Assessing the Impact of Essential and Leisure Internet Use and Related Happiness on Internet Addiction in Early and Middle Adolescents: A Cross-Sectional Study

Khansa Chemnad, Maryam Aziz, Sanaa Al- Harahsheh, Azza Abdelmoneium, Ahmed Baghdady, Diana Alsayed Hassan, Raian Ali

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Abstract

Background: Adolescent Internet addiction (IA) has become a growing concern in today's society as the use of technology and the Internet has become increasingly prevalent in the lives of young people.

Objective: Our study aims to differentiate between screen time spent on essential activities and non-essential Internet activities and how they relate to internet addiction (IA) in early and middle adolescents. Conducted among adolescents of Arab origin, our study addresses the limitation of the literature, which predominantly focuses on WEIRD (Western, educated, industrialized, rich, and democratic) populations.

Methods: This study surveyed 377 adolescents in Qatar. The survey gathered information on participants' demographics, the Internet Addiction Diagnostic Questionnaire, time spent on essential and non-essential Internet use, and subjective happiness associated with the amount of time spent on non-essential Internet use. Factorial analysis, multiple regression, and logistic regression were used for statistical analysis.

Results: Time spent on non-essential Internet use predicted IA in early and middle adolescents, whereas essential Internet use did not. Happiness with time spent on non-essential Internet use negatively predicted IA in middle adolescents only; greater dissatisfaction led to a higher IA risk.

Conclusions: Conclusion: Findings suggest that interventions aimed at addressing IA should focus on addressing non-essential use specifically rather than considering Internet use and screen time in general as a single entity. This approach can help effectively address factors contributing to IA.

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Abstract

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Internet activities and how they relate to internet addiction (IA) in early and middle adolescents. Conducted among adolescents of Arab origin, our study addresses the limitation of the literature, which predominantly focuses on WEIRD (Western, educated, industrialized, rich, and democratic) populations.

Methods: This study surveyed 377 adolescents in Qatar. The survey gathered information on participants' demographics, the Internet Addiction Diagnostic Questionnaire, time spent on essential and non-essential Internet use, and subjective happiness associated with the amount of time spent on non-essential Internet use. Factorial analysis, multiple regression, and logistic regression were used for statistical analysis.

Results: Time spent on non-essential Internet use predicted IA in early and middle adolescents, whereas essential Internet use did not. Happiness with time spent on non-essential Internet use negatively predicted IA in middle adolescents only; greater dissatisfaction led to a higher IA risk.

Conclusion: Findings suggest that interventions aimed at addressing IA should focus on addressing non-essential use specifically rather than considering Internet use and screen time in general as a single entity. This approach can help effectively address factors contributing to IA.

KEYWORDS: Internet addiction, Internet use, early adolescence, middle adolescence.

Introduction

Adolescent Internet addiction (IA) has become a growing concern in today's society as the use of technology and the Internet has become increasingly prevalent in the lives of young people. According to a study conducted by the Pew Research Center, since 2014-2015, there has been a modest increase in the proportion of adolescents who say that they use the Internet daily or more often [1]. In a follow-up study in 2022, 97% of adolescents said they used the Internet daily, compared to 92% of adolescents who said the same in 2014-2015. It is understandable that many adolescents struggle with IA, given the widespread use of the Internet. Studies have shown that approximately 10% of adolescents are at risk of IA, with even higher rates reported in many countries such as Hong Kong, China, and Korea [2], [3], [4], [5]. For example, a survey conducted in Korea found that nearly 30% of junior high school students were either addicted to the Internet or at a risk of IA [6]. While some Internet use can be beneficial for educational and social purposes, excessive use can lead to negative consequences, such as decreased academic performance, social isolation, and even mental health issues [7], [8], [9]. Therefore, it is important to understand the prevalence of IA among adolescents and its contributing factors.

IA is defined as the inability to control Internet usage, leading to disruptions in everyday functioning, and symptoms of withdrawal and tolerance [10]. Although not officially recognised as a disorder in the most recent edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5), IA has received considerable attention in the scientific literature and is regarded as a growing concern [11]. Opinions in the literature differ, with some researchers suggesting distinct diagnostic criteria and subtypes of IA, such as video game and online gambling addiction [12]. However, there is still a lack of consensus regarding its addictive nature and diagnostic criteria [13]. While there is still debate regarding

the exact nature and criteria for IA, it is clear that excessive Internet use can have negative consequences, particularly for adolescents. Understanding the prevalence and factors contributing to IA is important for addressing this growing concern, promoting healthy Internet use, and developing appropriate interventions for those who may be affected.

Most psychological research studies predominantly rely on samples from Western, educated, industrialised, rich, and democratic populations, often referred to as WEIRD [14]. However, when examining the effects of excessive Internet use on adolescent mental health, it is crucial to consider that the experiences of adolescents from non-WEIRD populations may vary owing to many factors such as different cultural norms and access to technology [15]. This emphasises the importance of including more diverse samples in research to gain a comprehensive understanding of the global impact of technology on mental health. Cultural context significantly shapes adolescence, and the encounters of young individuals differ extensively across various cultures [16]. To address this gap, our study focuses on adolescent IA in the Middle East, where limited research on IA has been conducted. In doing so, we aim to shed light on the specific dynamics of IA in this region and contribute to a more inclusive and comprehensive understanding of this phenomenon.

Excessive screen time is often identified as a prominent indicator of IA, contributing to an unhealthy relationship with the Internet and development of negative habits [17], [18]. In numerous studies examining adolescent IA, the amount of time spent online is commonly regarded as a key factor in determining the presence of IA [19], [20]. The COVID-19 pandemic has further heightened reliance on technology for remote learning and socialising among adolescents (Chemnad et al., 2022). The term 'screen time' is frequently used without sufficient attention being paid to the specific activities undertaken during that period. However, this lack of specificity has several methodological limitations. To address these limitations, this study aims to differentiate between the time spent on essential and non-essential Internet use activities, providing a more nuanced understanding of IA in adolescents. However, IA is not just a matter of excessive screen time; it has also been linked to mental health issues, such as loneliness, low self-esteem, sleep problems, depression, social phobia, and anxiety [22], [23]. Adolescents who struggle with these conditions may turn to the Internet as a coping mechanism, further exacerbating their addiction [24]. Ultimately, IA can have a significant negative impact on adolescents' lives, from decreased academic performance to strained relationships with loved ones [25].

RQ1: Do essential and non-essential types of Internet use predict Internet addiction (IA) in early and middle adolescents? Adolescence is a crucial period for identity exploration and formation, during which individuals may encounter situations in which their emerging beliefs and values conflict with societal expectations or their own behaviours, which may lead to cognitive dissonance [26]. This aspect of adolescent development is relevant to the exploration of subjective feelings

regarding digital technology use and its association with IA. Cognitive dissonance theory offers an understanding of this relationship by examining potential conflicts arising from adolescents' subjective feelings regarding their digital technology usage and addictive behaviour. According to the cognitive dissonance theory, individuals experience psychological discomfort when they hold contradictory beliefs, attitudes, or behaviours [27]. In the context of digital technology usage and IA, cognitive dissonance may arise when adolescents recognise the negative consequences of excessive digital technology use, but continue to engage in it. Literature suggests that subjective positive feelings about one's own life conditions are negatively correlated with IA [28]. It is reasonable to hypothesise that similar correlations may exist between subjective feelings regarding digital technology usage and IA. However, specific studies exploring this association are lacking. Given this gap in the literature, this study aims to address this by examining the association between subjective feelings of digital technology usage and IA.

RQ2: Can subjective happiness with non-essential Internet use predict adolescent IA?

Adolescents are growing in an era characterised by rapid technological advancements, and the use of smartphones has become a common part of their daily lives. This pervasive technology has greatly influenced their interactions with the Internet, particularly social networking sites [29]. Consequently, this has had a profound impact on various aspects of their lives, including social dynamics, cognitive development, and emotional wellbeing. The literature indicates notable distinctions between early and middle adolescents in terms of cognitive and psychological development [30]. It is critical to distinguish between early and middle adolescence when investigating adolescent IA, owing to the distinct developmental traits, experiences, and coping strategies that occur throughout these separate phases of adolescence [31]. Early adolescence is a critical period defined by the start of puberty and the transition from childhood to adolescence. This stage is distinguished by rapid physical, cognitive, and social changes, as well as identity exploration and self-concept construction [32], [33]. Furthermore, early adolescence is a critical time for the initiation and development of mental health issues [34]. Middle adolescence is characterised by managing the complications of moving into young adulthood [35]. They become more self-sufficient, engage in complex social connections, and gain feelings of autonomy [36]. If these aspects of development are not addressed properly during adolescence, consequences may have a lasting impact in their adulthood. Researchers must examine the diverse vulnerabilities, risk factors, and patterns of Internet usage among early and middle adolescents while studying IA during these different phases. Early adolescents may be more vulnerable to IA because they are constantly trying new things, including online platforms, to define their identities

and connect with friends [33]. Middle adolescence, on the other hand, is characterised by the emergence of more stable patterns of behaviour, including Internet use, as adolescents approach young adulthood and deal with increasing academic and social demands [37]. Furthermore, research has shown that characteristics that influence IA change between early and middle adolescence [38]. For example, parental supervision and advice may have a greater effect among early adolescents, but peer influence and social support may become more significant in middle adolescence [39], [40]. Furthermore, in middle adolescence, the onset of academic commitment and the need for self-regulation might alter Internet usage patterns and addiction risks. IA has become a growing concern among adolescents, with symptoms presenting both in relation to oneself and in interactions with others. However, the cognitive development and behavioural patterns of early and middle adolescents differ significantly, suggesting the need for a critical examination of IA symptoms according to age. Although previous research has highlighted the multifaceted nature of IA symptoms, little attention has been paid to the potential differential manifestation of symptoms based on the age of adolescents. Understanding how IA symptoms manifest differently in early and middle adolescence is crucial for tailoring prevention and intervention efforts. Understanding the differences between early and middle adolescence is critical when examining IA. Our study aims to address the existing knowledge gap by investigating aspects that have not been thoroughly explored in the field of adolescent IA.

RQ3: Does the time spent on essential and non-essential Internet use, as well as subjective feelings regarding non-essential Internet use, on Internet addiction (IA) differ between the early and middle adolescence stages?

Methods

Participants

The study involved school students residing in Qatar, and their participation was secured through online surveys administered via SurveyMonkey. The survey link was shared with adolescent students attending 16 public and private schools in Qatar. Data were collected between March and May, 2022. After excluding participants who did not meet the inclusion criteria, such as those who provided incomplete responses, 377 students out of the initial 540 were included in the analysis. Of these, 86 (22.81%) were male and 291 (77.19%) were female. The data collection period coincided with the final exams, resulting in varying response rates among schools. Two schools, with a significant number of female students, responded to the survey. The average age of the participating adolescents was 13.19 years (standard deviation = 1.24, range:11–17). The participants in the study were requested to explicitly provide their ages. Participants were categorised into two groups: Early Adolescents (aged 11-13) and Middle Adolescents (aged 14-17). The classification of adolescents into these developmental phases was determined based on the existing literature *[41]*.

Ethics approval and participants' consent

The study was approved by the Institutional Review Board (IRB) of Hamad Bin Khalifa University (No. QBRI-IRB 2021-05-094). School permissions were obtained to distribute the survey. The parents and adolescents were informed beforehand of the study and their written informed consent and assent were collected. Participants were informed about the study's purpose, and their involvement was voluntary, allowing them to skip questions or withdraw from the survey, if desired. The questionnaire was distributed in both English and Arabic to accommodate language preferences, and the accuracy of the Arabic translation was ensured using the back-translation method.

Measures

Internet Addiction Diagnostic Questionnaire (IADQ)

The IADQ consists of eight items, each representing a symptom used to identify IA *[10]*. The questionnaire utilises a binary response format, with participants indicating "no" or "yes" to each symptom. The total score on the IADQ ranges from 0 to 8, and is obtained by summing the values assigned to each of the eight binary questions. According to Young, Internet addiction criteria are met by responding "yes" to five or more symptoms. The symptoms assessed by the IADQ include "preoccupation" (Q1), "tolerance" (Q2), "unsuccessful efforts to limit or stop Internet usage" (Q3), "withdrawal" (Q4), "loss of control of time spent on the Internet" (Q5), "risk/lose relationships or opportunities" (Q6), "lies to conceal the extent of involvement" (Q7), and "dysfunctional coping" (Q8) *[42]*. Participants who answered "yes" to five or more symptoms were categorised as addicted to the Internet (Dependent Internet users), while the others were Non-Dependent Internet users. Prior studies on the IADQ reported Cronbach's alpha values ranging from 0.60 to 0.72 *[43]*. The reliability of the IADQ in this study was deemed acceptable, with a Cronbach's alpha value of 0.66 *[44]*.

Essential and Non-Essential Internet Use

Adolescents were presented with a set of questions regarding their use of digital technology, both for essential and non-essential purposes, on both weekends and weekdays. The weekend is officially observed on Fridays and Saturdays in Qatar. Participants were asked the following questions to encompass four different situations:

- How many hours do you use digital technology for study purposes daily on weekdays (Sunday – Thursday)?;
- How many hours do you use digital technology for non-essential reasons daily on weekdays (Sunday – Thursday)?;
- How many hours do you use digital technology for study purposes daily on weekends (Friday and Saturday)?;
- How many hours do you use digital technology for non-essential reasons daily on weekends (Friday and Saturday)?

Essential Internet Use time: Essential Internet use on weekdays and weekends was combined, and their average was used to compute essential Internet use time.

Non-Essential Internet Use time: Non-essential Internet use on weekdays and weekends was combined, and their average was taken to compute non-essential Internet use time.

Subjective happiness with non-essential Internet use time

Adolescents were asked to express their feelings regarding the extent of their non-essential use of digital technology. Their responses were collected using a five-point Likert scale:1: I am happy with it, 2: I am somewhat happy with it, 3: Neither happy nor unhappy with it, 4: I am somewhat unhappy with it, and 5: I am unhappy with it.

Statistical Analysis

Multiple linear regression analyses were conducted separately for early and middle adolescents to examine the relationship between non-essential Internet use, essential Internet use, and subjective happiness with non-essential

Internet use time and their IA (IA) status. The significance level for the statistical tests was set at p < 0.05. All statistical analyses were carried out using JASP version 0.17.1 [45].

Exploratory factor analysis with oblique (promax) rotation was performed to identify the latent structure of IA symptoms (Cureton & Mulaik, 1975). The determination of the number of significant components to retain for rotation was based on two criteria: (1) the scree plot indicating the number of extracted factors, and (2) ensuring that the factor solution allowed for a coherent interpretation of the results.

Results

Descriptive Statistics

Descriptive statistics of the participants are presented in Table 1.

Table 1: Descriptive statistics - Internet use patterns, IA

Variable	Early Adolescents (n=242)		Middle Adolescents (n=135)	
	M	*SD*	*M*	*SD*
Essential Internet use time	2.22h	1.76	2.96h	2.12
Non – Essential Internet use time	4.45h	2.74	4.52h	2.35
subjective happiness with non-essential Internet use time	*n*	*%*	*n*	*%*
1: I am happy with it	90	37.19	44	32.59
2: I am somewhat happy with it	77	31.82	40	29.63
3: Neither happy nor unhappy with it	46	19.01	35	25.93
4: I am somewhat unhappy with it	17	7.02	11	8.15
5: I am unhappy with it	12	4.96	5	3.70
IA	*M*	*SD*	*M*	*SD*
Total IA score (0-8)	3.26	1.98	3.47	2.17
Internet addiction Prevalence	*n*	*%*	*n*	*%*
Addicted Internet Users	63	26.03	50	37.04
Non – Addicted Internet Users	179	73.97	85	62.96

Factor analysis of IA symptoms

To group IA symptoms into factor scores, the dataset of the sample was subjected to exploratory factor analysis. Kaiser-Meyer-Olkin (KMO), a Measure of Sampling Adequacy (MSA), was employed in this research to evaluate multicollinearity in the data to determine the feasibility of conducting a factor analysis. The overall KMO measure was 0.76 with individual KMO measures all greater than 0.68, classifications of 'mediocre', 'middling', to 'marvellous' according to Kaiser & Rice (1974). Bartlett's test of sphericity was statistically significant ($P < .001$), indicating that the data was likely factorizable.

The analysis extracted two components, which accounted for 26% of the variance. Our scree plot was compatible with the two-factor model. We interpreted the two factors as representing Internal IA symptoms - symptoms related to self and External IA symptoms - those related to interaction with others. Factor 1 (18% of total variance): Internal IA symptoms

and Factor 2 (9%): External IA symptoms. Factor loadings for factor 1, factor 2, ranged from 0.31 to 0.55, and .33 to .78 respectively. Factor scores were derived by adding the scores of individual items within each empirical domain (sum score) and dividing the sum scores by the total number of items (mean item score). The component loadings and uniqueness of the rotated solutions are presented in Table 2.

Table 2
Factor Analysis of IA symptoms

Items	Factor 1	Factor 2	Uniqueness
preoccupation" (Q1),	0.49		0.79
"tolerance" (Q2),	0.31		0.91
"unsuccessful efforts to limit or stop Internet usage" (Q3),	0.50		0.76
"withdrawal" (Q4),	0.55		0.62
"loss of control of time spent on the Internet" (Q5),	0.50		0.77
"risk/lose relationships or opportunities" (Q6),		0.78	0.48
"lies to conceal the extent of involvement" (Q7),		0.33	0.75
and "dysfunctional coping" (Q8)	0.45		0.79

Early Adolescents

Multiple regression analysis was used to determine factors that predicted early adolescents' total IA scores and Internal IA symptoms. No outliers were observed in the data. Pearson's correlation was also used to analyse the associations between total IA, which was the dependent variable, and the independent variables of subjective happiness with non-essential Internet use time, essential Internet use time, and Non-essential Internet use time. The correlations between the variables are presented in Table 3.

Table 3
 Pearson's correlation table between the variables (Early Adolescents)

		1	2	3	4	5	
1.	Total IA	-					
2.	Internal IA symptoms	0.95***					
3.	External IA symptom	0.58***	0.30***				
4.	Subjective happiness with non-essential Internet use time	0.04	0.03	0.03			
5.	Essential Internet use time	0.07	0.04	0.10	0.04		
6.	Non – Essential Internet use time	0.41***	0.41***	0.18**	0.07	0.12	-

* $P < .05$, ** $P < .01$, *** $P < .001$

Table 4 demonstrates the results of the multiple regression that was run to predict the total IA score from the subjective happiness with non-essential Internet use time, essential Internet use time, and Non-essential Internet use time among early adolescents. All the assumptions of linearity, normality, homoscedasticity, and multicollinearity were satisfied. Residuals were independent, as assessed by a Durbin-Watson statistic of 1.93. There was no evidence of multicollinearity, as assessed by tolerance values greater than 0.1. The assumption of normality was met, as assessed

using a Q-Q plot. The multiple regression model significantly predicted the total IA score, $F (3, 238) = 15.72, P < .001$, $R^2 = 0.17$, adjusted $R^2 = 0.15$. Within the model, Non-essential Internet use time ($\beta = 0.40, P < .001$) was the only significant predictor of early adolescents' total IA scores.

Table 4
Multiple Linear Regression Analysis predicting IA in early adolescents

	R^2	Adjusted R^2	F (df)
	0.17	0.15	15.72 (3, 238)

Predictors	Standardized β	t	p
Constant		5.73	< .001
Subjective happiness with non-essential Internet use time	9.23×10^{-3}	0.16	.88
Essential Internet use time	0.02	0.36	.72
Non – Essential Internet use time	0.40	6.74	< .001

Multiple regression analysis was used to determine factors that predicted Internal IA symptoms with the independent variables of subjective happiness with non-essential Internet use time, essential Internet use time, and Non-essential Internet use time, and an ordinal logistic regression model was used to predict external IA symptoms. Table 5 demonstrates the results of the multiple regression that was run to predict the Internal IA symptom score from the subjective happiness with non-essential Internet use time, essential Internet use time, and Non-essential Internet use time. All the assumptions of linearity, normality, homoscedasticity, and multicollinearity were satisfied. Residuals were independent, as assessed by a Durbin-Watson statistic of 1.98. There was no evidence of multicollinearity, as assessed by tolerance values greater than 0.1. The assumption of normality was met, as assessed using a Q-Q plot. The multiple regression model significantly predicted the Internal IA symptom score, $F (3, 238) = 15.95, P < .001$, $R^2 = 0.17$, adjusted $R^2 = 0.16$. Within the model, Non-essential Internet use time ($\beta = 0.41, P < .001$) was the only significant predictor of early adolescents' Internal IA symptoms.

Table 5
Multiple regression analysis predicting Internal IA symptoms in early adolescents

	R^2	Adjusted R^2	F (df)
	0.17	0.16	15.95 (3, 238)

Predictors	Standardized β	t	p
Constant		6.18	< .001
Subjective happiness with non-essential Internet use time	3.18×10^{-3}	0.05	.96
Essential Internet use time	-4.31×10^{-3}	-0.07	.94
Non – Essential Internet use time	0.41	6.86	< .001

An ordinal logistic regression analysis was conducted to examine the relationship between the three predictor variables (i.e., Subjective happiness with non-essential Internet use time, essential Internet use time, and Non-essential Internet use time) and the outcome variable external IA symptoms (Table 6). The variables included in the ordinal logistic regression analysis met the assumptions of the statistical model: the dependent variable (i.e. external IA symptoms) was treated as an ordinal variable and the independent variables were treated as continuous variables (i.e. Subjective happiness with non-essential Internet use time, essential Internet use time, and Non-essential Internet use time). The assumption of no multicollinearity was assessed by examining the Variation Inflation Factors (VIFs) and the result (VIFs <1.1) indicated no multicollinearity. The results revealed that non-essential Internet use time was associated with increased external IA symptoms (OR = 1.13, 95% CI [1.02, 1.24]) (p = 0.02). Meanwhile, essential Internet use time was not associated with any change in external IA symptoms (OR = 1.11, 95% CI [0.96, 1.28]) (P = .168). Similarly, subjective happiness with non-essential Internet use time was not associated with any change in external IA symptoms (OR = 0.99, 95% CI [0.78, 1.25]), (P =.94) in early adolescents.

Table 6
Ordinal logistic regression predicting external IA symptoms in early adolescents

Predictors	SE	OR	95% CI for Odds Ratio		P
			Lower	Upper	
Subjective happiness with non-essential Internet use time	-0.01	0.99	0.78	1.25	0.94
Essential Internet use time	0.10	1.11	0.96	1.28	0.17
Non – Essential Internet use time	0.12	1.13	1.02	1.24	0.02

Binary logistic regression was conducted to examine the relationship between subjective happiness with non-essential Internet use time and the likelihood of being a dependent Internet user (addicted) compared to a non-dependent Internet user (unaddicted) in early adolescents. The reference category, representing non-dependent Internet users, was coded as class 1. The odds ratio (OR) of 0.93 (95% confidence interval [CI] = 0.73-1.20) indicated the effect size. However, the results did not reveal a significant association between subjective happiness with non-essential Internet usage time and internet addiction (OR = 0.93, P = .58).

Middle Adolescents

Multiple regression analysis was used to determine the factors that predicted the middle adolescents' total IA scores and Internal IA symptoms. No outliers were observed in the data. Pearson's correlation was also used to analyse the associations between total IA, which was the dependent variable, and the independent variables of subjective happiness with non-essential Internet usage time, essential Internet use time, and Non-essential Internet use time. The correlations between the variables are presented in Table 7.

Table 7
Pearson's correlation table between the variables (Middle adolescents)

		1	2	3	4	5	6
1.	Total IA	-					
2.	Internal IA symptoms	0.95***	-				
3.	External IA symptom	0.66***	0.39***	-			
4.	Subjective happiness with non-essential Internet use time	0.34***	0.28**	0.32***	-		
5.	Essential Internet use time	0.21*	0.15	0.26**	0.18*	-	
6.	Non – Essential Internet use time	0.35***	0.33***	0.24**	0.13	0.05	-

* $P < .05$, ** $P < .01$, *** $P < .001$

Table 8 demonstrates the results of the multiple regression that was run to predict the middle adolescents' total IA score from the subjective happiness with non-essential Internet usage time, essential Internet use time, and Non-essential Internet use time. All the assumptions of linearity, normality, homoscedasticity, and multicollinearity were satisfied. Residuals were independent, as assessed by a Durbin-Watson statistic of 1.83. There was no evidence of multicollinearity, as assessed by tolerance values greater than 0.1. The assumption of normality was met, as assessed using a Q-Q plot. The multiple regression model significantly predicted the total IA score ($F (3, 131) = 12.96, P < .001$, $R^2 = 0.23$, adjusted $R^2 = 0.21$). Within the model, Non-essential Internet use time ($\beta = 0.31, P < .001$) and subjective happiness with non-essential Internet usage time ($\beta = 0.27, P < .001$) were significant predictors of the middle adolescents' total IA score.

Table 8
Multiple Linear Regression Analysis predicting IA in middle adolescents

	R^2	Adjusted R^2	F (df)
	0.23	0.21	12.96 (3, 131)

Predictors	Standardized β	t	p
Constant		1.16	.25
Subjective happiness with non-essential Internet use time	0.27	3.44	< .001
Essential Internet use time	0.15	1.90	.06
Non – Essential Internet use time	0.31	3.94	< .001

Multiple regression analysis was used to determine factors that predicted Internal IA symptoms with the independent variables of subjective happiness with non-essential Internet use time, essential Internet use time, and Non-essential Internet use time, and ordinal logistic regression was used to predict external IA symptoms. Table 9 presents the results of the multiple regression. All the assumptions of linearity, normality, homoscedasticity, and multicollinearity were satisfied. Residuals were independent, as assessed by a Durbin-Watson statistic of 1.82. There was no evidence of multicollinearity, as assessed by tolerance values greater than 0.1. The assumption of normality was met, as assessed

using a Q-Q plot. The multiple regression model significantly predicted the Internal IA symptom score, $F (3, 131) = 9.15$, $P < .001$, $R^2 = 0.17$, adjusted $R^2 = 0.15$. Within the model, Non-essential Internet use time($\beta = 0.29$, $P < .001$) and subjective happiness with non-essential Internet usage time ($\beta = 0.22$, $P= 6.57×10^{-3}$) were significant predictors of middle adolescents' Internal IA symptoms.

Table 9
Multiple regression analysis predicting Internal IA symptoms in middle adolescents

	R^2	Adjusted R^2	F (df)
	0.17	0.15	15.95 (3, 238)

Predictors	Standardized β	t	p
Constant		2.10	.04
Subjective happiness with non-essential Internet use time	0.22	2.76	.007
Essential Internet use time	0.10	1.20	.23
Non – Essential Internet use time	0.29	3.65	< .001

An ordinal logistic regression analysis was conducted to examine the relationship between the three predictor variables (i.e., Subjective happiness with non-essential Internet use time, essential Internet use time, and Non-essential Internet use time) and the outcome variable external IA symptoms (Table 10). The variables included in the ordinal logistic regression analysis met the assumptions of the statistical model: the dependent variable (i.e. external IA symptoms) was treated as an ordinal variable and the independent variables were treated as continuous variables (i.e. Subjective happiness with non-essential Internet use time, essential Internet use, and Non-essential Internet use). The assumption of no multicollinearity was assessed by examining the Variation Inflation Factors (VIFs) and the result (VIFs <1.1) indicated no multicollinearity. The results revealed that all three predictors were associated with changes in the external IA symptoms. Non-essential Internet use time was associated with an increase in external IA symptoms (OR = 1.19, 95% CI [1.03, 1.39]) ($P = .02$). Essential Internet use time was associated with an increase in external IA symptoms (OR = 1.24, 95% CI [1.05, 1.46]), $P = .01$). Similarly, a higher unhappiness with non-essential Internet usage time was associated with increased external IA symptoms (OR = 1.75, 95% CI [1.28, 2.44]; $P <.001$).

Table 10
Ordinal logistic regression predicting external IA symptoms in middle adolescents

Predictors	SE	OR	95% CI for Odds Ratio		P
			Lower	Upper	
Subjective happiness with non-essential Internet use time	0.56	1.75	1.28	2.44	< .001
Essential Internet use time	0.21	1.24	1.05	1.46	.02
Non – Essential Internet use time	0.18	1.19	1.03	1.39	.01

A binary logistic regression was performed to assess the impact subjective happiness with non-essential Internet use time on the likelihood of being a dependent Internet user (addicted) versus a non-dependent Internet user (unaddicted). The reference category was coded as class 1, representing non-dependent Internet users. The odds ratio (OR) of 0.66 (95% confidence interval [CI] = 0.47-0.92) indicated the effect size. F-measure was 75%. The results indicated a significant

association between subjective happiness with non-essential Internet usage time and internet addiction (OR = 0.66, *P* < .05), suggesting that higher levels of unhappiness were associated with a decreased likelihood of being unaddicted to the Internet.

Discussion

This study aimed to enhance our understanding of adolescent Internet addiction (IA) by addressing three key research questions. Firstly, we examined the significance of differentiating between essential and non-essential Internet use in relation to IA. By focusing on distinguishing between time spent on essential and non-essential Internet activities, the study overcomes methodological limitations found in previous research that treated Internet use as a single entity. It offers a more detailed and nuanced perspective on IA beyond total screen time. Second, we investigated whether subjective happiness levels associated with time spent on non-essential Internet activities could predict IA in adolescents. Finally, recognising the developmental changes during middle and early adolescence, we separately studied IA in these two age groups to identify potential differences in the contributing factors – time spent on essential and non-essential Internet use and subjective happiness with regard to time spent on non-essential Internet use. This approach allowed us to enhance our understanding of IA by considering age-specific dynamics. Our findings revealed that non-essential Internet use significantly predicted IA in both early and middle adolescents, whereas subjective happiness with non-essential Internet use time was a significant predictor of IA only in middle adolescents.

The results of multiple regression analysis in both early and middle adolescents demonstrated that non-essential Internet use was a predictor of IA, as well as Internal IA symptoms. Consistent with the existing literature, our study demonstrated that excessive engagement in non-essential Internet activities positively correlates with IA. Specifically, excessive time spent on non-essential Internet activities such as social media and online gaming has consistently been linked to IA [48], [49]. Furthermore, essential Internet activities such as remote learning or using the Internet for school required work may not carry the same level of addiction risk. These results are consistent with those of Seo et al. (2009), who found a strong association between excessive online gaming and IA among Korean adolescents. Furthermore, Internet use for educational purposes did not exhibit a significant correlation with IA [51]. This distinction enables the development of targeted interventions and strategies to effectively address this issue. In light of the emergence of a digital society, in which digital technology has become essential for tasks that previously did not require them, it is crucial to acknowledge this technological shift. Before delving into the complexities of IA, it is necessary to recognise the evolving landscape of digital technology usage and interpret digital technology use with caution, as emphasised by Squire & Steinkuehler (2017). This caution entails considering the specific activities carried out on the Internet, the

motivations driving them, and the duration for which they occur.

The standardised coefficient value for non-essential Internet use (a significant predictor of total IA score and internal IA symptoms) in middle adolescents was lower when predicting both total IA and Internal IA symptoms than in early adolescents. This difference suggests that the impact of non-essential digital technology use on IA may vary according to the developmental stage of adolescents. One possible explanation for the higher standardised coefficient value in early adolescence is the heightened influence of peer pressure. Early adolescents are actively navigating their new identity and seeking peer acceptance, which can make them more susceptible to excessive digital technology use [54]. The pressure to conform to peers' behaviours and expectations may override their ability to exercise self-control and resist the allure of digital technology [55]. However, middle adolescents may possess stronger self-control skills and greater resistance to peer pressure [56]. As they progress through their developmental stages, they are more likely to develop a better understanding of the consequences associated with excessive digital technology use. This increased self-control and resilience to peer pressure could explain the lower standardised estimate value for non-essential Internet use in middle adolescence.

Another difference between early and middle adolescents was noted when we examined subjective happiness with non-essential Internet use time predicting the total IA score and internal IA symptoms. Although it was a significant predictor in middle adolescents, this was not the case in early adolescents. Our results showed that the more unhappy middle adolescents were with the time spent on non-essential digital technology use, the higher their IA. These findings are also consistent with those found in the literature in a sample that was based on objectively measured data and included young adults age 15-24, and adults aged 25-64, where the less happy the individuals were with their smartphone usage, the more likely they were to have higher problematic Internet use [57]. These results also contribute to the literature, as research examining subjective happiness with digital technology usage in relation to IA in adolescents is lacking. There were noticeable differences in the results related to external symptoms of IA between early and middle adolescents. In early adolescents, only non-essential Internet use time increased the likelihood of external IA symptoms. However, in middle adolescents, non-essential and essential Internet use as well as unhappiness with time spent on non-essential Internet use increased external IA symptoms. Essential Internet use can contribute to external symptoms of Internet Addiction (IA) among middle adolescents, leading them to neglect other aspects of their lives and exceed their intended online time.

This behaviour is particularly prominent as academic pressure intensifies [58], [59]. One possible explanation is the presence of information overload and the desire to avoid uncertainty, driving middle adolescents to allocate more time to their tasks. In the context of increased academic demands, uncertainty avoidance manifests as a desire to minimise

ambiguity and maintain control over academic performance. Consequently, middle adolescents spend more time on online educational activities, including essential Internet use, to mitigate uncertainty and meet academic responsibilities. The combination of increased academic demands, information overload, and uncertainty avoidance heightens the risk of IA [60], [61], [62]. These academic pressures can also impact social interactions, as middle adolescents prioritise academic performance and display signs of stress in their engagement with others [58], [63]. Recognising the unique challenges faced by adolescents at different developmental stages is crucial for effectively tailoring preventive measures and interventions.

Our study has important implications for promoting healthier digital technology habits in adolescents. The findings suggest that interventions aimed at addressing IA should focus on addressing non-essential use specifically, rather than considering Internet use as a whole. This targeted approach can help effectively address the factors contributing to IA. Because IA is a complex outcome influenced by multiple physical, psychological, and technological factors rather than a single issue, it has been suggested that prevention programs that target the overall organization of diverse problem behaviours (e.g., substance abuse, delinquency) may be more effective than those that target specific behaviours [23].

To effectively address IA, it is necessary to implement comprehensive school-based prevention programs that increase awareness, develop coping strategies, and promote responsible digital technology use. These programs can be integrated into the school curricula and should include methods to improve self-control and enhance knowledge of the underlying processes that contribute to excessive online activity, such as constant notifications [64], [65]. Schools can take additional steps by implementing digital well-being initiatives, such as mindfulness exercises and the integration of technology breaks into the daily schedule.. Moreover, promoting digital literacy and responsible digital technology use is crucial for educating adolescents about the potential risks and consequences associated with excessive digital technology use [66]. Given that adolescents' behaviours are largely shaped by other external factors, such as their families and external environments [38], schools play a crucial role in extending these preventive programs to parents and caregivers. Devices and programs used shall be able to isolate essential and non-essential uses, for example, advising children to avoid installing or visiting purely non-essential social media applications/sites on the same device. Additionally, understanding children's intentions when interacting with the Internet is crucial. This emphasises the need for smarter digital parenting tools that provide enhanced monitoring and guidance. A healthier digital environment can be created by considering intentionality and employing smart tools.

 Early identification and intervention are key to addressing IA. Schools can implement evidence-based prevention programs that specifically target IA in adolescents. These programs can incorporate educational components, skill-

building exercises, and peer support networks to help adolescents develop healthy online habits and balance their time between essential and non-essential activities [67]. Schools can further offer counselling services to students struggling with excessive non-essential digital technology use, providing guidance, support, and resources to help them develop healthier habits and cope with underlying psychological factors. Non-essential Internet use often arises as a coping strategy and maladaptive behaviour in response to academic pressure or a challenging family environment. The results of our study demonstrated a correlation between internal/external symptoms, such as escapism, dysfunctional coping, and non-essential Internet use. Consequently, addressing this issue entails creating an environment in which adolescents do not rely on the Internet as a means of avoidance or escape. To empower adolescents, policymakers can design programs targeting their environment to address the underlying factors contributing to maladaptive coping, such as reducing academic pressure and improving family support. This, in turn, can help reduce dependence on non-essential Internet use and promote the development of more adaptive coping strategies.

Parental involvement and supervision play a vital role in preventing IA in early adolescents. Actively engaging with children, establishing open communication channels, and monitoring their digital technology use can create a supportive environment and set boundaries for healthy online behaviour (Chemnad et al., 2022; Schmid & Garrels, 2021). Emphasising balance is also essential, highlighting the need for a well-rounded lifestyle that includes academic tasks, physical activities, face-to-face interactions, and non-digital recreational pursuits [70]. Self-control in early adolescents may be enhanced through self-control training activities and participation in self-control promoting programs [71].

Certain limitations of this study must be considered when interpreting the results. First, the present data were the results of a cross-sectional study, which limits the generalisability of our findings. Another limitation of our study was that the responses provided by the adolescents were based on self-reporting, potentially introducing reporting bias. It is possible that the adolescents did not accurately report the time spent on essential and non-essential activities and symptoms of IA. However, we believe that their reporting is proportional to the amount they spend. To mitigate the influence of reporting bias, future studies should incorporate objective measures, such as utilizing data on actual screen time, instead of relying solely on self-reported information. Another limitation of this study is that it fails to show the context of essential and non-essential Internet use. Spending time with friends on social media during the examination period may be considered essential for adolescents who want to receive moral support from their colleagues. Nevertheless, our study left it at the discretion of the participants. The impact of the specific activity/content that adolescents consume or spend excessive time on and the effect it has on them should be scrutinised in more detail and is an area that requires attention.

The strength of our study lies in its inclusion of a non-WEIRD population, specifically focusing on adolescent IA in the

Middle East, where limited research on IA has been conducted. Another strength of our study is that it addresses the research gap by examining both essential and non-essential Internet use in the same sample. While previous research has explored the different online activities that contribute to Internet Addiction (IA) [50], [51], few studies have specifically investigated the impact of essential and non-essential Internet use within a single study. Another strength of our study lies in the separate analysis of IA factors in early and middle adolescents, considering their distinct developmental traits, experiences, and coping strategies. This approach ensures comprehensive findings that capture the unique dynamics and influences shaping IA in each age group, thus enhancing the understanding of IA in relation to developmental stages.

Conclusion

This study sheds light on the complex relationship between digital technology use and IA among early and middle adolescents. For many years, screen time has been widely used as a prominent measure to assess the extent of IA among adolescents. As the digital society continues to evolve rapidly, relying solely on screen time as a standalone criterion fails to provide a comprehensive understanding of phenomena such as IA. Therefore, it is imperative to distinguish between essential and non-essential digital technology use, acknowledging diverse activities and their implications for a better understanding of individuals' engagement with digital technology. The findings of our study provide valuable insights for researchers, practitioners, and policymakers in addressing IA among adolescents. By recognising the distinct nature of Internet activities and considering developmental factors, effective interventions and strategies can be developed to promote healthy digital technology use and prevent IA in adolescents.

Conflict of Interest

The authors do not have any conflict of interest to declare.

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