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Association of problematic internet use with depression, impulsivity, anger, aggression, and social anxiety: Results of a national study among Lebanese adolescents

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ABSTRACT

Importance: Several studies conducted worldwide (mostly in Western countries) highlighted the negative effects of problematic internet use, particularly among adolescents aged 12 to 17, including depression, impulsivity, aggression, and social fear and avoidance. In Lebanon, literature on the prevalence and impact of problematic internet use among adolescents is limited.

Objective: This study aim was to study the association between problematic internet use and depression, impulsivity, anger, aggression and social phobia among Lebanese adolescents.

Methods: A cross-sectional study was performed on 1103 young adolescents (14–17 years), recruited from October 2017 till April 2018. The Internet Addiction Test (IAT) was used to evaluate the level of problematic internet use. Data were analyzed using the MANCOVA analysis. The main independent variable of interest was the IAT, while the dependent variables included the psychological scales.

Results: The multivariate analysis taking the psychological scales as the dependent variables and the problematic internet use (IAT score) as an independent variable, showed that problematic internet use was associated with higher depression, impulsivity, aggression, anger, hostility and social anxiety.

Interpretation: Problematic internet use has become an important health issue that should not be overlooked, particularly because of the increased use of the internet by adolescents. Educational programs on early exposure to the internet should be developed.

KEYWORDS
Problematic internet use, Adolescents, Depression, Aggression, Social phobia, Hostility

INTRODUCTION

Definition of problematic internet use

Problematic internet use (PIU) is defined as a person's inability to control their internet use, which in turn can result in feelings of distress and functional impairment in daily tasks.[1] Internet addiction is a broad term that covers a range of behaviors and impulse-control also known as PIU or pathological internet use, is generally defined as

problematic, compulsive use of the internet, that results in significant impairment in an individual's function in various life domains over a prolonged period of time.[2] PIU shares neurological, biochemical, and psychological characteristics with both behavioral and substance-related addictions.[3-5] The potential genes most often linked to internet addiction are those involved in the dopaminergic and serotoninergic systems.[6]

The advent of internet technology has markedly impacted our lives especially during the past two decades. Nowadays, most people can access the web through their mobile phones and pads, and connect to social media. Internet use has become part and parcel of our daily activities including working, studying, socializing, and entertaining.[7] As a consequence, PIU has been on the rise in the past few years. In 2013, a survey in the United States showed that 41.3% of adolescents spent more than 3 hours using the internet during school days, knowing that their use was not meant for homework. This figure is roughly double that of the year 2003.[8] In Lebanon, a study in 2011 revealed that 39.1% of Lebanese adolescents suffered from moderate to severe problems due to PIU.[9]

Adolescents and internet use

Adolescents today live in a very different way than previous generations, and they have a complex and bidirectional relationship between what happens online and offline.[10] Adolescents are characterized by the massive use of internet on mobile phones and they consider it an essential part of their everyday lives. Consequently, many of the classic psychological issues (abuse, aggression, and addictions) have rapidly found an online equivalent (cyberbullying, sexting, PIU, nomophobia, and so on), and their prevalence is growing as a result of this increased exposure.[10,11] Many studies have found that cyberbullying, Internet pornography, and Internet fraud can have a detrimental impact on teenage mental health and behavior in a variety of ways.[12-14] Adolescents with PIU have been reported to have a prevalence rate ranging from 0.8 percent in Italy to 26.7 percent in China.[15-17]

Risk factors for internet use

Recent studies suggest that adolescents using the internet uncontrollably do not think before acting: they are impulsive and unable to restrain their immediate reactions. They can also become more aggressive, bite others at school, steal others possessions and disobey older people.[18] The pathological use of the internet may also result in serious social issues like the extreme fear of being judged, evaluated negatively or rejected. This is why teens who are addicted to social media tend to acquire more introverted behaviors, such as restraining from having contact with people they don't know, speaking in public, making eye contact or even going to school.[19]

Several studies conducted worldwide highlighted the negative effects of PIU, particularly among adolescents aged 12 to 17, including depression, impulsivity, aggression, and social fear and avoidance. Studies have showed that the link between internet addiction and other psychopathological symptoms is complicated and bidirectional.[7,20] Hypothetical and theoretical models about the comorbidity have recently been developed, which relate to the existence of various psychological and psychopathological problems linked with internet addiction.[21] Young adults may tend to overuse the internet, both to find beneficial information and to cope with their distress.[22] Several studies have found an association between internet use and psychopathological factors.[19,23-30]

In addition, lack of parental support and emotional participation, family conflicts, and overall poor family functioning have all been proven to have a detrimental impact on young people's substance addiction behavior including internet addiction.[31] Young people who perceive a low quality relationship with their parents may use the internet in an inappropriate way to deal with their distress and to seek emotional/social support from the virtual world.[32]

Sociodemographic factors are important variables associated with psychological health. A large body of evidence suggests that age, gender, socioeconomic status are related to psychological distress.[33-36] A disadvantaged socioeconomic status (loss of income, less accessibility to local resources, etc.) is associated with a poor physical and social environment that would affect the biological, physiological and psychological conditions of the individual.[37] On the other hand, people with psychological distress would suffer from mental health problems, consequently a deterioration occur in their socioeconomic status.[37] In addition, age was related to psychological distress were most of studies have found a U-shaped association where a linear increases or decreases or no differences across age groups was detected.[38-41] This association is explained by different lifetime exposures to certain risk variables that have been related to variations in psychological distress and other health issues.[42] Also, gender's influence in psychological distress has been well-documented where women in almost all parts of the world are reported to endure more psychological discomfort than males.[43] Women are more prone to develop psychological distress due to biochemical mechanisms in addition to many different psychosocial pathways such as personality attributes.[44] Also, Women's social responsibilities (e.g., caring and household roles, integrating work and private life) and social status in society are also thought to have a role in the variations in psychological distress between men and women.[44] Therefore, controlling for these indicators is a better way to assess whether those who have PIU are more prone to psychological distress. Also, this approach helps us to evaluate whether adolescent

mental health is a result of PIU, rather than a continuation of life course sociodemographic disadvantage.

Problematic and objective of the study

The above-mentioned studies were carried out in different countries, many of which are Western countries. In Lebanon, literature on the prevalence and impact of PIU among adolescents is limited. A Lebanese study done by Obeid et al[45] had showed that high PIU was found in 3.6% of Lebanese adolescents while 40% had occasional and frequent internet users.[45] Previous studies conducted among Lebanese adults have evaluated the association between problematic social media use and loneliness,[46] alexithymia,[47] memory performance,[48] alcohol use disorder[49] and mental health issues (depression and anxiety).[50] No studies have studied the association between PIU and mental health issues among adolescents. The aim of this cross-sectional study is to evaluate the effect of PIU on psychological variables such as depression, impulsivity, anger, aggression and social phobia among Lebanese adolescents.

METHODS

Ethical approval

The Psychiatric Hospital of the Cross Ethics and Research Committee, in compliance with the Hospital's Regulatory Research Protocol, approved this study protocol (HPC-002-2018) based on the fact that the autonomy and confidentiality of participants were respected and no harm will be prompted to them. A written consent was obtained from the students' parents before starting the data collection.

Sampling and data collection

A cross-sectional study was conducted during a period of seven months extending from October 2017 till April 2018. Out of 1300 questionnaires distributed, 1103 (84.8%) were completed and collected back. Adolescents were randomly sampled from all five Lebanese governorates, namely Beirut, Mount Lebanon, North, South, and Bekaa, in a proportionate manner. The above-mentioned governorates are subsequently divided into several Cazas (stratums), which are, in turn, divided into villages. Using the list of villages provided by the Central Agency of Statistics in Lebanon, two villages from each Caza were randomly selected; students from schools found in those villages were then randomly selected to participate in the study. The enrollment of the participants was done using a proportionate random sample of schools from all Lebanese Mohafazat/districts (Beirut, Mount Lebanon, North, South and Bekaa). A total of eighteen private schools was contacted; two refused participation. Those who accepted to participate were located as follows: 4 in Beirut; 2 in South Lebanon; 6 in Mount Lebanon; 2

in North Lebanon; and 2 in Bekaa. In each school, all students within the specified age range (13–17 years) were eligible to participate. Excluded were those who refused to fill the questionnaire. Data was collected by trained, study-independent personnel. All methods were performed in accordance with the relevant guidelines and regulations.

Calculation of the minimum sample size

The expected frequency of PIU was fixed at 39.1% based on a previous Lebanese study.[51] The Epi-info software version 7.2 (population survey) calculated a minimum sample size of 732 to ensure a confidence level of 95% and a design effect of 2.

Questionnaire

The self-administered questionnaire used during the interview was in Arabic the native language in Lebanon and needed 25 to 30 minutes to be completed. Students were asked to fill the anonymous questionnaire in the classrooms to avoid their parents' influence while answering the questions. The questionnaire was separated into two parts, in the first the sociodemographic characteristics were evaluated including age, gender, socioeconomic status, smoking status and alcohol drinking. The socioeconomic status was calculated by using the house-crowding index (dividing the total number of persons living in the house by the number of rooms (apart from the kitchen and bathrooms). As for assessing the smoking status, current cigarette smoking was defined as smoking at least one cigarette per day and the current waterpipe smoking was defined as smoking at least one waterpipe per month. Alcohol drinking was assessed as follow: drinking alcohol at least once a month, at least once a week or every day as a frequent alcohol user and participants who they did not drink alcohol at all or drank alcohol less than once a month as no or infrequent alcohol users.

Internet Addiction Test (IAT)

The IAT is the most used instruments that measure PIU. It comprises twenty items rated in a Likert scale (from 1 = does not apply to 5 = always). In this study the validated Arabic version was used.[51,52] The total score was calculated by summing all the items with higher score indicating greater PIU and the range varies between 20 and 100. The score could be categorized into three groups: score between 20 and 49 as average internet user, score between 50 and 79 occasional or frequent problems caused by internet and score between 80 and 100 higher PIU. The Cronbach's alpha for this scale was very good (0.891).

BARRAT impulsiveness scale (BIS-11)

BIS-11 is a self-rated scale containing 30 items designed to assess the personality/behavioral construct of impulsiveness.[53] The scale is rated in a four point Likert

scale (from 1 = absent or rare to 4 = present or extreme), with a total score ranging between 30 and 120. A high level of impulsiveness is found in a score above ≥ 72. The Cronbach's alpha for this scale was good (0.764).

Buss-Perry scale

The Buss-Perry Scale is a 29-item questionnaire using five-point Likert scale ranging from "extremely uncharacteristic of me" to "extremely characteristic of me". The scale is subdivided on four dimension of aggression: physical aggression, verbal aggression, anger and hostility.[54] The total aggression score was calculated by summing up the scores of the four subscales. The Cronbach's alpha for this scale was good (0.782).

Liebowitz Social Anxiety Scale (LSAS)

The LSAS is used to assess the range of social interaction and performance situations that patients with social phobia fear and avoid.[55] The scale includes 24 items rated in a four point Likert scale (from 0 to 3) and divided into two subscales (13 questions concerning performance anxiety and 11 pertaining to social situations). The overall score with a maximum of 144 point is calculated by summing up the total fear and total avoidance scores. Higher the scores would indicated a social anxiety disorder. The LSAS has been validated as a self-report scale.[56] In this study, the Cronbach's alpha values were excellent for the total score 0.937, and for the fear and avoidance subscales 0.923 and 0.913, respectively.

The Adolescent Depression Rating Scale (ADRS)

This 10-item scale was developed to screen for depression among adolescents, with questions rated as yes/no. Higher scores indicate higher levels of depression.[57] The Cronbach's alpha for this scale in this study was 0.777.

Forward and back translation

A mental health professional translated all the scales from the English versions into Arabic, and then this translation was translated back to English by a clinical psychologist. At the end of the translation process, the principal investigator conducted a revision of the content of the translation until no discrepancies were found.

Statistical analysis

The SPSS version 23 was used to perform the statistical analysis. Descriptive statistics including mean and standard deviation for continuous measures, counts and percentages for categorical variables, were calculated for all study variables. To assess the association with the continuous scales, Pearson correlation analyses were used for continuous variables, and Student t-test for categorical variables with two levels. A multivariate analysis of covariance (MANCOVA) was carried out taking the scales as the dependent variables and the PIU score as an independent variable, controlling for age, gender, monthly income, parents' status and number of siblings. In order to test for multicolinearity between the covariates a correlation analysis was performed. A correlation of 0.5 and above of covariates will not adjust the dependent variable.[58] Moreover, reliability analysis for all scales was assessed through Cronbach's alpha values. A $P < 0.05$ was considered significant.

RESULTS

The sociodemographic and other characteristics of the participants are shown in table 1. The mean age of the participants was 15.5 ± 1.3 years and the mean number of siblings was 2.1 ± 1.3. More than half of the participants were females (58.4% females); 93.7% lived with their parents.

Bivariate analysis

In the total sample, male participants have significantly higher mean depression, mean physical aggression and mean social avoidance than female participants. While female participants have higher anger than males. Participants who smoke have significantly higher mean depression, mean physical aggression, mean verbal aggression, mean anger, mean hostility, and mean social fear score than non-smokers. Participants having a separated parents have significantly higher mean depression and mean impulsivity, as compared to those who having parents living together. Participants who frequently drink alcohol have higher mean depression, mean physical aggression, mean verbal aggression, and social fear (Table 2).

TABLE 1 Sociodemographic and other characteristics of the participants ($n = 1103$)

Variables	Number of participants (%)
Sex	
Male	458 (41.6)
Female	644 (58.4)
Parents status	
Living with parents	1031 (93.7)
Separated parents	69 (6.3)
Smoking status	
No	970 (88.4)
Yes	127 (11.6)
Drinking alcohol	
No or infrequent drinker	887 (80.4)
Frequent drinker	216 (19.6)
Age (years)	15.5 ± 1.3
Number of siblings	2.1 ± 1.3

Numbers in the table might not add to the total number of participants due to missing values. Data were shown as n (%) or mean ± standard deviation.

In terms of association, higher age was associated with higher depression, verbal aggression, and hostility score. Higher PIU, depression, impulsivity, aggression, and anger score were associated with all these factors including higher depression, impulsivity, aggression, anger, hostility, social fear, and social avoidance scores. Higher hostility score was associated with all the factors except for social anxiety (Table 3).

Multivariable analysis

Means of the different psychological scales among the PIU categories after adjustment for age, gender, monthly income, parents' status and number of siblings

are calculated. After adjusting for all covariates, a significant difference was found for all the scales. Higher means depression (35.08), impulsivity (68.34), physical aggression (38.82), verbal aggression (21.72), anger (29.91) and hostility scores (37.61) were significantly found in higher PIU as compared to average internet users. A higher mean social fear (19.97) and avoidance (23.32) scores were significantly found in participants with occupational or frequent internet users as compared to average internet users.

The MANCOVA analysis was performed taking the psychological scales as the dependent variables and the PIU (IAT score) as an independent variable. Adjustment

TABLE 2 Bivariate analysis taking the psychological scales as the dependent variables in the total sample

Variables	Depression	Impulsivity	Physical aggression	Verbal aggression	Anger score	Hostility score	Liebowitz fear	Liebowitz avoidance
Gender								
Male	3.92 ± 2.20	67.03 ± 8.35	32.99 ± 7.92	17.37 ± 6.23	25.47 ± 6.69	31.90 ± 7.91	17.27 ± 13.88	23.37 ± 15.49
Female	3.64 ± 2.01	66.12 ± 7.55	30.87 ± 8.42	17.02 ± 6.41	26.46 ± 6.93	31.69 ± 8.09	18.23 ± 14.06	20.35 ± 12.83
P	**0.034**	0.065	**<0.001**	0.359	**0.018**	0.663	0.264	**<0.001**
Parents status								
Living with parents	3.71 ± 2.10	66.38 ± 7.99	31.69 ± 8.30	17.06 ± 6.31	26.05 ± 6.84	31.76 ± 7.99	17.84 ± 13.96	21.49 ± 14.06
Separated parents	4.35 ± 1.96	68.49 ± 6.18	32.59 ± 7.97	18.57 ± 6.74	26.07 ± 6.94	31.89 ± 8.50	17.18 ± 14.55	23.33 ± 14.35
P	**0.014**	**0.032**	0.383	0.054	0.987	0.895	0.705	0.294
Smoking status								
No	3.66 ± 2.08	66.35 ± 7.79	31.38 ± 8.19	16.77 ± 6.33	25.85 ± 6.86	31.37 ± 8.02	18.17 ± 13.95	21.71 ± 13.99
Yes	4.48 ± 2.06	67.81 ± 8.62	34.84 ± 8.26	20.12 ± 5.64	27.42 ± 6.53	34.81 ± 7.30	15.37 ± 14.23	20.66 ± 14.64
P	**<0.001**	0.050	**<0.001**	**<0.001**	**0.015**	**<0.001**	**0.034**	0.429
Drinking alcohol								
No or infrequent drinker	3.64 ± 2.09	66.34 ± 7.88	31.41 ± 8.28	16.79 ± 6.33	25.90 ± 6.91	31.52 ± 8.05	18.13 ± 13.95	21.65 ± 13.77
Frequent drinker	4.21 ± 2.08	67.18 ± 7.93	33.13 ± 8.10	18.67 ± 6.13	26.67 ± 6.54	32.83 ± 7.77	16.53 ± 14.10	21.38 ± 15.29
P	**<0.001**	0.161	**0.006**	**<0.001**	0.136	**0.031**	0.130	0.802

Values marked in bold are significant ($P < 0.05$).

TABLE 3 Bivariate analysis of the association of the psychological scales

Variables	Depression	Impulsivity	Physical aggression	Verbal aggression	Anger score	Hostility score	Liebowitz fear	Liebowitz avoidance
Age	0.070[*]	0.005	0.022	0.126[***]	0.045	0.144[***]	−0.016	0.020
Problematic internet use	0.311[***]	0.226[***]	0.328[***]	0.298[***]	0.238[***]	0.280[***]	0.162[***]	0.090[**]
Depression	−	0.071[***]	0.071[*]	0.383[***]	0.391[***]	0.323[***]	0.328[***]	0.215[***]
Impulsivity	0.071[*]	−	0.189[***]	0.128[***]	0.068[*]	0.200[***]	0.086[**]	0.128[***]
Physical aggression	0.308[***]	0.189[***]	−	0.546[***]	0.463[***]	0.527[***]	0.078[*]	0.077[*]
Verbal aggression	0.383[***]	0.128[***]	0.546[***]	−	0.493[***]	0.636[***]	0.079[**]	0.055
Anger score	0.391[***]	0.068[*]	0.463[***]	0.493[***]	−	0.509[***]	0.113[***]	0.069[*]
Hostility score	0.323[***]	0.200[***]	0.527[***]	0.636[***]	0.509[***]	−	0.040	0.048
Liebowitz fear	0.328[***]	0.086[**]	0.078[*]	0.079[**]	0.113[***]	0.040	−	0.462[***]
Liebowitz avoidance	0.215[***]	0.128[***]	0.077[*]	0.055	0.069[*]	0.048	0.462[***]	−

[*]$P < 0.05$, [**]$P < 0.01$, [***]$P < 0.001$; −, not applicable.

for the following covariates was performed: age, gender, monthly income, parents' status and number of siblings. Higher IAT was significantly associated with higher depression ($\beta = 0.235$, $P < 0.001$), impulsivity ($\beta = 0.099$, $P < 0.001$), physical aggression ($\beta = 0.154$, $P < 0.001$), verbal aggression ($\beta = 0.104$, $P < 0.001$), anger ($\beta = 0.095$, $P < 0.001$), hostility ($\beta = 0.130$, $P < 0.001$), social fear ($\beta = 0.142$, $P < 0.001$) and social avoidance ($\beta = 0.082$, $P = 0.001$) (Table 4).

DISCUSSION

This study aimed to examine the association between PIU with a range of psychological problems in adolescents. This relationship may have an effect on poor mental health by increasing frustration and social anxiety which, as a consequence, might manifest as addictive behaviours.[59,60] Our study showed that PIU in adolescents was associated with several psychopathological issues such as social anxiety, hostility, aggression, depression, impulsivity, anger, and social fear and avoidance.

The associations between the PIU and psychological distress remain controversial and mostly bidirectional.[20,61,62] Moreover, the study enrolled adolescents and this age group is known to include the most frequent internet users, and is characterized by substantial physical, social and emotional changes (since adolescence is a transitional period) that favor the emergence of different addictions.[63] This highlights the fact that age plays a vital role in the PIU as the risk of developing PIU increases with younger age, in line with other findings.[64]

IAT and depression

In this study, the results confirmed that PIU is associated with depression in line with other studies.[28,65,66] It detaches students from social connections and drives users into communicating with friends and colleagues in a virtual world instead of direct face contact. As a consequence, the loss of social relations triggers the development of depressive symptoms. Also, internet addiciton might also affect the students' sleeping pattern due to the considerable amount of time spent surfing the internet; this unstable and poor sleep quality that internet users might have increases the risk of depression.[67]

IAT and impulsivity

Our results concerning impulsivity and PIU were consistent with those found by other studies conducted by Dalbudak et al[68] and Leménager et al[69] that reported higher rates of PIU among participants with impulsive disorder compared to healthy groups. Internet addicts are characterized by being indecisive, preoccupied with details, nervous, irritable, aggressive and impulsive. Moreover, other results showed a positive relationship between PIU and impulsivity symptoms.[70] The underlying

model that explains this relationship is that PIU has been hypothesized as a part of the obsessive-compulsive disorders, since internet-addicts are impulsive, unable to control their internet use, to resist a temptation, urge or impulse that may harm them or others, and to express themselves due to limited social communication; they also enjoy addictive behaviors.[71,72]

IAT and social anxiety

The study results showed that PIU predict social avoidance in adolescents. This is similar as other studies that show that the incidence of PIU is associated with higher incidence of social phobia and depression.[73-75] These findings can be explained by the fact that internet communication is more parctical and convenient compared to others means. It facilitates interaction without engaging face-to-face contact, which helps social anxious individuals experience greater ease of communication[76]; these people use internet as a self-medication to relieve stress and anxiety they cannot cope with.[77]

IAT and anger

The study highlights the fact that PIU is strongly associated with higher incidence of anger where several studies were conducted previously and concluded that internet addict adolescents are prone to develop aggression, irrespective of whether confounding variables were considered.[18,78,79] The correlation between PIU and anger might be explained by the fact that adolescents with PIU are more likely to have angry, aggressive and holistic behaviors due to computer mediated social interaction that limits social relations, exposure to media violence raising the development of destructive thoughts, and entering a deindividuated state during internet activities.[80] In addition, a study conducted by Ko et al[81] reported that use of internet has vital consequences on internet addicts because it reduces distress by providing immediate rewards and opportunities to engage in different activities as chatting and games.

IAT and aggression

Here, we found that PIU was associated with higher physical and verbal aggression. Other studies had also found that PIU is an important risk factor for aggression.[18,81,82] As already mentioned, internet addiction would experience more negative life events and encounter less social support thus leading to aggression easier.[78] Unconsciously individuals could get violence behaviors easily from the internet as lots of violent exist in the network world that could strengthen aggression.[78]

Limitations

First, the data were all based on self-reported measures,

TABLE 4 Multivariate analysis of covariance (MANCOVA)

Variables	Beta	P	95% Confidence interval	
			Lower	Upper
Total depression				
IAT total score	0.235	<0.001	0.191	0.278
Age	0.073	0.013	0.015	0.130
Gender (females *vs.* males[†])	−1.520	0.057	−3.084	0.044
Parents status (separated *vs.* living together[†])	3.168	0.047	0.045	6.291
Number of siblings	0.025	0.411	−0.034	0.084
Monthly income	0.004	0.955	−0.127	0.134
Barratt total score				
IAT total score	0.099	<0.001	0.072	0.125
Age	0.061	0.731	−0.288	0.411
Gender (females *vs.* males[†])	−0.804	0.094	−1.744	0.136
Parents status (separated *vs.* living together[†])	1.707	0.080	−0.204	3.619
Number of siblings	−0.080	0.662	−0.440	0.280
Monthly income	−0.055	0.892	−0.849	0.739
Physical aggression score				
IAT total score	0.154	<0.001	0.127	0.181
Age	0.109	0.542	−0.241	0.459
Gender (females *vs.* males[†])	−2.151	<0.001	−3.106	−1.197
Parents status (separated *vs.* living together[†])	0.713	0.464	−1.195	2.621
Number of siblings	0.458	0.013	0.095	0.821
Monthly income	0.870	0.032	0.077	1.664
Verbal aggression score				
IAT total score	0.104	<0.001	0.083	0.124
Age	0.482	0.001	0.202	0.762
Gender (females *vs.* males[†])	−0.438	0.241	−1.170	0.294
Parents status (separated *vs.* living together[†])	1.167	0.123	−0.315	2.649
Number of siblings	−0.004	0.976	−0.285	0.276
Monthly income	−0.277	0.379	−0.895	0.341
Anger score				
IAT total score	0.095	<0.001	0.072	0.118
Age	0.157	0.305	−0.143	0.458
Gender (females *vs.* males[†])	1.038	0.013	0.217	1.859
Parents status (separated *vs.* living together[†])	−0.139	0.867	−1.776	1.497
Number of siblings	0.197	0.212	−0.112	0.507
Monthly income	0.454	0.192	−0.229	1.136
Hostility score				
IAT total score	0.130	<0.001	0.104	0.157
Age	0.715	<0.001	0.359	1.070
Gender (females *vs.* males[†])	−0.478	0.312	−1.404	0.449
Parents status (separated *vs.* living together[†])	−0.167	0.861	−2.043	1.708
Number of siblings	0.347	0.057	−0.010	0.704
Monthly income	0.267	0.503	−0.515	1.049
Social fear				
IAT total score	0.142	<0.001	0.095	0.190
Age	−0.213	0.505	−0.838	0.412
Gender (females *vs.* males[†])	1.051	0.221	−0.631	2.733
Parents status (separated *vs.* living together[†])	−1.002	0.564	−4.408	2.405
Number of siblings	0.327	0.319	−0.317	0.972
Monthly income	−0.364	0.615	−1.784	1.056
Social avoidance				
IAT total score	0.082	0.001	0.034	0.130
Age	0.250	0.437	−0.381	0.882
Gender (females *vs.* males[†])	−3.450	<0.001	−5.176	−1.723
Parents status (separated *vs.* living together[†])	2.059	0.241	−1.383	5.501
Number of siblings	0.322	0.332	−0.329	0.974
Monthly income	0.303	0.679	−1.132	1.738

[†]Reference group; Note: In the global model, the independent variable was problematic internet use and the covariates were age, gender, monthly income, parents' status and number of siblings.

thus the study might limited by social desirability and recall bias since students' responses may have been prejudiced by what is considered socially acceptable, and responses to the questionnaire were completely dependant on participants' memory. Second, this is a cross-sectional study, so the results cannot address causal relationships, and directionality in the relationship between PIU and depressive symptoms cannot be deduced, since these two disorders are highly interlinked and precipitated by one another. Also, the scales used in this study except the IAT was not validated in the Arab countries. Despite these limitations, it is worth mentioning that this is the first study to identify predictors of PIU among Lebanese adolescents and the results of this study could carry important clinical implications for prevention, intervention, and research on PIU. However, longitudinal in-depth analysis must be conducted in the future to clearly delineate the relation between these two disorders where the predictor and mediator should be assessed ahead of the outcome of interest, thus providing better evidence and understanding.

Conclusion

This study showed that PIU is a common disorder affecting Lebanese adolescents. Specialized awareness techniques should be implemented to prevent and minimize the inappropriate untilization of the internet and improve its rational use. More specifically, education about early exposure to the internet (such as during preschool) and its association with PIU in adolescence, should be provided and implemented in all schools, especially that adolescents spend most of their time at school.

CONFLICT OF INTEREST

The authors have no conflicts of interest to report.

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