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## COVID-19: Global Perspective

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# Internet use during coronavirus disease of 2019 pandemic: Psychiatric history and sociodemographics as predictors

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## ABSTRACT

Coronavirus disease of 2019 (COVID-19) pandemic and related containment measures have grossly affected the daily living and created a need for alternative ways of social communication and entertainment. The aim of this study was to explore the use of various Internet contents depending on sociodemographics and on psychiatric history of participants. This cross-sectional, population-based study is a part of a wider international multicenter study. A total of 1275 participants across Serbia (71.1% of females; average age = 41.81 ± 12.52 years) were recruited using two-level chain-referral sampling method. The participants filled in an anonymous online questionnaire that included questions on sociodemographic data, psychiatric history, and various aspects of increased Internet use since the pandemic. The data were analyzed using a series of multiple logistic regressions. About two-thirds of the sample reported using Internet more during the pandemic. All of the tested regression models, apart from models predicting browsing religion and travel/tourism, were significant, explaining from about 2% (for the contents specific for COVID-19) up to 34.4% (for the sexual content) of variance of use. Reporting a previously diagnosed psychiatric disorder was a significant predictor of greater Instagram use and browsing sexual and sport-related content since the pandemic. To the best of our knowledge, the study is the first to report on the relationship between Internet using and mental health, during COVID-19 pandemic, in the Balkan region. The findings showed various patterns of the increased use of Internet contents since the pandemic referring to both potentially positive and negative Internet influences.

**Key words:** Coronavirus disease of 2019, Internet, mental health

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## INTRODUCTION

The coronavirus disease of 2019 (COVID-19) pandemic is, in number of ways, specific. COVID-19 pandemic and related containment measures have grossly affected the daily living.

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The COVID-19 is a novel coronavirus disease, marked by an often severe and occasionally terminal acute respiratory syndrome, caused by coronavirus severe acute respiratory syndrome coronavirus 2, first identified in December 2019 in Wuhan, China. Since then, it has rapidly spread, globally. The World Health Organization (WHO) declared the disease a pandemic on 11 March 2020.<sup>[1-3]</sup>

To protect the health of the populations and restrain the spread of the infection, many European countries have introduced containment measures, including physical distance, quarantine, and isolation. Quarantine is a stressful experience due to the decreased freedom of personal movement and reduction of social contacts, as well as due to its natural ability to provoke or enhance the feelings of insecurity and uncertainty. Particularly vulnerable to these measures could be special populations, such as are individuals with preexisting mental health conditions, among others.<sup>[4]</sup>

Activities such as keeping remote social contacts with friends/families in order to reduce psychological impacts of isolation, access to entertainment, and even access to sources supporting physical exercise are performed through information and communications technology (ICT). Moreover, maintaining such activities using ICT is a strategy recommended by the WHO in the time of pandemic.<sup>[5]</sup> In addition, a part of the general health guidelines for quarantine period include useful tips for physical activity, mental health, parenting, healthy eating, and quitting tobacco.<sup>[6]</sup>

In accordance with these recommendations, it has been expected that populations would be able to receive the necessary health information, work, or study from home using ICT. Increased use of social networks was also to be anticipated. The increased use of Internet technologies is presumably directed toward compensating for the lack of direct, real-life communication.

Social networks allow users to share publicly or semipublicly (in a selected group) their content, content from other sites, photos, or to join different groups according to their interests. They also allow them to play games, to shop, or to find the information of interest. In addition to these favorable aspects of social network use, a large body of research speaks of their detrimental impacts.<sup>[7]</sup> For instance, Instagram is a social network with the fastest growth in the number of users,<sup>[8]</sup> which may speak in favor of its addictive potential. TikTok, a social network whose use has not been part of any major research so far, could also be added to the list.

In addition to social networks, the Internet provides number of contents that could have negative consequences for health. Behaviors such as gambling, video gaming, TV

series watching, watching pornography, or surfing the Internet are often used to reduce stress and anxiety and/or to alleviate depressed mood. These potentially addictive behaviors may help alleviate stresses of daily living (often reflected as “escapism”) and avoid problems and difficult thoughts.<sup>[9-12]</sup> Therefore, keeping involvement in these behaviors at moderate and controlled levels, especially during the pandemic, is an imperative.

It is to note that monitoring the use of the Internet was the subject of many studies over a few decades foregoing pandemic. The latest recommendations on Internet use underline the proven harmfulness of some content and online activities, especially playing on line games.<sup>[13]</sup> However, there is still a lot is ambiguity and doubt regarding the Internet use. Therefore, research into Internet use during the pandemic poses a research challenge of specific importance and value. The Internet use is particularly to be explored with reference to age, gender, and marital status of respondents.

Bearing in mind the previous studies,<sup>[14,15]</sup> it is to be expected that the increased Internet use may have both positive and negative implications, in terms of better quality of life (contents such as health, culture, education, business, computers and technology, sports, science, arts, and politics) on the one hand and addictive potential (Instagram and sexual contents) on the other hand. As the Internet use is expected to be expended or even encouraged by the regulations, assessing its implications may be of particular value in general population or even more in special populations.

Thus, this study aims to explore the use of various Internet contents depending on sociodemographics factors in general population. Our secondary aim was to further explore the specificities of Internet use in regard to psychiatric history of participants.

## MATERIALS AND METHODS

This cross-sectional, population-based study is a part of a wider international multicenter research coordinated by the Italian Society of Social Psychiatry.<sup>[16]</sup> The study was approved by Ethics Committee of the Clinical Centre of Serbia and the Board of Clinic of Psychiatry, Clinical Centre of Serbia, and was conducted in accordance with good research practice guidelines of the Belgrade University Faculty of Medicine.

### Subjects

The study included the first 1275 participants of the wider study sample (71.1% of females; average age = 41.81 ± 12.52 years). Participants were recruited using two-level chain-referral sampling method. The inclusion criteria were participant’s age 18 or above, as

well as having residence in Serbia during the prevailing part of emergency state introduced due to pandemic (the emergency state in Serbia lasted from March 16 to May 6 2020). The descriptive characteristics of the participants are presented in Table 1.

**Procedure and instruments**

The study started at the end of the emergency state in Serbia (end of quarantine measures). The participants filled in an anonymous online questionnaire. The invitation letter to participate in the research included information on the basic research objectives, inclusion criteria, and anonymity. No identifying information (name and IP address) was assessed by the online form. All of the other assessed information was treated as confidential. At the beginning of the online form, the respondents were informed on the details of the study aims and procedure and the confidentiality and freedom of the participant to quit responding at any time. After being informed, the respondents were asked to decide whether they agreed to participate in the study or not. Only those who agreed to participate in the study were allowed to proceed to the questionnaire itself.

Further on, the online questionnaire comprised a set of self-report questionnaires. The following were used in this study:

1. General questionnaire assessed the sociodemographic data (age, gender, marital status) and information about having a current/previous psychiatric disorder
2. Questionnaire on Internet use during the pandemic (designed for the purpose of this study) assessed time spent on Internet and whether participants used Internet more since the pandemic. It also assessed whether the participants performed any of the online activities more (chatting, surfing, playing on line games, downloading various contents, Internet for studies/school/work, attending online courses, using Instagram, using TikTok, and using Facebook) or browsed any of the Internet contents more (health and medicine, sports, science, politics, contents specific

for COVID-19, sexual contents, pop-culture, business, computers and technology, arts and culture, education, music, travel/tourism, and religion).

**Statistical methods**

To present the variables in the study, we used descriptive statistics (frequencies, percent, mean, and standard deviation). To assess the relationship between the sociodemographics and having a diagnosed psychiatric disorder on one side and various Internet variables on the other side, we used a series of multivariate logistic regressions. In regression models of all specific Internet activities and contents increased during the pandemic, we additionally controlled for total time spent on Internet per day. The results were regarded as statistically significant only if both *P* values were  $\leq 0.05$  and confidence intervals were adequate.

**RESULTS**

The descriptive parameters of Internet use since the pandemic among participants are presented in Tables 2-4. About two-thirds of the sample reported using Internet more during the pandemic, and more than 10% of participants spent over 8 h on Internet daily. The most prevalent activities on Internet that participants engaged in more during the pandemic were Internet for job/school/studies, surfing, chatting, and using Facebook and Instagram, whereas TikTok, online gaming, and taking educative online courses were the least present in the sample. When it comes to specific Internet contents browsed more since the pandemic by participants, religion, computers and technology, business, sports, and pop-culture were the most prevalent. Contrary to this, health and medicine in general and related to COVID-19 as well as sexual contents were the least prevalent.

Further on, we conducted a series of multivariate logistic regression models with Internet variables as outcomes and gender, age, marital status, having a previously diagnosed psychiatric disorder, and total time spent on Internet per day as predictors. The regression model of spending over 8 h/day on the Internet, and using Internet in general more during the pandemic as outcomes, included the aforementioned sociodemographic and psychiatric variables as predictors.

All of the tested regression models, apart from models predicting browsing religion and travel/tourism, were significant, explaining from about 2% (for the contents specific for COVID-19) up to 34.4% (for the sexual content) of variance of use [Table 5].

Odds ratios for each significant predictor of each of the Internet outcomes are presented in Graphs 1-3. Younger participants were using Internet more, were chatting, surfing, playing games, downloading different contents,

**Table 1: Participants' characteristics**

	Percentage
Gender	
Female	71.1
Male	28.9
Marital status	
Married/living with a partner	61.2
Divorced	7.3
Single	19.0
In a relationship, not living with a partner	10.0
Widowed	2.6
History of mental health disorder	
Yes	3.8
No	96.2
Age	
41.81±12.52	

**Table 2: Using Internet in general – Descriptive**

	Percentage
Internet use	
Did not use more than before the pandemic	32.8
Used more than before pandemic	67.2
Hours spent on Internet	
4.47±3.31	
Internet use (high/low)	
>8 h/day (high Internet use)	11.4
≤8 h/day (low Internet use)	88.6

**Table 3: Percent of participants who used more any of the Internet activities during the pandemic**

Activity	Percentage
Chatting	44.8
Surfing	47.8
Playing on line games	15.2
Downloading various contents	35.1
Internet for studies/school/work	58.4
Attending online courses	25.6
Using Instagram	36.2
Using TikTok	6.0
Using Facebook	36.6

**Table 4: Percent of participants who browsed more each of the Internet contents during the pandemic**

Content	Percentage
Health and medicine	47.0
Sports	87.2
Science	67.1
Politics	60.9
Contents specific for COVID-19	54.1
Sexual contents	9.8
Pop-culture	82.7
Business	88.6
Computers and technology	90.7
Arts and culture	66.2
Education	67.8
Music	60.4
Travel/tourism	76.2
Religion	93.6

using Internet for studies, attending online courses, using Instagram, Facebook, and TikTok more, and browsed sexual and politics-related contents more since the pandemic. Older participants were more engaged in browsing sports, health and medicine, computers and technology, as well as music and education related contents. Women were more prone to downloading different contents, music, books, surfing, using Internet for work and school, and using Instagram, Facebook, and TikTok. In addition, they were browsing contents related to sports, science, politics, business, and computers more. Men were more likely to play games, browse general health and medicine, as well as contents specific for COVID-19, sexual contents, arts and culture, and education. Those who were married were more likely to browse arts, music, and play games, whereas single

participants searched more for the contents related to COVID-19 and health, and downloaded various texts, articles, books, and music. Spending over 8 h/day on Internet was predicted by younger age, male gender, and being single. Reporting a previously diagnosed psychiatric disorder was a significant predictor of greater Instagram use and browsing sexual and sport related content since the pandemic [Graphs 1-3].

## DISCUSSION

To the best of our knowledge, this study is the first in the Balkan region to report on the specifics and predictors of Internet use during the pandemic COVID-19, with positive psychiatric history as one of the predictors. Overall, our findings showed various patterns of the increased use of Internet contents since the pandemic, referring to both potentially positive and negative Internet influences. The study also indicates that the patterns of increased Internet use differ in regard to age, gender, and marital status. In addition, particularly high Internet use, exceeding 8 h a day, is also specific to particular populations. Of marked importance is that the results indicate that previous history of any mental disorder was a significant predictor of specific Internet activities and browsing specific contents.

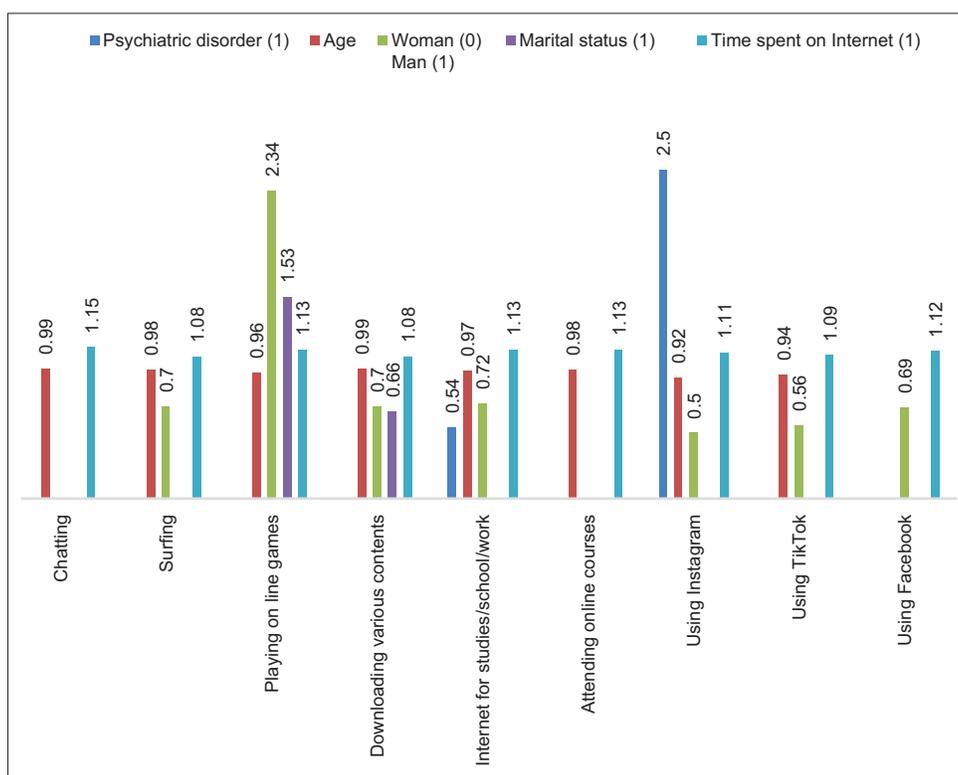
### Internet during the pandemic – The prevalence

First of all, the top five Internet activities with increased use during the pandemic referred to using Internet for job/school/studies, surfing, chatting, and using Facebook and Instagram. This is expected, since the quarantine measures implicated continuing the studies online and working from home, and since the population could have replaced leisure activities by surfing and social activities by chatting and the most widely established social networks.<sup>[7]</sup> These top five Internet activities related to both protective (using Internet for job/school/studies) and potentially addictive effects (Instagram).<sup>[8]</sup> Using TikTok more during the pandemic was the least prevalent activity among the participants, which may be related to this being a very “young” social network (it was established very recently and is dominantly used by very young persons).<sup>[17]</sup> Playing games more during the pandemic was also absent in many participants, possibly due to the already high gaming activities and addiction potential of these activities in those prone to gaming before the pandemic.<sup>[18]</sup> Engaging in online educative courses more was also not present in many participants, which may be precipitated by stress-related problems with concentration.<sup>[19]</sup>

When it comes to the Internet contents that were browsed more during the pandemics, the top five were the religious contents, contents related to computers and technology, business, sport, and pop-culture. These

**Table 5: Parameters of multivariate logistic regression models**

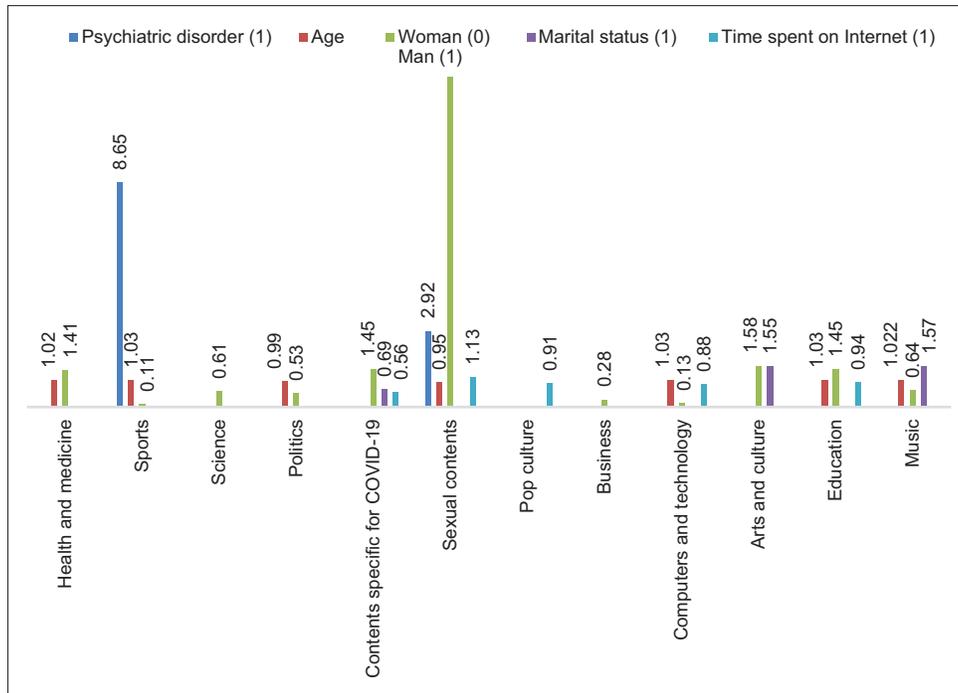
	$\chi^2$ (5, n=1275)	P	Cox and Snell (R <sup>2</sup> )	Nagelkerke (R <sup>2</sup> )
Using Internet more than previously	114.07	0.001*	8.6	11.9
Spending over 8 h on the Internet/day	34.44	0.001*	2.7	5.3
Chatting	71.46	0.001*	5.8	7.6
Surfing	54.99	0.001*	4.4	5.8
Playing on line games	106.77	0.001*	8.5	14.8
Downloading various contents	49.3	0.001*	4.0	5.5
Internet for studies/school/work	109.8	0.001*	8.6	11.6
Attending online courses	54.0	0.001*	4.4	6.5
Using Instagram	260.41	0.001*	19.4	26.5
Using TikTok	43.15	0.001*	3.6	9.8
Using Facebook	53.65	0.001*	4.3	5.9
Health and medicine	27.23	0.001*	2.1	2.8
Sports	104.7	0.001*	12.3	23.0
Science	23.89	0.001*	1.9	2.6
Politics	41.57	0.001*	3.2	4.3
Contents specific for COVID-19	19.28	0.001*	1.5	2.0
Sexual contents	226.57	0.001*	16.3	34.4
Pop-culture	29.80	0.001*	2.3	3.8
Business	58.82	0.001*	4.5	8.9
Computers and technology	142.64	0.001*	10.6	23.0
Arts and culture	21.16	0.001*	2.1	2.9
Education	66.88	0.001*	5.1	7.1
Music	50.37	0.001*	3.9	5.2
Travel/tourism	4.58	0.470	/	/
Religion	2.72	0.740	/	/



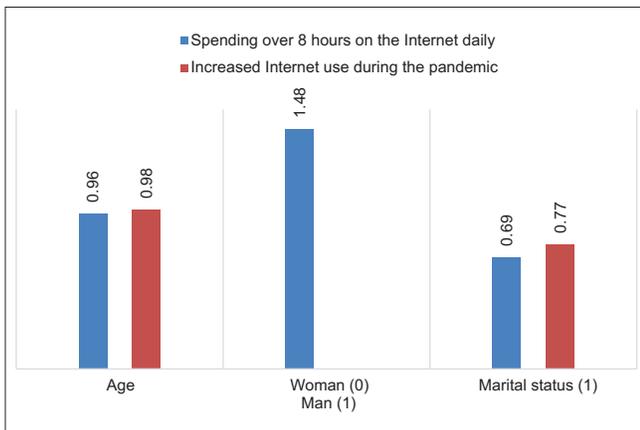
**Graph 1: Odds ratios in predicting the increased engagement in different Internet activities during the pandemic**

aspects could all be considered potentially protective. Faith has been considered a psychological “shelter” for centuries<sup>[20]</sup> and therefore these unprecedented times of life-threatening pandemic may have produced negative

effect, making this specific shelter more needed. Since virtual space has become a surrogate of real space when it comes to business, sport, and pop-culture events, there is no surprise that contents related to computers and



**Graph 2:** Odds ratios in predicting the increased browsing of different Internet contents during the pandemic



**Graph 3:** Odds ratios in predicting increased Internet use during the pandemic and spending over 8 hours on Internet daily

technology, as well as to business, sports, and pop-culture, were browsed more. The least prevalent subject browsed more during the pandemic referred to sexual contents, possibly due to the already high involvement in those activities before the pandemic.<sup>[21]</sup> Considering that social media is one of the most updated sources of information regarding COVID-19 pandemic,<sup>[22]</sup> we expected a considerable amount of participants to search the Internet for COVID-19 and health related information. Contrary to expectations, however, browsing more health and medicine and COVID-19-related health and medicine was present only in about half of the participants. This may reflect two different coping mechanisms in the presence

of the new “enemy” – approach (seeking information) and avoidance (avoiding information).

### Internet during the pandemic – The sociodemographic predictors

The sociodemographic predictors showed different associations to Internet activities and contents in our study. Younger participants were using Internet more in general, and spent over 8 h daily on the Internet during the pandemic, similar to the earlier findings.<sup>[23]</sup> Since the majority of young persons has a computer,<sup>[14]</sup> it is likely that they would use more the ICT for the various aspects of life including school, leisure activities, social contacts and everyday life, during the pandemic. It is important to note that younger participants searched for sexual content more frequently, which may be one of the risk factors for the development of problematic Internet use. In addition, it may have some other negative consequences for the health of this vulnerable population.<sup>[24]</sup> Older participants, on the other hand, were more engaged in browsing contents that reflected their interests the most-health and medicine, education-related contents, computers and technology, as well as sports and music. A number of studies speak in favor of young population being prone to the negative effects of Internet, and of being in the greater risk of developing problematic Internet use.<sup>[25]</sup> Mirroring those findings, the young people in our study used potentially addictive activities on Internet (gaming and Instagram). A recent study reported a similar finding, indicating an increase in user engagement in online gaming among those aged 25-35 years.<sup>[26]</sup> Research evidence suggests

that problematic gaming is associated with psychosocial problems such as lack of sleep, low school well-being, concentration problems, impaired life skills, and poor self-control.<sup>[27]</sup> Extreme engagement in online gaming is also strongly associated with poor academic performance among school-going children and adolescents.<sup>[28]</sup> However, the positive facet of gaming has also been acknowledged, in terms of educational, physical, and therapeutic benefits.<sup>[29]</sup> Amin and colleagues have developed the strategies for work-life balance for online gaming during the COVID-19 pandemic.<sup>[30]</sup>

When it comes to gender, it is known that there is a significant difference regarding male and female interests and activities on the Internet. The main difference refers to women using social networks more, whereas men are more involved in gaming.<sup>[26,31]</sup> Similarly, our study pointed out to these differences when it comes to more frequent use of Internet activities and contents during the pandemics. Women were more prone to using the Internet for work and school, to downloading cultural contents such as texts, music, books, to surfing with no particular reason, to browsing political contents, content related to sports, science, business, and computers, and to using Instagram, Facebook, and TikTok. Men were more prone to spending over 8 h in the Internet during pandemics. They were also more likely to browse general health/medicine or COVID-19 related content, as well as explore arts and culture, sexual contents, or play games. It has been hypothesized that males are more prone to develop problematic Internet use than females.<sup>[32]</sup> Reflecting that, male gender predicted using more addictive activities and contents, as well as spending more than 8 h on Internet during pandemic, in our study. However, females using Instagram and Facebook (another activity with addictive potential) may suggest a qualitative gender difference in proneness to Internet addiction during pandemic. Instagram is a social network with apparently greatest addictive potential and the number of its users has been growing the most.<sup>[8]</sup> Furthermore, one of the challenges of Facebook, Reddit, and TikTok is that they lack scientific oversight, generate noise, and offer false information.<sup>[33]</sup>

The final sociodemographic explored as predictor by this study was partner status. Those who were married or living in common-law were more likely to use Internet for leisure activities such as browsing arts and music, as well as and playing games. Single participants, on the other hand, spent over 8 h on the Internet, searched more for the contents related to COVID-19 and health, surfed, and downloaded various texts, articles, books, and music, during the pandemic. It may be that those who live without partners dedicated more of their time to exploring the virtual world; however, it is those who lived with partners who were more prone to addictive activities (gaming).

### Internet during the pandemic – Psychiatric disorder as a predictor

The studies exploring the types and the changes in Internet use in those with mental health problems, in specific, stressful situations, are generally lacking and are restricted to specific patient populations. The data on the use of social networks are particularly scarce. Some studies report that the patients with strong tendency to spend a lot of time on the Internet are more prone to social media usage, with social media usage continuously rising within general population.<sup>[23]</sup> Our study evaluated the data gathered at the end of the initial phase of pandemic – the phase of pronounced containment measures such as obligatory quarantine. Quarantine is a stressful experience. First of all, it reduces the freedom to move and to have social contacts, and second, it provokes or enhances the feelings of insecurity and uncertainty. People with mental health disorders could be particularly vulnerable to these measures.<sup>[4,30,34,35]</sup> They may turn to the virtual world trying to mimic the preexisting real-life tendencies or try to seek for emotional and sensual stimulation this way. The studies find that those with mental health challenges tend to use Internet in order to seek information and have social contacts.<sup>[23]</sup> In our study, reporting a previously diagnosed psychiatric disorder was a significant predictor of greater use of both protective (sports) and potentially addictive Internet activities and contents (Instagram and browsing sexual contents) during the pandemic, which is compliant with the aforementioned data. We did not further explore the particular Internet usage content in regard to the type of the disorder. However, previous studies report that the Internet use has not been related to either type of mental disorder or its severity.<sup>[23]</sup> Having a mental health condition during the times such as the pandemic and quarantine may represent a very specific challenge in terms of engaging in virtual world, bearing both opportunities and risks.

Interpreting our results should be taken in light of some limitations as well as its strengths. The major limitation of the study is that it did not use the sampling method that provides representativeness. Using a random sampling method with face-to-face interviews was not possible and ethically justifiable due to the pandemic protection measures. However, using the online questionnaire possibly recruited only participants with high access to Internet which could have affected the characteristics of the participants.

The strengths of the study refer to large number of participants, exploring the change of various Internet aspects during the pandemic, and the multivariate exploration of the sociodemographic predictors while accounting for previously diagnosed psychiatric disorder. Additionally, this was the first such study in the region.

## CONCLUSIONS

The study findings showed that during the pandemic COVID-19 and the quarantine as a containment measure in Serbia, people turned to the more frequent use of both protective and potentially addictive Internet activities and contents. Both protective and potentially addictive activities or contents were specifically predicted by age, gender, and partner status. Those with already existing and diagnosed psychiatric disorders were, as well, prone to both protective and potentially addictive Internet activities and contents. These findings may serve as points of prevention, in terms of tailoring specific Internet-related interventions for target populations, to promote the positive and prevent the negative influences within this or next possible pandemics.

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Nil.

## Conflicts of interest

There are no conflicts of interest.

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