

# Exploring Associations Between Problematic Internet Use and Physical Symptoms Associated With Mental Disorders Among Students

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**Introduction:** There is still insufficient data whether problematic internet use (PIU) is linked with physical symptoms associated with mental disorders, particularly among student demographics. **Aim:** This study was conducted to determine whether problematic internet use (PIU) in adults is associated with physical symptoms linked to mental disorders. **Methods:** An anonymous online survey included the nine-item Problematic Internet Use Questionnaire (PIUQ-9) to measure PIU and the 15-item Patient Health Questionnaire (PHQ-15) to measure physical symptoms associated with mental disorders. Depression symptoms were measured with the Patient Health Questionnaire (PHQ-9) and anxiety symptoms with the seven-item General Anxiety Disorder (GAD-7) scale. The study included 207 students (mean age: 23 ± 3 years, 83.6% women). **Results:** Significant correlations were identified between PIUQ-9 scores and physical symptoms. Multivariable regression analysis, adjusting for age, gender, and PHQ-9 and GAD-7 scores, revealed associations between PIU and physical symptoms: extremity/joint pain ( $\beta = 0.161$ ,  $p = 0.019$ ), sexual dysfunction ( $\beta = 0.145$ ,  $p = 0.032$ ), chest pain ( $\beta = 0.135$ ,  $p = 0.047$ ), and fatigue ( $\beta = 0.214$ ,  $p = 0.005$ ). **Conclusions:** High levels of PIU in young adults were associated with physical symptoms linked to mental disorders irrespective of age, sex, depression, and anxiety symptoms.

*(Neuropsychopharmacol Hung 2026; 28(2): 57–65)*

**Keywords:** internet addiction disorder, anxiety, depression, medically unexplained symptoms, mental disorders

## INTRODUCTION

### *Problematic internet use*

Problematic internet use (PIU) is defined as the use of the Internet that creates psychological, social, school, and/or work difficulties in a person's life (Beard & Wolf, 2001). It encompasses a wide range of activities, including social media use, web-streaming, pornography viewing, online shopping and cyberbullying (Fineberg et al, 2018; Fineberg et al, 2025; Fineberg et al, 2022b; Niklová et al, 2019).

Nowadays, the use of the Internet is a part of our daily lives and continues to grow. The number of Internet users has grown more than fivefold since 2005, currently reaching 5.4 billion people (67.0% of the global population) (Petrosyan, 2024). According to a 2023 report from the Lithuanian National Department of Statistics, 98.9% of individuals in the 16–24 years age group and 93.5% of those in the 25–34 years age group used the Internet daily (2024).

Alongside the increased use of the Internet, global concern about PIU and its public health and societal costs is also growing. Adolescents are one of the most researched groups concerning PIU, but there is still insufficient knowledge about PIU in adults. PIU affects 7.02% of the world's population (Burkauskas et al, 2023; Gjoneska et al, 2025; Pan et al, 2020). Students who exhibit PIU symptoms have an increased risk of developing other psychiatric disorders like depression and anxiety (Joshi et al, 2021; Milasauskiene et al, 2021; Xie et al, 2021) and are also considered a vulnerable group (Bunevicius et al, 2008; Stanyte et al, 2022).

It is widely known that PIU is closely related to mental disorders, including anxiety and depression. A systematic review of 20 separate studies reported that 75% of those studies found significant associations between PIU and depression, while 57% connected PIU with anxiety disorders (Carli et al, 2012). Students who experience anxiety and depression symptoms may have a tendency to use the Internet to relieve symptoms like low mood, insomnia, fearfulness, feelings of guilt, and hopelessness by focusing their attention on online activities (Csepeli & Nagyfi, 2014; Ranjan et al, 2021).

People who experience social anxiety tend to avoid physical and social contact with others. It increases the risk of developing PIU, especially in young adults and adolescents who might seek relief from physical contact by engaging in virtual friendships (Lee & Stapinski, 2012; Sertbaş et al, 2020). It

was documented that social anxiety disorder was associated with high PIU scores in young participants (age  $\leq 25$  years), whereas generalized anxiety disorder was associated with high PIU scores in the older participants (Ioannidis et al, 2018).

Another psychiatric disorder that increases the risk of PIU is depression. The risk correlates with the severity of depressive symptoms. Depressive symptoms such as trouble concentrating, psychomotor dysregulation, and suicidal ideation were most strongly associated with PIU risk (Moreno et al, 2015). Moreover, signs or symptoms of PIU can be easily masked or justified, and some studies indicate that it may manifest with symptoms of another disorder like depression (Bisen & Deshpande, 2018).

As internet use has grown in recent decades, so has scientific concern about PIU and with this, related social and physiological changes have increased as well (Fineberg et al, 2022a). Studies that assessed PIU have reported significant evidence that behavioural addictions like PIU are associated with physical health and well-being (Cao et al, 2011; Kojima et al, 2019; Lopes et al, 2022). Studies have provided results that PIU can correlate with daily habit changes like skipping breakfast, going to bed late, and a lack of physical activity (Kojima et al, 2019). Such dysfunctional daily habits lead not only to unwanted mental health outcomes (e.g., anxiety, stress, or depression symptoms) but also to eating disorders, sleep deprivation, lack of physical energy, physiological dysfunction, orthostatic dysregulation symptoms, and weakened immunity (Cao et al, 2011; Kojima et al, 2019; Lopes et al, 2022; Melca et al, 2023; Morahan-Martin & Schumacher, 2000).

As researchers delve deeper into the complexities of PIU, attention has increasingly been given to its potential links with physical symptoms associated with mental disorders, particularly among student demographics. The correlation between excessive internet use and mental health issues (e.g., anxiety, depression) has garnered significant interest in academic and clinical communities. However, the exploration of how PIU may manifest in physical symptoms associated with these mental health conditions among students remains an evolving area of research. The aim of the present study was thus to determine whether PIU in students is associated with physical symptoms linked to the risk of mental disorders. Based on the literature analysed, we hypothesised that PIU would be associated with greater expression of physical symptoms. If this general association was confirmed, we aimed to

explore which specific physical symptoms were associated with PIU.

## MATERIALS AND METHODS

### *Procedure*

A cross-sectional study design was used to conduct this study within the Lithuanian University of Health Sciences (LSMU), using Google Forms. We used an online anonymous survey that targeted students. A formal online consent form was shown to each participant to tick before starting the survey. No incentives were given upon completion. Only fully completed questionnaires were included. All participants were  $\geq 18$  years old. The survey was in Lithuanian. The study received approval from the university's Bioethics committee and conformed with the principles outlined in the Declaration of Helsinki.

### *Questionnaires*

Anxiety symptoms were measured with the seven-item General Anxiety Disorder (GAD-7) scale (Pranckeviciene et al, 2022; Spitzer et al, 2006; Stanyte et al, 2023). This questionnaire is a seven-item, self-report anxiety survey designed to assess the patient's health status during the previous 2 weeks. The items enquire about the degree to which the patient has been bothered by feeling nervous, anxious or on edge, not being able to stop or control worrying, worrying too much about different things, having trouble relaxing, being so restless that it is hard to sit still, becoming easily annoyed or irritable, and feeling afraid as if something might happen. Scores of 0, 1, or 2 are given for experiencing symptoms "not at all", for "several days", for "more than half the days", and for "nearly every day", respectively. The scores are then totalled and presented from 0 to 21. Scores of 5, 10, and 15 represent cut-off points for mild, moderate, and severe anxiety, respectively. When screening for an anxiety disorder, a recommended cut-off point for referral for further evaluation is 10 or greater. Cronbach's alpha for the measure in the current study was 0.916.

Depression symptoms were measured with the Patient Health Questionnaire 9 (PHQ-9) (Kroenke et al, 2001; Pranckeviciene et al, 2022; Stanyte et al, 2023). The PHQ-9 is the depression module which scores each of the nine DSM-IV criteria as "0" (not at all) to "3" (nearly every day). The questionnaire contains nine questions about depressive symptoms

(from DSM-IV criteria). Each question must be evaluated from "0 – not at all" to "3 – nearly every day". The severity score depends on scoring: 5–9 – minimal symptoms, 10–14 – minor depression, 15–19 – major depression, moderately severe, 20 or more – major depression, severe. Cronbach's alpha for the measure in the current study was 0.853. The GAD-7 and PHQ-9 tools were validated for Lithuanian samples and earlier findings showed the instruments were adequate to evaluate depression and anxiety symptoms in Lithuanian individuals (Pranckeviciene et al, 2022; Stanyte et al, 2023).

The nine-item version of the Problematic Internet Use Questionnaire (PIUQ-9) was used to assess PIU (Burkauskas et al, 2020; Laconi et al, 2018). The PIUQ-9 is a short version of the 18-item Problematic Internet Use Questionnaire (Demetrovics et al, 2008). The sum score of the questionnaire's short form ranges 9–45. A higher score indicates a higher risk of PIU. Cronbach's alpha for the measure in the current study was 0.891.

The 15-item Patient Health Questionnaire (PHQ-15) was used to evaluate somatic symptoms (Kroenke et al, 2002). The PHQ-15 was developed for the detection of patients in a primary care setting at risk of somatoform disorders. However, the instrument can serve as a continuous measure of somatic symptom (physical) severity. The questionnaire consists of 15 items regarding physical problems that bothered individuals over a 4-week period. Each item ranges from zero/0 ("not bothered") to 2 ("bothered a lot"), resulting in a total score ranging 0–26. Cronbach's alpha for the measure in the current study was 0.745.

### *Statistical Analysis*

SPSS for Windows, Version 29.0 (SPSS Inc., Chicago, Illinois, USA) was used to analyse the data. The data are expressed as mean  $\pm$  SD for variables with a Gaussian distribution and as a number (percent) for qualitative variables. We first calculated the means and frequencies for socio-demographic, PIU, mental distress, and physical symptom scores.

For the hypothesis testing, we employed Pearson correlational analysis to determine the association of PIU scores as measured with the PIUQ-9 with scores on physical symptoms as measured with the PHQ-15. An explorational analysis was performed, using Spearman correlation again per the association of PIU scores as measured with the PIUQ-9 with specific somatic symptoms measured with the PHQ-15. All variables that, after Benjamini-Hochberg correction,

were statistically significantly associated with the physical domain in the correlational analyses were subsequently included in respective multivariable regression models. We used multivariable linear regression analyses to determine if PIU remained associated with specific physical symptoms after adjustment for age, sex, and mental distress scores as measured with the GAD-7 and PHQ-9.

## RESULTS

Our study included 207 students. The mean age of participants was  $23 \pm 3$  years; 16.4% were men and 83.6% were women (Table 1); 79% of the study participants lived in cities, while 21.0% lived in villages. Mean scores on psychological assessments were: PHQ-15 (somatic symptoms) – 8.4 (SD = 4.5), PHQ-9 (depressive symptoms) – 7.9 (SD = 5.1), GAD-7 (anxiety symptoms) – 5.1 (SD = 3.4), and PIUQ-9 (problematic internet use) – 19.2 (SD = 6.9).

Person correlational analysis revealed a moderate positive association between PIU and general physical symptomatology ( $r = 0.348$ ,  $p < 0.001$ ).

Then, Pearson correlational analysis with Benjamini-Hochberg correction was performed to identify associations between PIUQ-9 scores and specific physical symptoms. Several somatic symptoms domains were associated with PIUQ-9 scores, including extremity/joint pain,  $r(205) = 0.220$ ,  $p = 0.001$ , sexual dysfunction,  $r(205) = 0.182$ ,  $p = 0.009$ , headache,  $r(205) = 0.185$ ,  $p = 0.007$ , chest pain,  $r(205) = 0.177$ ,  $p = 0.011$ , dizziness,  $r(205) = 0.183$ ,  $p = 0.008$ , trouble sleeping,  $r(205) = 0.238$ ,  $p < 0.001$ , and fatigue,  $r(205) = 0.311$ ,  $p < 0.001$ . See Table 1.

For those physical symptoms variables that were significant in the correlational analysis, multivariable regression analysis was used, adjusting for age, gender, PHQ-9, and GAD-7 scores. It revealed weak but significant associations between PIU and physical health symptoms: extremity/joint pain ( $\beta = 0.161$ ,  $p = 0.019$ ), sexual dysfunction ( $\beta = 0.145$ ,  $p = 0.032$ ), chest pain ( $\beta = 0.135$ ,  $p = 0.047$ ), and fatigue ( $\beta = 0.214$ ,  $p = 0.005$ ). See Table 2.

We used post-hoc power analysis to determine the effect size (as measured by Cohen's  $f^2$ ) of our findings: extremity/joint pain Cohen's  $f^2 = 0.049$ ; sexual dysfunction Cohen's  $f^2 = 0.063$ ; Chest pain Cohen's  $f^2 = 0.062$ ; fatigue Cohen's  $f^2 = 0.025$  representing an overall small effect size.

**Table 1.** Correlations of Physical Symptoms With the Nine-Item Problematic Internet Use Questionnaire (PIUQ-9),  $n=207$

PHQ-15	r (p)
Stomach pain	0.168 (0.015)
Back pain	0.100 (0.152)
Extremity/joint pain	0.220 (0.001)*
Menstrual pain	0.140 (0.044)
Sexual dysfunction	0.182 (0.009)*
Headache	0.185 (0.007)*
Chest pain	0.177 (0.011)*
Dizziness	0.183 (0.008)*
Fainting spells	0.005 (0.940)
Feeling heart pound or race	0.165 (0.018)
Shortness of breath	0.018 (0.802)
Constipation, loose bowels, or diarrhoea	0.100 (0.151)
Nausea, gas, or indigestion	0.104 (0.135)
Trouble sleeping	0.238 (< 0.001)*
Fatigue	0.311 (< 0.001)*

Note. \* Significant values, after Benjamini-Hochberg correction. PHQ-15 – Patient Health Questionnaire-15, measuring physical symptoms linked to mental disorders.

## DISCUSSION

Our results indicate that PIU is an important determinant of physical symptomatology in students. The associations were independent of various potential confounders, such as sex, age, and mental distress scores. This study's results could be adjusted in practice to help identify PIU among people who have complaints about stomach pain, extremity/joint pain, sexual dysfunction, chest pain, or fatigue. General practitioners should pay more attention to patients with such complaints.

Most of the studies which analysed PIU have focused on mental health outcomes. Anxiety and depression symptoms are the most commonly found when investigating PIU and human health relationships (Lopes et al, 2022; Melca et al, 2023; Morahan-Martin & Schumacher, 2000). More and more researchers have raised the question of whether behavioural addictions affect physical and

**Table 2.** Multivariable Regression Between Somatic Symptoms and the Nine-Item Problematic Internet Use Questionnaire (PIUQ-9)

	Adjusted		Unstandardized coefficients		Standardized coefficients		F	p	VIF	
	R <sup>2</sup>	R <sup>2</sup>	B	Standard error	β	t				
Sexual dysfunction	0.12	0.10	2.10	0.97	0.145	2.16	0.032	5.51	<0.001	1.03
Headache	0.11	0.09	1.18	0.12	0.116	1.64	0.104	5.07	<0.001	1.14
Chest pain	0.12	0.10	2.05	0.14	0.135	2.00	0.047	5.37	<0.001	1.24
Dizziness	0.11	0.09	1.20	0.75	0.110	1.60	0.111	5.05	<0.001	1.09
Trouble sleeping	0.11	0.09	0.95	0.53	0.135	1.77	0.078	5.17	<0.001	1.31
Fatigue	0.13	0.11	1.63	0.58	0.214	2.82	0.005	6.24	<0.001	1.34
PHQ-15	0.15	0.13	0.043	0.12	0.282	3.58	<0.001	7.33	<0.001	2.49

Note. Adjusting: age, sex, depression, and anxiety scores as measured with the Patient Health Questionnaire-9 and the seven-item General Anxiety Disorder scale.

biological changes. It is obvious and well-known that mental and physical health issues directly influence each other. Regarding PIU, this relationship often manifests through sedentary behaviors, poor posture, and extended screen time, leading to physical health issues (Kojima et al, 2019; Melca et al, 2023; Morahan-Martin & Schumacher, 2000).

Overall, the existing evidence indicates a significant relationship between PIU and mental health and physical health, which is in line with the present study's results. Physical symptoms related to sleep, fatigue, musculoskeletal, sexual, and cardiovascular health are a serious concern associated with PIU (Kojima et al, 2019; Melca et al, 2023; Morahan-Martin & Schumacher, 2000).

A cross-sectional study by Tanabe et al. (Tanabe et al, 2021) carried out in Japan suggested that adults with PIU are at risk of physical disorders. Researchers have explained that extended periods of sitting and poor posture while using digital devices can lead to neck, shoulder, and back pain, a lack of physical activity, or being overweight (Suris et al, 2014; Tanabe et al, 2021). A cross-sectional study with college students aged 16–24 years in Asia confirmed previous findings and provided results of a positive relationship of internet addiction and musculoskeletal pain in multiple body sites (Yang et al, 2019). These findings are somewhat in line with our study, which concluded that PIU positively correlated with extremity/joint pain.

Moreover, in our study we observed that PIU related with reported chest pain. This suggests that students who reported higher PIU scores reported

more frequently experiencing chest pain. A cross-sectional study of middle school students from northwest Romania provided similar results that internet use could evoke cardiovascular effects in some adolescents (Lazea et al, 2020). (Lazea et al, 2020) additionally found an independent relationship between palpitation and internet usage time; they suggested that one of the most important factors associated with the occurrence of palpitations and related symptoms was the time frame of internet usage.

As internet usage has grown, scientists have started to analyse deeper how the Internet affects internet users. An extensive study that covered several European countries examined how addictive or problematic use of the Internet or technology negatively affects the well-being of children (subjects aged 9–16 years) (Smahel et al, 2015). Most of the common health problems associated with internet or technology use were eye problems, headaches, eating problems, and tiredness (Smahel et al, 2015). Similar results were published after a recent cross-sectional study performed in Lithuania with an adolescent sample (aged 12–16 years) (Lesinskienė et al, 2024). The authors provided results that adolescents who rarely reported sleeping problems, headaches, or abdominal pain had a lower PIU risk than those who reported suffering more often or stronger. A different cross-sectional study supported other studies' findings and reported that internet gaming addictions were related to personal physical health (Shakya et al, 2023). Contrary to our study results, Shakya et al. (2023)

researched medical students (aged 18–29 years) in a Hindu region. The authors reported that internet gaming mainly affected sleeping problems, including waking up too early, daytime sleepiness, snoring, fatigue, and headache upon waking in their gaming disorder sample. Higuchi et al. (2005) explained that excessive screen time suppresses the secretion of melatonin, and that causes sleeping deficiencies. Unfortunately, we did not find sleep troubles and significant PIU correlations in our research. However, correlations between fatigue, stomach pain, and PIU somewhat complemented earlier findings.

Furthermore, substance or behavioural addictions directly affect our daily habits, and a dysfunctional daily routine leads to somatic complaints like sleep deprivation, headache, vertigo, fatigue, and causes sexual difficulties in male and female samples (Fuzeiro et al, 2022; Kojima et al, 2019; Mortazavi et al, 2011). Again, PIU leads to daily habit changes like skipping breakfast, eating fast food, or late-night eating (Kojima et al, 2019). Previous findings (Lesinskienė et al, 2024) and our study findings caused us to hypothesise that stomach pain and PIU could be the consequence of a daily habit change.

Our study results confirm a previous case report's conclusions (Fuzeiro et al, 2022) and proved the PIU and sexual dysfunction relationship. Fuzeiro et al. analysed correlations of sexual function and the problematic use of smartphones and social networking sites and raised a hypothesis that an excessive use of smartphones or social media can affect sexual function by means of its adverse effects on mood. Some results support that anxiety and depression are psychological conditions that affect sexual function (Burri et al, 2011). Some researchers have reported that the quality of sexual relationships are affected by online activities and the use of online sexual content (Zheng & Zheng, 2014). A detailed analysis which examined a sample of adult men reported somewhat contrary results and announced that the use of online sexual content in general had no impact on men's sexual health (Pawlikowska-Gorzelańczyk et al, 2023). However, (Pawlikowska-Gorzelańczyk et al, 2023) agreed that an excessive use of sexual content like pornography did correlate with sexual function.

## STRENGTHS AND LIMITATIONS

One of the significant strengths of these studies was that results included controls for anxiety and depression to make a clear correlation between PIU

and physical symptoms. Again, most studies that analysed PIU explored mental health outcomes like anxiety and depression. This careful control of mental health variables strengthens the hypotheses that the observed physical health symptoms are indeed a consequence of PIU rather than being indirectly influenced by underlying mental health conditions. Furthermore, our results showed similar correlations between GAD-7, PHQ-9, and PHQ-15 scores.

However, our study had several limitations. First, the study design produced cross-sectional data, which prevented us from assuming causality between study variables. Second, our small sample prevented us from obtaining more specific and significant results regarding correlations between PIU, symptoms of anxiety and depression, and unwanted health issues. Moreover, our study sample was limited to young adults per age and gender. Future investigators should recruit a larger and more varied sample of individuals regarding age and gender to confirm our findings and determine if these physical symptoms have the same correlations with PIU.

## CONCLUSIONS

High levels of PIU in students were associated with physical symptoms linked to mental disorders. This correlation persisted even when accounting for clinical risk factors and depression and anxiety symptoms.

## ABBREVIATIONS

PIU = Problematic Internet Use  
PIUQ-9 = Problematic Internet Use Questionnaire  
PHQ-15 = 15-item Patient Health Questionnaire  
PHQ-9 = Patient Health Questionnaire  
GAD-7 = General Anxiety Disorder

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**ACKNOWLEDGMENTS:** This research was completed under the project "Adaptation of Internet Addiction Identification Instruments to the General Public for Prevention and Intervention Purposes," financed by the Public Health Promotion Fund, which is administered by the Lithuanian Ministry of Health (contract no. S-164). O.K. received support from the National Research, Development and Innovation Fund,

provided by the Ministry of Culture and Innovation of Hungary, financed under the STARTING\_24 funding scheme (project no. STARTING 150089) and from the János Bolyai Research Scholarship of the Hungarian Academy of Sciences.

**DECLARATION OF INTEREST:** In the past 2 years, JB has served as a consultant at IQVIA, has received research funding grants from the Research Council of Lithuania and collected speaking fees from the Council of Europe International Cooperation Group on Drugs and Addiction (Pompidou Group). VS reported being a consultant to Signant Health and received personal fees from Lundbeck, Sanofi, Servier, Johnson & Johnson, KRKA, and grants from the Research Council of Lithuania. The other authors declared no commercial or financial relationships that could be construed as a potential conflict of interest.

**ETHICS STATEMENT:** This manuscript is the authors' original work. All participants engaged in the research voluntarily and anonymously. Their data are stored in coded materials and databases without personal data. The study received approval from the university's Bioethics committee, number: BEC-MF-32.

**DATA AVAILABILITY:** Datasets presented in this article are available from the corresponding author upon reasonable request.

**DECLARATION OF AI USE:** Artificial intelligence was not used in the preparation of this manuscript.

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## A problémás internethasználat és a mentális zavarokhoz kapcsolódó testi tünetek közötti összefüggések vizsgálata hallgatók körében

**Bevezetés:** Jelenleg nem áll rendelkezésre elegendő adat arra vonatkozóan, hogy a problémás internethasználat (PIU) összefügg-e a mentális zavarokhoz kapcsolódó testi tünetekkel, különösen egyetemi hallgatók körében. **Célkitűzés:** A vizsgálat célja annak vizsgálata volt, hogy a felnőttek körében tapasztalható problémás internethasználat (PIU) összefügg-e a mentális zavarokhoz kapcsolódó testi tünetekkel. **Módszerek:** Az anonim online kérdőíves felmérés során a kilenc tételből álló Problematic Internet Use Questionnaire (PIUQ-9) kérdőívet alkalmaztuk a problémás internethasználat mérésére, valamint a 15 tételű Patient Health Questionnaire-t (PHQ-15) a mentális zavarokhoz kapcsolódó testi tünetek felmérésére. A depressziós tüneteket a Patient Health Questionnaire (PHQ-9), míg a szorongásos tüneteket a hét tételből álló Generalized Anxiety Disorder skála (GAD-7) segítségével mértük. A vizsgálatban 207 egyetemi hallgató vett részt (átlagéletkor:  $23 \pm 3$  év; 83,6% nő). **Eredmények:** Szignifikáns összefüggést találtunk a PIUQ-9 pontszámok és a testi tünetek között. Az életkorra, nemre, valamint a PHQ-9 és GAD-7 pontszámokra korrigált többváltozós regressziós elemzés alapján a problémás internethasználat az alábbi testi tünetekkel mutatott összefüggést: végtag- és ízületi fájdalom ( $\beta = 0,161$ ;  $p = 0,019$ ), szexuális diszfunkció ( $\beta = 0,145$ ;  $p = 0,032$ ), mellkasi fájdalom ( $\beta = 0,135$ ;  $p = 0,047$ ), valamint fáradtság ( $\beta = 0,214$ ;  $p = 0,005$ ). **Következtetések:** A fiatal felnőttek körében tapasztalt magas szintű problémás internethasználat összefüggésben állt a mentális zavarokhoz kapcsolódó testi tünetekkel, függetlenül az életkortól, a nemtől, valamint a depressziós és szorongásos tünetektől.

**Kulcsszavak:** internetfüggőség, szorongás, depresszió, orvosilag nem magyarázható tünetek, mentális zavarok