The Relationship between Internet Addiction and Perceived Health

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BACKGROUND: The development of society and the close connection of everyday life with the internet have brought a new type of non-substance addiction – internet addiction. Although the relationship between internet addiction and health has been confirmed and the importance of this issue has been emphasized, it has not been sufficiently examined in European countries. **AIMS:** The main objective of the study was to assess the significance of the relationship between internet addiction and health perception in a sample of university students in the Slovak Republic. **DESIGN AND MEASUREMENTS (METHODS):** Data was collected using a questionnaire distributed in 2020. The objective was achieved using descriptive analysis and correlation analysis, but mainly quartile regression analysis. **SAMPLE (PARTICIPANTS):** The sample was created by a combination of selection based on availability (voluntariness) and later quota selection. The study sample consisted of 1612 responses of Slovak university students. The analyses included data on internet addiction (IA) and health perception (HP). **RESULTS:** Health perception among the Slovak university students showed relatively positive values. Internet addiction-related values suggested normal levels of internet use among the Slovak students. Problematic behaviour was found in approximately 33% of the sample that was analysed. Less than one per cent of the respondents could be assessed as severely addicted. The effect of IA on HP has also been proved and confirmed. Overall, it can be concluded that there is a negative effect of internet addiction on health perception, i.e. HP decreases with increasing IA. **CONCLUSIONS:** Internet addiction prevention and education should not be underestimated. The development of society and the tendency of the population to non-substance addictions can currently be considered a major threat for the future.

Keywords | Internet – Internet Addiction Tests (IAT) – Non-Substance Addiction – Public Health – Health Perception – Questionnaire – Slovak Students – Quantile Regression

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1 INTRODUCTION AND THEORETICAL BACKGROUND

With the development of humanity and new opportunities, new health problems are also emerging, which may be the price of a fast-changing world to which humanity must adapt. The internet offers benefits in many ways and makes people's lives easier, whether it is getting information or communicating. On the other hand, this phenomenon poses a certain threat in the form of problematic internet use, and it is therefore necessary to examine its consequences for physical and mental health (Vigna-Taglianti et al., 2017). The importance of this issue is underlined by the fact that it is a hobby which can become an uncontrollable addiction in many cases (Lin et al., 2018). Tolerance increases over time, and people spend more and more time on the internet; therefore, the potential for abuse is evident. As a result, the problem of internet addiction has become a much-discussed issue; simultaneously, some authors have highlighted the need to address this issue from different health perspectives, but especially in terms of the effects of problematic internet use on the health of the population (Aboujaoude, 2010). The main reason for dealing with this issue lies in the need to know and emphasize the potential threat of this health problem. Therefore, the present study clarifies the relation between internet addiction and perceived health.

Internet addiction is a relatively young health problem that affects the lives of many people who may not even know it, as the internet has become an integral part of everyday life (Shin et al., 2018; Tsitsika et al., 2009). Therefore, it can be considered a hidden and critical disease that can lead to other health problems (Shapira et al., 2003; Tran et al., 2017). Davis (2001) divided internet addiction into two types: general and specific. In general, this phenomenon represents an excessive use of the internet, when an individual has no clear objective, wastes time uncontrollably. and remains in the virtual world, which may also be related to the social aspect. On the other hand, the author explained a specific addiction to the internet as an addiction with a specific online objective that controls an individual (sexual material, auction services, stock trading, gambling).

According to Tsitsika et al. (2014), addictive internet behaviour is more common among young people whose parents have lower levels of education, as well as among young people who start using the internet at an earlier age and make greater use of social and gaming sites. In this context, Lam et al. (2009) identified drinking habits, family dissatisfaction, and stressful events as potential risk factors for internet addiction. These authors also highlighted that males are more likely than females to be addicted to the internet. This fact was also confirmed by Tsai et al. (2009), who added the habit of skipping breakfast, a lack of social support, mental health morbidity, and neurotic personality characteristics among the risk factors. Similar findings were confirmed by Yan et al. (2014), who dealt with family functioning, personality traits, and stress-related events. In a study conducted by Tural Hesapcioglu and Yesilova (2020), the findings indicate that internet addiction has been positively correlated with depressive status, suggesting that the higher the level of internet addiction, the higher the depressive status. Simultaneously, the findings provided by Cerniglia et al. (2017) clarify the link between poor mental health and internet addiction, and prove the negative consequences in everyday life. Internet addiction can also be associated with many other negative health patterns of behaviour, such as harmful alcohol consumption (Yen et al., 2009), smoking (Seyrek et al., 2017), cannabis and other illegal drug use (Secades-Villa et al., 2014), irregular eating habits, skipping meals, poor diet quality (Kim et al., 2010), increased meal size, the habit of snacking while using the internet, reduced physical activity, and shorter duration of physical activity (Kamran et al., 2018), as well as poor sleep (Wolniczak et al., 2013). In this regard, some authors have underlined the fact that internet addiction causes health problems that can manifest themselves as fatigue associated with sleep deprivation, repetitive strain injury, back pain, and carpal and radial tunnel syndromes resulting from spending long hours on the internet (Flisher, 2010; Murali & George, 2007). Nazik and Gunes (2019) found that problematic internet use was associated with burning in the eyes, pain in the trapezius muscles, and sleepiness. At the same time, the authors confirmed a negative relationship between long-term internet use and healthy lifestyle behaviours. These findings support the assumption that people addicted to the internet suffer from prolonged computer-related seated immobility, which increases the risk of venous thromboembolism and obesity (Eliacik et al., 2016; Healy et al., 2010; Healy et al., 2008). All of these findings agree with the evidence in the case study of Braithwaite et al. (2018), in which a 44-year-old man can have a deterrent effect on how a hobby can become a serious disease. This man had a passion for online computer games, and he was able to be online continuously for 44 hours; in addition, he smoked 20 cigarettes per day and suffered from excessive obesity. These risk factors eventually led to venous thrombosis. This case is proof that internet addiction can strike anyone and it is not limited to young people.

As already mentioned, the negative features of internet addiction may indicate poorer health and its perception, which can affect the quality of life. Therefore, it is necessary to point out the findings revealed by Ha and Hwang (2014), who revealed that internet addiction is significantly associated with poor self-rated health, subjective unhappiness, and depressive symptoms. Similar findings were demonstrated in a study conducted by Ustinaviciene et al. (2016), who showed that internet addicts were more likely to report a poorer perception of their health compared to non-internet addicts. Cao et al. (2011) also confirmed a positive relationship between problematic internet use and psychosomatic symptoms such as a lack of physical energy, physiological dysfunction, weakened immunity, difficulties in social adaptation, and emotional and behavioural symptoms. These findings are consistent with the results of other studies that confirmed a significant relation between internet addiction and poor health-related quality

of life, as evidenced by self-care problems, daily routine difficulties, pain and discomfort, and anxiety and depression in internet addicts (Tran et al., 2017). At the same time, Chern and Huang (2018) revealed that people addicted to the internet showed a lower health-related quality of life, which includes the physical, psychological, social, and environmental domains. Machimbarrena et al. (2019) also confirmed a significant inverse relationship between problematic internet use and the health-related quality of life as self-reported variables.

The internet was originally intended to be a medium with the main purpose of interconnecting people. Additionally, activities on the internet can be a source of entertainment and relaxation. However, it is dangerous if the time spent on these activities exceeds a reasonable level and becomes the main content of a person's life. Such a case of problematic internet use can culminate in internet addiction, which can pose a health risk. Although the relationship between internet addiction and health has been confirmed, as well as the importance of this issue having been emphasized, it has not been sufficiently examined in European countries. In connection with internet addiction, a different perception of health can also be expected, which is the main subject of the research activities in the following parts of this study.

2 METHODOLOGY

As already mentioned, internet addiction is a relatively young problem that can have serious consequences for society, as the internet has become an integral part of life. Therefore, assessing and proving the effects of internet addiction on health in different geographical, demographic or social conditions seems to be beneficial.

2.1 Research objective

The primary objective of the study was to assess the significance of the relationship between internet addiction and health perception in a sample of university students in the Slovak Republic. In relation to this objective, a hypothesis was formulated as follows: We assume that the effect of internet addiction on health perception is significant in the selected sample.

2.2 Survey methodology

Data was collected using a questionnaire distributed in 2020. The research was conducted on a population of Slovak students, in a combination of selection based on availability (voluntariness) and later quota selection. The vast majority of Slovak universities and colleges (32 institutions) were involved in the research. In the case of quota selection, in addition to the inclusion of most universities, the selection was also focused on the field of study, the form of study, and the gender characteristics of the respondents. This information is described in the next paragraph. The collection itself was carried out using a Google form questionnaire, which was distributed to students (i) through student emails with the help of representatives at selected universities and colleges, (ii) through student groups on the Facebook social network, and (iii) through the students themselves, who shared the questionnaire with each other. The questionnaire contained a control item indicating agreement with the statement that one million has six zeros (a numerical expression was also provided); 98 observations were excluded from the subsequent analytical processes as a result of disagreement with this item. After several control items and the gradual elimination of irrelevant observations, the data validation reached 1612 observations (responses) of Slovak university students.

In terms of gender, the sample included 584 men (36.2%) and 1028 women (63.8%). Regarding the levels of study, the sample consisted of 1099 observations (68.2%) of a bachelor's degree, 412 observations (25.6%) of a master's (or engineering) degree, 39 observations (2.4%) of a combined bachelor's and master's (or engineering) degree, and 62 observations (3.8%) of a doctoral (PhD) degree. Regarding the form of study, the sample contained 1496 observations (92.7%) of the full-time form and 116 observations (7.2%) of the part-time form. In terms of residence, 794 observations (49.3%) were represented by the countryside, 187 (11.6%) by towns with a number of inhabitants up to 10,000, 508 (31.5%) by cities with 10,001–100,000 inhabitants, and 123 (7.7%) by cities with 100,001–1,000,000 inhabitants.

2.3 Data analysis

Two constructs were analysed: internet addiction (IA) using the Internet Addiction Test (IAT) developed by Young (2017), and health perception (HP). The HP scale cannot be considered standardized. This scale captured the perception of health status through four items of the questionnaire, which are listed in the appendix. The IAT consisted of 20 items, with the individual items being counted to obtain the total IAT score and to evaluate IA. The total HP score was calculated from the arithmetic mean of the values related to the health perception items in the questionnaire. The possibility of adjustment was verified by reliability (Cronbach's α). After the above-mentioned adjustments, descriptive analysis was used to point to the variables under analysis more specifically. This was followed by correlation analysis, which was carried out using the Spearman correlation coefficient ρ. The most important part of the analytical process was the application of quantile regression analysis, which verifies the effects of IA on HP, and the 25^{th}, 50^{th}, and 75^{th} percentiles were used. The IBM SPSS statistic v. 26 (Armonk, New York, US) and the programming language R v. 4.0.1 (RStudio, Inc., Boston, MA, USA) were used for the analytical procedures.

3 RESULT

In the first step of the analytical processes leading to the fulfilment of the above-mentioned objective, descriptive analysis was used to point out the basic characteristics of the variables under analysis. The purpose of these outputs was primarily to acquaint the reader with the variables entering the analyses. The independent variable was an output of the Internet Addiction Test (IAT) scale, i.e. internet addiction (IA), which was assessed as the sum of all items. In addition to the authors of the IAT questionnaire and their suggestions for processing, the suitability of the adjustment of the obtained data by the sum was also supported by the reliability, which was considered sufficient (α = 0.899). The second variable used in the analytical processes was the perceived health status (HP), which represented the dependent variable. The rate of reliability expressed by Cronbach's α was also acceptable (α = 0.786). The items of perceived health status were adjusted by arithmetic mean.

Statistics	IA	HP
Mean	26.01	3.94
CI 95%	25.35–26.66	3.89–3.98
Median	24.00	4.25
Std. Deviation	13.41	0.98
Skewness	0.75	-0.90
Kurtosis	0.69	0.07
Minimum	0	1
Maximum	90	5
25. Percentiles	16.00	3.25
75. Percentiles	34.00	4.75

Table 1 | Descriptive statistics of the variables under analysis

Table 1 provides the basic statistical characteristics of the variables that were analysed. The measures of central tendency point to the fact that the level of IA was acceptable and could be considered to be average internet use (mean = 26.1, CI 95% = 25.35–26.66, median = 24); the HP rate was also assessed positively (mean = 3.94, CI 95% = 3.89–3.98, median = 4.25). Based on this evidence, it can be concluded that students acquired relatively positive total values for internet addiction, as well as for health perception. The level of variability expressed by standard deviation did not display significantly high values. Skewness and kurtosis showed values in the range from -1 to 1; therefore, it is not possible to state significant deviations from the normal distribution based on the above-mentioned characteristics (Skewness: IAT = 0.75, HP = -0.90; Kurtosis: IA = 0.69, HP = 0.07). The theoretical interval of HP was from 1 to 5; accordingly, the measured minimum and maximum values mirrored the theoretical interval (min = 1, max = 5). The theoretical maximum value of IA was 100, but the measured value was 90. This fact can be assessed positively in terms of the intensity of the total internet addiction. The quantile characteristics represented by the 25th and 75th percentiles displayed relatively satisfactory values. The questionnaire

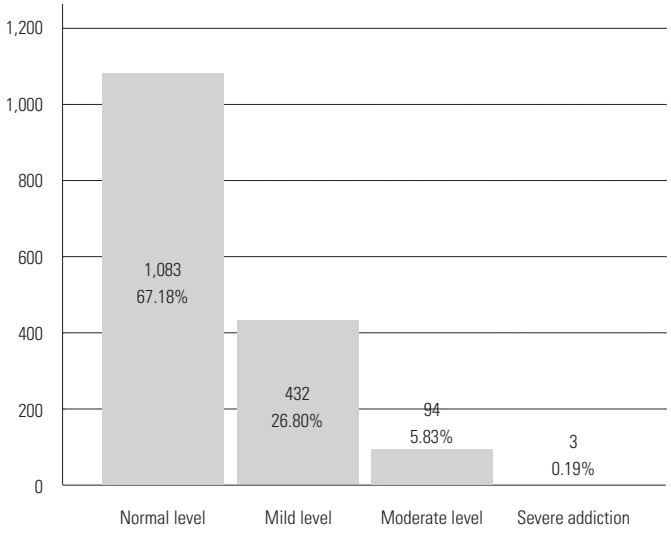

Figure 1 | IA score interval

items and selected characteristics of descriptive statistics are shown in the table in Appendix 1.

Figure 1 determines the IA intervals and reveals that 67.18% of the Slovak students showed normal internet use and 32.82% of Slovak students showed problematic internet use. Severe addiction was only found in three cases (0.19%). The decreasing intensity of the addiction in the context of the frequency of occurrence can be evaluated positively, i.e. the stronger the addiction, the less frequent it is. This finding was expected.

The next part of the analytical process deals with the effect of IA on HP. In the first step of assessing the significance of the relationships, it was appropriate to evaluate the correlation.

For this purpose, the Spearman correlation coefficient ρ was used. This method was chosen on the basis of the output of multivariate normality, which recommended the application of a nonparametric method (Mardia Skewness = 388.78 (p-value < 0.001); Mardia kurtosis = 5.76 (p-value < 0.001)). The correlation coefficient showed the value of -0.1965 (p-value < 0.001), which can be interpreted as a low to medium negative correlation. Accordingly, a decrease in HP can be associated with an increase in IA. Quantile regression analysis was used to determine the effect and its output is shown in *Table 2*.

τ	Coef	Value	CI 95 %	Sig.
0.25	α	3.917	3.71–4.12	< 0.001
	IA (β)	-0.021	-0.03—0.01	< 0.001
0.5	α	4.634	4.49–4.78	< 0.001
	IA (β)	-0.017	-0.02—0.01	< 0.001
0.75	α	5.048	4.97–5.12	< 0.001
	IA (β)	-0.012	-0.01—0.01	< 0.001

Table 2 | Quantile regression output

Table 2 shows the most important output of the analysis. When significance is being evaluating, all relations can be considered significant, as evidenced by the p-value in the last column of the table. In all the cases that were analysed, the value of significance was less than 0.001; therefore, the statistical significance could be clearly confirmed. In terms of coefficients (IA), it is possible to see negative coefficients, indicating that HP decreases with an increasing IA rate and vice versa. From the opposite view of the result, this output can be considered positive, as it can be assumed that an increase in HP may be associated with a decrease in IA. On the basis of the above-mentioned output, it is possible to accept the hypothesis together with the statement that the effect of internet addiction on health perception is significant in the selected sample.

Figure 2 visualizes the output of the analysis of the relation between IA and HP. As demonstrated above, a negative relation can be clearly seen. Therefore, an increase in IA causes a decrease in HP. To complete the view of the model presented here, it is appropriate to point out the characteristics of the model in the context of the Mean Absolute Error (MAE) parameter, which displayed the least acceptable value (MAE = 0.9769) in the model variant with τ (tau) equal to 0.25; the most acceptable value (MAE = 0.7660) was found in the median variant of the model with τ equal to 0.50, and the model variant with τ equal to 0.75 displayed a value between the values of the previous two cases (MAE = 0.8955).

4 DISCUSSION AND CONCLUSION

The development of society and the strong connection of life with the internet have brought a new type of non-substance addiction – internet addiction (Tsitsika et al., 2009). As the internet is an integral part of every day, this type of addiction is overlooked and often even the person affected by this addiction is not aware of its severity. The lesser importance attributed to it by society may be due to the assumption that there are no health consequences of this addiction, or that it is a minor disease compared to other types of addiction. However, in scientific discussions, the health status associated with this addiction is being mentioned more and more often (Aboujaoude, 2010). The inability to separate the internet from life today (or the difficulty of doing so) may make internet addiction one of the major health problems in the future. At this point, it should be emphasized that the problematic use of the internet mainly affects young people (Lin et al., 2018; Tsitsika et al., 2014), who represent an important group of the population in the future.

In this context, the primary objective of the study was to assess the significance of the relation between internet addiction and health perception in the sample of university students in the Slovak Republic. On the basis of this objective, a hypothesis was formulated as follows: we assume that the effect of internet addiction on health perception is significant in the selected sample. As demonstrated in the previ-

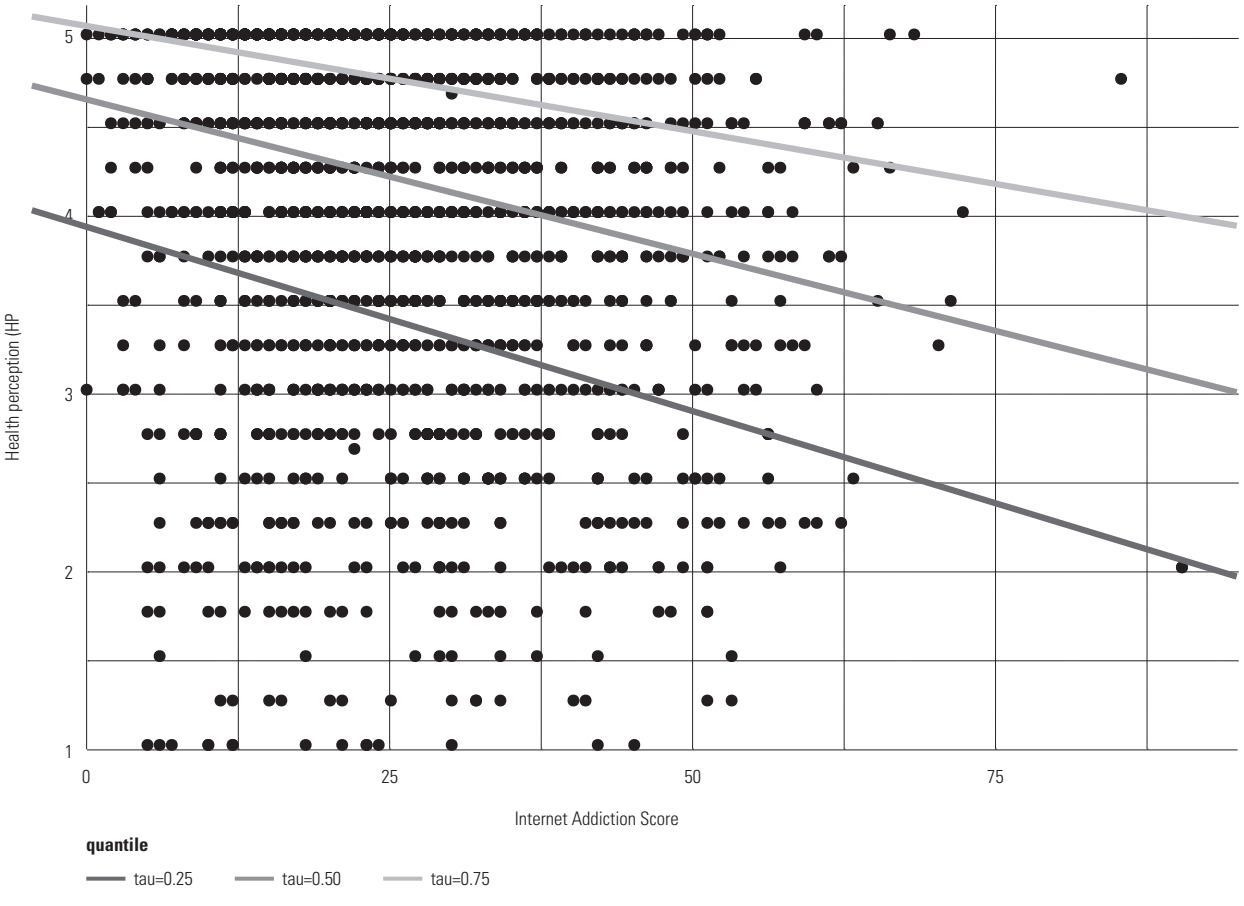

Figure 1 | Relation trajectory

ous section, this hypothesis was confirmed using quantile regression and the objective can be considered fulfilled.

The analyses included two variables; the first was internet addiction (IA) as determined by the Internet Addiction Test (IAT) score and the second was health perception (HP). On the basis of the results, it can be concluded that both variables displayed relatively acceptable values. When the IAT score (indicating IA) is transformed into intervals, a normal level of internet use occurred in approximately 67% of the Slovak university students, and thus problematic behaviour was found in approximately 33% of the sample that was analysed. The level of health perception (HP) was at a relatively high level, with a mean of 3.94, the maximum possible value being 5, which indicates the best self-assessment of health status. The relationship analysis carried out using the Spearman coefficient ρ proved a low to medium negative correlation ($\rho = -0.1965$). Subsequent application of regression analysis revealed and confirmed a significant negative rate of effect in all model variants with tau (25^{th}, 50^{th}, and 75^{th} percentiles). It can thus be concluded that an increase in IA can be associated with a decrease in positive perceived health, but in particular, that internet addiction directly affects health perception. It can be stated that these findings are consistent with the findings provided by Ha and Hwang (2014) and Ustinaviciene et al. (2016), who confirmed that internet addicts are more likely to report a poorer health perception than non-internet addicts. At the same time, it is possible to build in part on other findings that have revealed that internet addiction can be associated with many health problems (Cao et al., 2011; Eliacik et al., 2016; Flisher, 2010; Murali & George, 2007; Nazik & Gunes, 2019) and unhealthy lifestyle behaviours (Kamran et al., 2018; Kim et al., 2010; Seyrek et al., 2017; Yen et al., 2009), and these difficulties may be reflected in health perception. Last but not least, these difficulties can lead to a reduction in health-related quality of life (Chern & Huang, 2018; Machimbarrena et al., 2019; Tran et al., 2017). Many of these authors, including Berte et al. (2019), emphasized the identification and mapping of internet addiction, as the current situation appears to be insufficiently addressed and risky for the future. Blinka et al. (2020) also highlighted a certain degree of attention and recommendations for prevention in the case of excessive use of the internet in the conditions of Slovak university students.

It is possible to see that internet addiction is an inconspicuous disease to which not much attention is paid in social discussions. This may also be the reason why prevention is not sufficiently promoted. From this point of view, it can be assumed that public policies will face major challenges regarding this issue, as a non-substance addiction is no less dangerous to health than a substance addiction. The development of society and its focus on the online world may be a predictor of a future increase in the incidence of non-substance addiction. As has been emphasized, internet addiction has a negative effect on perceived health status, and at the same time any reduction in the health of the population has national economic consequences. Therefore, it is recommended to focus on preventive activities, as well as on raising awareness of non-substance addictions. These types of addiction are currently less common compared to substance addictions, but this stage can be considered as a starting point, and thus their current underestimation could have negative effects on society in the future. Therefore, this problem should be addressed now and public efforts should focus on preventing internet addiction. Therefore, internet addiction prevention programmes and education should receive more support in society as a whole. In this respect, not only more support but also more space for discussion is highly desirable.

This research could not avoid limitations resulting from the fact that the data was collected during the SARS-CoV-2 pandemic. Despite this limitation, the sample can be considered representative and valid, and the results of the analyses are relevant. The fact that the perception of health status was not detected using a standardized tool can also be considered a limitation. Finally, another limitation may be the fact that control variables were not included in the analyses. We perceive the application of control variables and more thorough verification of findings as a feature of future research activities. Future research will focus on proving relations among other population groups with a more detailed classification, including gender and socio-economic characteristics. The effects of internet addiction will also be assessed in other dimensions of health.

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Declaration of interest: Authors declare that they do not have any competing financial, professional, or personal interests from other parties.

ID	Survey items	Mean	Median
IAT_1	How often do you find that you stay online longer than you intended?	2.72	3.00
IAT_2	How often do you neglect household chores to spend more time online?	1.72	2.00
IAT_3	How often do you prefer the excitement of the internet to intimacy with your partner?	0.49	0.00
IAT_4	How often do you form new relationships with fellow online users?	1.09	1.00
IAT_5	How often do others in your life complain to you about the amount of time you spend online?	1.20	1.00
IAT_6	How often do your grades or school work suffer because of the amount of time you spend online?	1.90	2.00
IAT_7	How often do you check your email before something else that you need to do?	2.48	2.00
IAT_8	How often does your job performance or productivity suffer because of the internet?	2.04	2.00
IAT_9	How often do you become defensive or secretive when anyone asks you what you do online?	1.05	1.00
IAT_10	How often do you block out disturbing thoughts about your life with soothing thoughts of the internet?	1.20	1.00
IAT_11	How often do you find yourself anticipating when you will go online again?	0.86	1.00
IAT_12	How often do you fear that life without the internet would be boring, empty, and joyless?	0.96	1.00
IAT_13	How often do you snap, yell, or act annoyed if someone bothers you while you are online?	1.00	1.00
IAT_14	How often do you lose sleep as a result of late-night log-ins?	1.32	1.00
IAT_15	How often do you feel preoccupied about the internet when offline, or fantasize about being online?	0.67	0.00
IAT_16	How often do you find yourself saying "just a few more minutes" when online?	1.69	1.00
IAT_17	How often do you try to cut down the amount of time you spend online and fail?	1.59	1.00
IAT_18	How often do you try to hide how long you've been online?	0.72	0.00
IAT_19	How often do you choose to spend more time online over going out with others?	0.86	1.00
IAT_20	How often do you feel depressed, moody, or nervous when you are offline, a feeling which goes away once you are back online?	0.45	0.00
HP_1	In general, I feel healthy.	4.00	4.00
HP_2	No one has told me lately that I look unhealthy.	4.16	5.00
HP_3	I have not had the need to visit a doctor lately.	4.02	5.00
HP_4	I have not had the need to think about my health status lately.	3.55	4.00

Appendix 1 | The Questionnaire

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