female university students. Additionally, no significant differences were reported between male and female university students in Malaysia for each ADHD trait.

Similarly, previous research [20], [31], [42] reported no significant gender differences in ADHD among adults. A plausible explanation for why males no longer exhibit significantly higher ADHD traits than females in adulthood may lie in the changes in symptom presentation. In childhood, ADHD is more readily detected in male, as they tend to display more impulsive behaviors, whereas female often exhibit inattentive behaviors, which are more likely to be overlooked. As individuals mature, impulsive behaviors tend to diminish, while inattentive traits persist, resulting in a more balanced gender distribution of ADHD in adulthood.

Table 4. Gender differences in ADHD traits

	Gender	Mean	Standard deviation	t	Sig. (2-tailed)
ADHD	Male	6.42	4.04	1.88	0.061
	Female	5.94	3.96		
Inattention	Male	3.66	2.29	1.26	0.208
	Female	3.47	2.30		
Motor	Male	1.38	1.39	1.84	0.067
	Female	1.22	1.35		
Verbal	Male	1.38	1.17	1.80	0.072
	Female	1.24	1.12		

**5. CONCLUSION**

There are several limitations to consider in this study. Future research could adopt random sampling to generate more representative samples. The use of convenience sampling resulted in a markedly unequal gender distribution, with approximately 28% male and 72% female participants among Malaysian university students. Although the findings offer valuable insights into ADHD traits and internet addiction among university students in Malaysia, the sample may not adequately reflect the target population, thereby limiting the generalizability of the results. To improve generalizability, future research should consider employing stratified random sampling to obtain more representative samples. This approach facilitates proportional representation across relevant strata, such as gender. Another limitation of this quantitative study, which relies on self-reported measures, is the potential for respondents to provide socially desirable responses regarding ADHD traits and internet addiction to present themselves positively. This may compromise the accuracy of the responses. While this drawback cannot be eliminated, it can be mitigated by administering an instrument to assess social desirability, including positive and negative impressions, concurrently with the administration of the instruments in the study. Last but not least, future studies are recommended to explore the direct and indirect effects of AI literacy, alexithymia, psychological capital, addictive screen use, and bedtime procrastination on internet addiction among university students in Malaysia, in order to enhance explanatory power, given that the current regression model accounts for only 9.7% of the variance in internet addiction.

The findings of this study are highly valuable in raising public awareness about the importance of addressing adult ADHD. Early identification can significantly enhance the mental health of university students struggling with inattention and impulsivity. In light of this, it is proposed that campus counselling centers implement ADHD screening initiatives to facilitate early detection, which can then inform personalized interventions. Rather than relying on one-size-fits-all approaches, tailored interventions should be developed to mitigate the adverse effects of adult ADHD on the daily functioning of university students in Malaysia. Additionally, both the government and university management should actively promote coping strategies and help-seeking behaviors among individuals affected by neurodevelopmental disorders. Psychoeducation and interventions targeting excessive internet use should also account for the presence of ADHD traits among students. Peer support groups and approaches grounded in cognitive behavioral therapy (CBT) can be employed to improve attention, impulse control, and healthy digital engagement. During the intervention process, digital tools such as screen time trackers may be used to monitor behavioral changes. In this technological era, psychology experts can collaborate with IT specialists to develop gamified interventions that help manage ADHD traits and redirect digital engagement among these tech-savvy individuals. For instance, cognitive training games may be designed to enhance attention span and impulse control in adults with ADHD. Additionally, digital detox games could be considered to reduce compulsive browsing behaviors. Mental health professionals should further advocate for neurodevelopmental literacy and digital hygiene among students, parents, and educators. Finally, subject-matter experts are encouraged to collaborate with relevant authorities and the Ministry of Health to develop guidelines for healthy digital engagement and inclusive mental health policies.

**FUNDING INFORMATION**

This research is supported by Universiti Malaya Malaysia under UM International Collaboration Grant (Project no: ST010-2022).

**AUTHOR CONTRIBUTIONS STATEMENT**

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C : Conceptualization

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Fo : Formal analysis

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P : Project administration

Fu : Funding acquisition

## CONFLICT OF INTEREST STATEMENT

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article. Additionally, we hereby declare that this is an original work. It has not and is not being submitted or published elsewhere.

## DATA AVAILABILITY

The data that support the findings of this study are available from the corresponding author, [SY-L], upon reasonable request.

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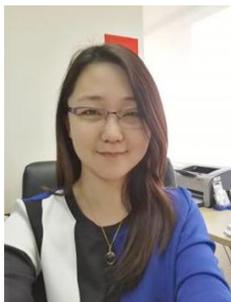
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