













ORIGINAL ARTICLE

COVID-19, Health Habits, and Addictive Behaviors in the General Population

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Main Points

- The coronavirus disease 2019 (COVID-19) pandemic and lockdown have had adverse consequences for the physical and mental health of the general population.
- During lockdown, we found a significant increase in the number of individuals who reported poor physical and psychological states, need for physical treatment, and use of illegal drugs.
- Being single or divorced, familial conflicts, having lower education levels, and experiencing fears related to COVID-19 infection predicted a worsening physical and psychological state, as well as the presence of some addictive behaviors.
- The presence of anxiety symptoms during the lockdown was a significant contributor in increasing a reported need for treatment of physical and/or psychological illness.



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Abstract

The lockdown due to the coronavirus disease 2019 (COVID-19) pandemic had a significant impact on daily routines and habits. New lifestyle behaviors contributed to the onset and course of mental diseases, including addictive problems. The objective of this work was to describe changes in health status during lockdown in the general population, including potentially addictive behaviors, and explore possible contributing factors.

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The analyzed data comprised a population-based sample of 240 individuals (73.3% women, mean age 43.8 years old). Assessments included sociodemographics and self-reports for health state and addictive behaviors. The risk of perceived worsening physical and psychological state was 21.7% and 20.0%, respectively, after the lockdown. The risk of requiring a new treatment for physical and psychological illnesses was 10.4% and 4.2%, respectively, while 2.5% of the participants started using illegal drugs and 9% initiated video game use. Finally, the statistical predictors of health worsening during the lockdown were the presence of anxiety symptoms, being unmarried, having low education levels, experiencing fears related to COVID-19 infection, and having family conflicts. This research identified vulnerability factors contributing to changes in physical and mental health, as well as those associated with addictive behaviors during lockdown. These results should be considered in further stressful situations to design personalized preventive and therapeutic plans.

Keywords: Addictive behaviors, COVID-19, general population, health, lockdown, video games

Introduction

On the March 11, 2020, an unprecedented global event took place. The World Health Organization (WHO) elevated the coronavirus disease 2019 (COVID-19)-related public health emergency to an international pandemic (WHO, 2020a). A state of alert was introduced with a consequent series of restrictive measures, including lockdown and home isolation. In this context, physical and mental health was significantly affected (Wang et al., 2020).

Elevated rates of anxiety and depressive symptoms have been reported among the general population since the beginning of the pandemic (Wang et al., 2020). Discontinuation of everyday routines, economic and professional uncertainty, or health concerns have been described as contributory (Chew et al., 2020). Suffering from anxiety and depressive symptoms due to the pandemic has been associated with being female or a student, low educational level, interpersonal conflicts, low social support, and worse perceived health situation, among other factors (Wang et al., 2020). Restrictive policies, together with the negative psychological discomfort derived from adverse circumstances during the pandemic, have also impacted physical health (Sánchez-Sánchez et al., 2020). For instance, physical inactivity and a more sedentary lifestyle, changes in dietary patterns toward the consumption of “unhealthy” foods, and poor eating habits (e.g., snacking and overeating) have been described. Together, these behaviors may have shorter- and longer-term adverse consequences by increasing the risk of developing medical diseases, such as obesity or diabetes (Sánchez-Sánchez et al., 2020). Moreover, to cope with fear, uncertainty, emotional distress, and other psychological symptoms derived from this emergency, non-adaptive coping strategies such as those related to potential addictive behaviors (e.g., gambling-related behaviors or drugs use) have been employed by some people (Fernandez-Aranda, Casas et al., 2020), specifically in vulnerable populations (e.g., those with mental illness) (Baenas et al., 2020).

A major concern regarding the pandemic situation has been the extended use of technologies to almost every aspect of daily life during confinement. The so-called “positive technology,” a term applied to the use of technology for qualitative improvement of personal experiences (e.g., smartphone apps, standalone and social virtual reality, and video games), has been described as a useful tool to reduce the psychological impact of the pandemic (Riva et al., 2020), to lessen anxiety and stress, as well as to promote social contact (Tavormina & Tavormina, 2021). On the other hand, excessive engagement in specific online activities such as video gaming, social media use, gambling, viewing

of pornography, or shopping may lead to severe problems and elevate the risk of disordered or addictive use (King et al., 2020).

The study by Ellis et al. (2020) described results for 2004 individuals who played video games during confinement. Self-reported physical activity during COVID-19-related social restrictions significantly decreased, and more than half of participants reported poor mental health. Moreover, a significant increase in time of video games use was observed, with benefits to their mental health described by three-quarters of the sample. The motivation to use video games during confinement was associated with entertainment, emotional coping, and lessening of negative psychological impacts of the pandemic (Ellis et al., 2020). However, regulated use, particularly in vulnerable populations, such as adolescents and those experiencing high stress and having mental health concerns (e.g., depression and anxiety), is important (Tavormina & Tavormina, 2021). The WHO has recommended balanced screen time with some promotion of gaming online with other players to maintain social interactions and for entertainment, through its support of online initiatives such as “Play Apart Together” (WHO, 2020b). A consensus guidance recommending healthy routines and appropriate use of the Internet during the pandemic has also been disseminated (Király et al., 2020).

Confinement during the earliest part of the pandemic was associated with decreases in on-site gambling (Elder, 2020) and increases in online gambling (Håkansson, 2020). In a study (of a non-clinical sample) by Price (2020), online gambling was associated with potential risk of developing a gambling disorder (GD). Greater psychological impact due to the pandemic and substance use while gambling were related to this potential risk. Being a young male with regular gambling and high alcohol use prior to confinement was proposed as a risk profile for engaging in gambling behavior during the onset of the pandemic (Håkansson, 2020).

Lack of social contact, loneliness, and less daily structure or conviviality have been associated with increased substance consumption during confinement among the general population (Zvolensky et al., 2020), mostly regarding alcohol and tobacco use (Vanderbruggen et al., 2020). Some studies of the illegal drug market during confinement did not observe significant changes due to the pandemic despite restrictive measures (Gaume et al., 2021), although other studies suggested changes in pricing, demand, and access to care (Farhoudian et al., 2021; Radfar et al., 2021). Other studies reported increases in the use of non-prescribed image and performance-enhancing drugs, a varied group including some illegal substances (e.g., anabolic drugs, aphrodisiacs, and growth hormones), to deal with lifestyle changes in the context

of lockdown and improve mental and physical states (e.g., reducing fat mass, increasing muscle mass, and enhancing sexual, or cognitive functions) (Dores et al., 2021). In the study by Dores et al. (2021), this use was associated with male sex, exercise, and anxiety. Finally, difficulties in accessing healthcare services have been described as a contributing factor for procuring drugs by non-conventional means during lockdown (Farhoudian et al., 2021), including non-prescribed medications (Dores et al., 2021).

The above findings suggest that the COVID-19 pandemic and related restrictive measures (e.g., lockdown) have negatively impacted physical and mental health of many individuals. In this context, non-healthy and potentially addictive habits could be non-adaptive strategies for coping with this adverse situation. The present study aimed to explore (a) changes in health during lockdown among the general population, evaluating changes in potentially addictive-related behaviors and (b) possible contributing factors to addictive behaviors and poor health.

Methods

Participants

The sample consisted of 240 adults, mostly women ($n = 176$, 73.3%) and with a mean age of 43.82 years [standard deviation (SD) = 12.3]. The participants were voluntarily recruited from a community catchment area and did not have a previous diagnosis of GD according to Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) criteria (APA, 2023). They completed an online survey retrospectively regarding information before and after lockdown. The official established lockdown in the region of Catalonia (Spain) extended from March 14, 2020, to May 11, 2020, within the confinement period early in the pandemic. All the participants included had completed assessments.

Measures

Online Survey (Bellvitge University Hospital, Barcelona, Spain, 2020). Most survey questions were multiple choice (including some with binary yes/no responses), although some were open format. In all cases, the option of voluntarily not answering was given to participants:

- (a) Sociodemographics: age, gender, date, and place of birth; place of current residency; anthropometric measures (weight and height); marital status; educational level; profession; employment status; and the presence of cohabitants during lockdown.
- (b) Health pre- and post-lockdown was assessed, including substance-use behaviors (tobacco, alcohol, and illegal substances); treatments due to physical or psychological problems; and perceived physical and psychological states.
- (c) Life events pre- and post-lockdown, such as moving home or living in another country, divorce, and changes in employment status, among others, were assessed. The participants indicated the age of the first time they had had a life event, the frequency, and the level of discomfort (from 0 = no discomfort to 3 = very much discomfort).
- (d) The Patient Health Questionnaire (PHQ questionnaire) pre- and post-lockdown (multiple-choice questions) was used. The PHQ is a 10-item self-report questionnaire regarding depressive symptoms in the last 2 weeks (Kroenke et al., 2001). Its Spanish version was used (Diez-Quevedo et al., 2001).
- (e) COVID-19-related concerns were assessed using multiple-choice questions such as being afraid of COVID-19 infection or feeling anxious in relation to COVID-19 news, among others.
- (f) Eating behaviors pre- and post-lockdown were assessed using five questions with binary responses and 17 multiple-choice questions. These included snacking and other eating-related behaviors (e.g., eating to regulate emotion).
- (g) Physical activity pre- and post-lockdown was assessed using 12 multiple-choice questions, such as doing exercise to improve physical appearance or feeling well practicing exercise.
- (h) Video games use type and frequency pre- and post-lockdown (online and offline modalities) were assessed.
- (i) Cultural activities during lockdown, such as doing recreational artistic activities, were assessed with seven questions.
- (j) Information related to the COVID-19 pandemic was assessed using 10 multiple-choice questions.

Procedure

The Psychoneurobiology of Eating and Addictive Behaviours Research Group of the Bellvitge University Hospital-IDIBELL, together with the Unit of Communication and Scientific Culture of the former institution, designed the survey. The initiative was supported by the Local City Council, which disseminated it to their citizens through social media. Data were collected between the June 22, 2020, and July 31, 2020. The survey was part of a broader research project which aimed to study the effects of the COVID-19 pandemic and confinement on physical and mental health, eating habits, addictive-related behaviors such as gambling, cultural consumption, or sources of information on health and science, among other factors. The survey took 30 minutes to complete and preserved anonymity. Thus, each case was assigned a random code on the online platform to maintain confidentiality. The link for the survey was <http://is.gd/covid19idibell>.

Statistical Analysis

Statistical analyses were conducted using Stata17 for Windows (Stata-Corp, 2021). Comparisons of measures assessing health and addictive behaviors between the pre-lockdown and the post-lockdown periods were done using McNemar tests, and Cohen's g coefficients estimated effect sizes of proportional changes (null effect was considered for $|g| < 0.05$, low-poor for $|g| > 0.05$, moderate-medium for $|g| > 0.15$, and large-high for $|g| > 0.25$) (Cohen, 1988). Stepwise logistic regression models explored the best statistical predictors of potential changes during the lockdown. These models defined as the dependent variable the identification of an incidence case (participants who changed from absent at pre-lockdown to present at the post-lockdown) and the list of candidate predictors including sociodemographic variables (gender, age, marital status, education levels, employment status, and social position indexes), substance use before the lockdown, and contextual variables during the lockdown measured in the study. Global predictive capacity of the final models was assessed with the Nagelkerke's pseudo- R^2 coefficient.

Ethics

The present study was carried out in accordance with the latest version of the Declaration of Helsinki. The Bellvitge University Hospital Clinical Research Ethics Committee approved the study (ref: PR329/19).

Results

Participant Characteristics

Most participants were women ($n = 176$, 73.3%), married ($n = 156$, 65.0%), with secondary ($n = 71$, 29.6%) or university ($n = 135$, 56.3%) education levels, employed ($n = 177$, 73.8%), and with social position indexes distributed as follows: 10.0% high, 35.0% mean-high, 28.8% mean, 18.8% mean-low, and 7.5% low. Mean age was 43.82 years old ($SD = 12.3$).

Substances and Gambling/Gaming Before the Lockdown

The first block of Table 1 contains the prevalence of substance use and the gambling/gaming activity among the total sample prior to confinement ($n = 240$). The percentage of participants who reported tobacco use was 16.3%, while 28.3% reported alcohol use and 1.7% use of illegal drugs. The number of participants who reported no gambling was 145 (60.4%), while 73 (30.4%) individuals indicated one gambling activity, 11 (4.6%) two gambling activities, and the remaining 11 participants (4.6%) three or more gambling activities. The gambling/gaming activities with the highest prevalence in the sample were video games (36.7%) and lotteries (36.3%), while other gambling forms were reported by less than 6% of the participants. Table supplementary 1 details information in relation to the types of gambling/gaming considered in this study within each category (i.e., non-strategic, strategic, and mixed gambling).

Within the subsample of participants who reported gambling ($n = 95$), the most frequent were non-strategic (44.2%) and mixed (47.4%) gambling forms, and most of them were landed based (89.5%). Among this subsample, the mean age of onset of

gambling was 29.7 years old ($SD = 10.4$), and the mean duration of gambling was 17.4 years old ($SD = 10.4$).

Contextual Variables During Lockdown

During lockdown, the number of unemployed participants was 105 (43.8%), 33 participants indicated living alone (13.8%), 62 reported familial conflicts (25.8%), 113 expressed COVID-19-related concerns (47.1%), and 126 described fears related to the risk of infection (52.5%). The number of participants who reported anxiety symptoms was 37 (15.4%) and who reported depressive symptoms was 20 (8.3%).

Changes in Health Status During the Lockdown

The first block of Table 2 includes the results of the tests assessing changes pre- and post-lockdown in measures of healthy and addictive behaviors, including the percentages of the participants who reported poor physical and psychological states, the needs for treatment for physical and mental issues, the substance use and video game use.

The second block of Table 2 shows risk estimates of cumulative incidences during the lockdown. These results indicate that the risk of treatment for physical illness was 10.4% (this value indicates that approximately 10 new participants required treatment for physical health problems out of every 100 participants who began the lockdown without reporting such needs) and the risk of treatment for psychological illness was 4.2%. The risk of reporting poor physical or psychological states was around 22% and 20%, respectively. The risk for substance use was between 0.8% (tobacco) and 2.5% (illegal drugs or non-prescribed medication), and the risk of video games use was 8.8%.

Table 1.
Substance Use and Gambling/Gaming Before the COVID-19 Pandemic

Total Sample ($n = 240$)			Participants with Gambling/Gaming Activity ($n = 95$)		
Substances	n	%	Preferences	n	%
Tobacco	39	16.3	Type		
Alcohol	68	28.3	Non-strategic	42	44.2
Illegal drugs	4	1.7	Strategic	8	8.4
Gambling/gaming	n	%	Mixed	45	47.4
Without gambling/gaming activity	145	60.4	Modality		
With gambling/gaming activity	95	39.6	Landed based	85	89.5
Video games	88	36.7	Online	1	1.1
Lotteries	87	36.3	Mixed	9	9.5
Slot machines	14	5.8		Mean	SD
Bingo	6	2.5	Onset of gambling (years-old)	29.67	10.35
Football (soccer) betting	7	2.9	Duration of gambling (years)	17.41	10.42
Cards	6	2.5	Bets/episode (mean, euros)	13.35	15.90
Casino	7	2.9	Bets/episode (maximum, euros)	47.37	176.04
Saloon	6	2.5			
Horses betting	6	2.5			
Sports betting	7	2.9			
Stock market	11	4.6			

Note: COVID-19 = coronavirus disease 2019; SD = standard deviation.

Table 2.
Changes in Health, Substance use, and Video Game Use During COVID-19 Pandemic (n = 240)

	Pre-lockdown		Post-lockdown		<i>p</i>	<i> g </i>	Risk (Incidence Cases)			
	<i>n</i>	%	<i>n</i>	%			<i>n</i>	%	95% CI (risk)	
Healthy state										
Treatment for physical illness	62	25.8	76	31.7	.029*	0.19 [†]	25	10.4	6.6	14.3
Treatment for psychological illness	36	15.0	34	14.2	.832	0.05	10	4.2	1.6	6.7
Perceived poor physical state	41	17.1	73	30.4	<.001*	0.42 [†]	52	21.7 _p	16.5	26.9
Perceived poor psychological state	39	16.3	84	35.0	<.001*	0.44 [†]	48	20.0	14.9	25.1
Substances										
Tobacco	39	16.3	39	16.3	1.000	0.00	2	0.8	0.0	2.0
Alcohol	68	28.3	64	26.7	.424	0.14	5	2.1	0.3	3.9
Illegal drugs/medications	4	1.7	10	4.2	.031*	0.50 [†]	6	2.5	0.5	4.5
Use of video games										
Any video games type	88	36.7	88	36.7	1.000	0.00	21	8.8	5.2	12.3

Risk (incidence cases): patients who changed to a worsening health status.

*Significant difference.

[†]Effect size within the mild-moderate to the high-large range.

|g| = Cohen's *g* coefficient (absolute value).

Te values *p* = 1.000 are correct here, since equal results were obtained in the pre and post assessment (the change was equal to 0, and therefore the *p*-value is equal to 1)

Regression models explored statistical predictors of worsening of health and addictive behaviors during the lockdown. lock-down. Table 3 shows results obtained from the regression model. The presence of anxiety symptoms during the lockdown was a

significant contributor in increasing a reported need for treatment of physical and/or psychological illness. Being single or divorced, having lower education levels, and experiencing fears related to COVID-19 infection increased the likelihood of worsening

Table 3.
Predictive Models of the Risk of Worsening During COVID-19-Related Lockdown (n = 240)

Model	<i>B</i>	<i>SE</i>	<i>p</i>	<i>OR</i>	95% CI <i>OR</i>		<i>NR</i> ²
Treatment for physical illness							
Anxiety during the COVID-19 pandemic	1.105	0.473	.020	3.018	1.194	7.627	.041
Treatment for psychological illness							
Anxiety during the COVID-19 pandemic	3.322	0.815	.000	27.724	5.611	137.0	.088
Perceived worsening physic state							
Marital status: single or divorced	1.178	0.332	.000	3.247	1.692	6.230	.125
Education level: high	- 0.461	0.223	.039	0.631	0.407	0.977	
Fears related to infection by COVID-19	0.672	0.337	.047	1.957	1.010	3.792	
Perceived worsening psychological state							
Marital status: single or divorced	0.849	0.342	.013	2.337	1.196	4.567	.120
Education level: high	- 0.527	0.227	.020	0.590	0.378	0.921	
Fears related to infection by COVID-19	0.983	0.357	.006	2.673	1.327	5.384	
Alcohol or other drug use							
Family conflicts during the COVID-19 pandemic	1.110	0.651	.048	3.035	1.000	10.864	.040
Video game use							
Marital status: single or divorced	1.001	0.464	.031	2.722	1.097	6.757	.043

List of candidate predictors: sociodemographics (gender, age, marital status, education, employment status, and social status), substance use (alcohol or other drugs), contextual variables and fears during the lockdown (employment status, living alone, familial conflicts, COVID-related concerns, fears related to risk of infection, anxiety symptoms, and depressive symptoms).

Note: COVID-19 = coronavirus disease 2019; HL = Hosmer – Lemeshow test (*p*-value); *NR*² = Nagelkerke's pseudo *R*²; *OR* = odds ratio.

physical and psychological states. Finally, familial conflicts were associated with the onset of alcohol and drug use and being single or divorced was associated with the onset of video gaming during the lockdown.

Discussion

The main objective of the present study was to assess changes in physical and mental health status during lockdown in a non-clinical population during the early part of the COVID-19 pandemic, exploring potential addictive behaviors. Moreover, we aimed to identify contributing factors to changes in health and addictive behaviors.

Although most participants had not gambled prior to confinement, almost a third of the sample had participated in at least one form of gambling. Among people who had gambled, most of them reported only one form of gambling—landed-based and either non-strategic or mixed. In this line, one of the most prevalent activities in the sample before lockdown was lotteries. Gambling has historically been a common and widespread activity among the general adult population, with cultural factors influencing participation (e.g., social accessibility and cultural acceptability) (Ji et al., 2015). Gambling has typically been economically profitable and at times supported by publicity campaigns (Hing et al., 2016). In Spain, the lottery has become the most popular game in the country since its creation (Garvía, 2007). In fact, during Christmas time, lottery gambling is a common and traditional practice for most adults. People often buy national lottery tickets that are shared and exchanged with family and friends (Ariyabuddhiphongs, 2011).

The availability of gambling has increased over the past several decades (Clotas et al., 2020), particularly online gambling (Mora-Salgueiro et al., 2021). However, more traditional forms of gambling, such as lotteries, continue to be prevalent (Clotas et al., 2020). Potential factors associated with lottery popularity could be that, as a non-strategic form of gambling, it is chance based, so no game-related knowledge or experience is needed (Jiménez-Murcia et al., 2020). Moreover, lottery and non-strategic gambling forms of gambling are typically preferred by females, consistent with the nature of the present sample (Subramaniam et al., 2016). Despite offline gambling (including on lotteries) decreasing during the pandemic (Elder, 2020), individuals who gambled prior to confinement may be considered as a vulnerable population for developing problematic and/or disordered gambling, for example in moving from offline to online gambling modalities (Håkansson, 2020).

Other prevalent activity in the sample before the pandemic involved the use of video games. Approximately 9% of participants newly used video games during lockdown, with single marital status being associated with new users. Thus, social isolation and potential desires to maintain social contact or physical activity in the context of routine changes may have contributed to initiating the use of video games during confinement (Ellis et al., 2020). “Balanced” use of video games has been supported by the WHO (WHO, 2020b), and video gaming use during confinement may have beneficial impacts on physical and mental health (Ellis et al., 2020; Riva et al., 2020; Tavormina & Tavormina, 2021).

However, use of video games as a mechanism to cope with emotional distress may foreshadow potential risk of abuse (Ellis et al., 2020; Tavormina & Tavormina, 2021). Then, monitoring hours of the use, combining their use with other leisure activities, encouraging their use in the company of others, and maintaining healthy lifestyle habits are important considerations (Király et al., 2020).

Perceived poor physical and psychological states increased during lockdown. These results agree with prior studies of physical and mental health during the pandemic (Sánchez-Sánchez et al., 2020; Wang et al., 2020). The use of illegal drugs and/or non-prescribed medications increased during lockdown, with 2.5% of individuals reporting new use. This result might be partially related to a poor physical and psychological state due to the pandemic and confinement (Dores et al., 2021). In this vein, an increased risk of initiating and/or maintaining drug use has been described as a non-adaptive way to cope with physical and psychological symptoms (e.g., self-medicating) and was linked to difficulties in accessing health care (Dubey et al., 2020). Furthermore, drug consumption may also increase during times of stress (Zvolensky et al., 2020), which might support the associations with family conflicts during lockdown found in our study.

The strongest statistical predictors of health worsening during the lockdown were being unmarried, low education levels, the presence of anxiety symptoms, fears related to COVID-19 infection, and family conflicts. These findings agree with prior studies that have previously described factors associated with physical and mental state in the general population during confinement (Alzueta et al., 2021; Brooks et al., 2020; Wang et al., 2020). Although seemingly contradictory information has been reported on the influence of sociodemographic factors such as marital status or educational level on physical and mental health status (Alzueta et al., 2021; Taylor et al., 2008), some studies have suggested that not being partnered and having low educational levels are associated with poorer psychological well-being during adverse situations (Alzueta et al., 2021; Wang et al., 2020). People with mental illness, such as anxiety-related disorders, may also experience elevated risk of experiencing poor health during the COVID-19 pandemic (González-Sanguino et al., 2020). The fear of COVID-19 infection has also been associated with poor psychological states by Brooks et al. (2020). Other important predictors of health and well-being may include personal effects of COVID-19, such as conflicts with others at home (Alzueta et al., 2021; Wang et al., 2020). Although some results are preliminary and longer-term studies are needed, these aspects of vulnerability should be considered because of their potential influence on the physical and mental health status of the population currently and in future similar situations.

In sum, explored changes in physical and mental health, as well as in some potential addictive-related behaviors, among the general population during lockdown. Vulnerability factors of health worsening were identified, such as anxiety symptoms, being single/unmarried, having low education levels, experiencing fears related to COVID-19 infection, and having familial conflicts. These results should be considered for further stressful situations to design personalized preventive and therapeutic plans.

Limitations and Directions/Suggestions for Future Research

Limitations include the modest sample size, limited geographic location, a cross-sectional and retrospective nature of the study, as well as self-report assessments and associated biases. These factors may limit the generalizability of results. Future longitudinal and prospective research in larger samples should include quantitative validated scales to evaluate changes over longer durations of time.

Ethics Committee Approval: Ethical committee approval was received from the Ethics Committee of Bellvitge University Hospital (Approval No: PR329/19).

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References

- Alzueta, E., Perrin, P., Baker, F. C., Caffarra, S., Ramos-Usuga, D., Yuksel, D., & Arango-Lasprilla, J. C. (2021). How the COVID-19 pandemic has changed our lives: A study of psychological correlates across 59 countries. *Journal of Clinical Psychology, 77*(3), 556 – 570. [\[CrossRef\]](#)
- American Psychiatry Association (APA) (2013). *Diagnostic and statistical manual of mental disorders (DSM 5)* (5th ed). American Psychiatric Association.
- Ariyabuddhiphongs, V. (2011). Lottery gambling: A review. *Journal of Gambling Studies, 27*(1), 15 – 33. [\[CrossRef\]](#)
- Baenas, I., Caravaca-Sanz, E., Sánchez, I., Riesco, N., Testa, G., Vintró-Alcaraz, C., & Treasure, J. (2020). COVID-19 and eating disorders during confinement: Analysis of factors associated with resilience and aggravation of symptoms. *European Eating Disorders Review, 28*(6), 855 – 863. [\[CrossRef\]](#)
- Brooks, S. K., Webster, R. K., Smith, L. E., Woodland, L., Wessely, S., Greenberg, N., & Rubin, G. J. (2020). The psychological impact of quarantine and how to reduce it: Rapid review of the evidence. *Lancet, 395*(10227), 912 – 920. [\[CrossRef\]](#)
- Chew, Q. H., Wei, K. C., Vasoo, S., Chua, H. C., & Sim, K. (2020). Narrative synthesis of psychological and coping responses towards emerging infectious disease outbreaks in the general population: Practical considerations for the COVID-19 pandemic. *Singapore Medical Journal, 61*(7), 350 – 356. [\[CrossRef\]](#)
- Clotas, C., Bartroli, M., Caballé, M., Pasarín, M. I., & Villalbí, J. R. (2020). El negocio de los juegos de azar: Una perspectiva desde la salud pública. *Revista Española de Salud Pública, 94*, e202006043.
- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed). Lawrence Earlbaum Associates.
- Diez-Quevedo, C., Rangil, T., Sanchez-Planell, L., Kroenke, K., & Spitzer, R. L. (2001). Validation and utility of the patient health questionnaire in diagnosing mental disorders in 1003 general hospital Spanish inpatients. *Psychosomatic Medicine, 63*(4), 679 – 686. [\[CrossRef\]](#)
- Dores, A. R., Carvalho, I. P., Burkauskas, J., Simonato, P., De Luca, I., Mooney, R., Ioannidis, K., Gómez-Martínez, M. Á., Demetrovics, Z., Ábel, K. E., Szabo, A., Fujiwara, H., Shibata, M., Ventola, A. R. M., Arroyo-Anlló, E. M., Santos-Labrador, R. M., Griskova-Bulanova, I., Pranckeviciene, A., Kobayashi, K., Martinotti, G., et al. (2021). Exercise and use of enhancement drugs at the time of the COVID-19 pandemic: A multicultural study on coping strategies during self-isolation and related risks. *Frontiers in Psychiatry, 12*, 648501. [\[CrossRef\]](#)
- Dubey, M. J., Ghosh, R., Chatterjee, S., Biswas, P., Chatterjee, S., & Dubey, S. (2020). COVID-19 and addiction. *Diabetes and Metabolic Syndrome, 14*(5), 817 – 823. [\[CrossRef\]](#)
- Elder, J. (2020). Tim Costello on COVID-19: A wake-up call for fathers, a reprieve for gamblers. *The New Daily*. Retrieved from <https://thenewdaily.com.au/news/people/2020/05/16/tim-costello-and-covid-19/>.
- Ellis, L. A., Lee, M. D., Ijaz, K., Smith, J., Braithwaite, J., & Yin, K. (2020). COVID-19 as 'game changer' for the physical activity and mental well-being of augmented reality game players during the pandemic:

- Mixed methods survey study. *Journal of Medical Internet Research*, 22(12), e25117. [CrossRef]
- Farhoudian, A., Radfar, S. R., Mohaddes Ardabili, H., Rafei, P., Ebrahimi, M., Khojasteh Zonoozi, A., De Jong, C. A. J., Vahidi, M., Yunesian, M., Kouimtsidis, C., Arunogiri, S., Hansen, H., Brady, K. T., ISAM Global Survey Consortium (ISAM-GSC), Potenza, M. N., Baldacchino, A. M., & Ekhtiari, H. (2021). A global survey on changes in the supply, price and use of illicit drugs and alcohol, and related complications during the 2020 COVID-19 pandemic. *Frontiers in Psychiatry*, 12, 646206. [CrossRef]
- Fernández-Aranda, F., Casas, M., Claes, L., Bryan, D. C., Favaro, A., Favaro, A., Granero, R., Gudiol, C., Jiménez-Murcia, S., Karwautz, A., Le Grange, D., Menchón, J. M., Tchanturia, K., Treasure, J., (2020). COVID-19 and implications for eating disorders. *European Eating Disorders Review*, 28(3), 239 – 245. [CrossRef]
- Garvía, R. (2007). Syndication, institutionalization, and lottery play. *American Journal of Sociology*, 113(3), 603 – 652. [CrossRef]
- Gaume, J., Schmutz, E., Daepfen, J. B., & Zobel, F. (2021). Evolution of the illegal substances market and substance users' social situation and health during the COVID-19 pandemic. *International Journal of Environmental Research and Public Health*, 18(9), 4960. [CrossRef]
- González-Sanguino, C., Ausín, B., Castellanos, M. Á., Saiz, J., López-Gómez, A., Ugidos, C., & Muñoz, M. (2020). Mental health consequences during the initial stage of the 2020 coronavirus pandemic (COVID-19) in Spain. *Brain, Behavior, and Immunity*, 87, 172 – 176. [CrossRef]
- Håkansson, A. (2020). Changes in gambling behavior during the COVID-19 pandemic—A web survey study in Sweden. *International Journal of Environmental Research and Public Health*, 17(11), 1 – 16. [CrossRef]
- Hing, N., Russell, A. M. T., Vitartas, P., & Lamont, M. (2016). Demographic, behavioural and normative risk factors for gambling problems amongst sports bettors. *Journal of Gambling Studies*, 32(2), 625 – 641. [CrossRef]
- Ji, L. J., McGeorge, K., Li, Y., Lee, A., & Zhang, Z. (2015). Culture and gambling fallacies. *SpringerPlus*, 4, 510. [CrossRef]
- Jiménez-Murcia, S., Granero, R., Fernández-Aranda, F., & Menchón, J. M. (2020) Comparison of gambling profiles based on strategic versus non-strategic preferences. *Current Opinion in Behavioral Sciences*, 31, 13 – 20. [CrossRef]
- King, D. L., Delfabbro, P. H., Billieux, J., & Potenza, M. N. (2020). Problematic online gaming and the COVID-19 pandemic. *Journal of Behavioral Addictions*, 9(2), 184 – 186. [CrossRef]
- Király, O., Potenza, M. N., Stein, D. J., King, D. L., Hodgins, D. C., Saunders, J. B., Griffiths, M. D., Gjonneska, B., Billieux, J., Brand, M., Abbott, M. W., Chamberlain, S. R., Corazza, O., Burkauskas, J., Sales, C. M. D., Montag, C., Lochner, C., Grünblatt, E., Wegmann, E., Martinotti, G., et al. (2020). Preventing problematic internet use during the COVID-19 pandemic: Consensus guidance. *Comprehensive Psychiatry*, 100, 152180. [CrossRef]
- Kroenke, K., Spitzer, R. L., & Williams, J. B. W. (2001). The PHQ-9: Validity of a brief depression severity measure. *Journal of General Internal Medicine*, 16(9), 606 – 613. [CrossRef]
- Mora-Salgueiro, J., García-Estela, A., Hogg, B., Angarita-Osorio, N., Amann, B. L., Carlbring, P., Jiménez-Murcia, S., Pérez-Sola, V., & Colom, F. (2021). The prevalence and clinical and sociodemographic factors of problem online gambling: A systematic review. *Journal of Gambling Studies*, 37(3), 899 – 926. [CrossRef]
- Price, A. (2020). Online gambling in the midst of COVID-19: A nexus of mental health concerns, substance use and financial stress. *International Journal of Mental Health and Addiction*, 1 – 18. [CrossRef]
- Radfar, S. R., De Jong, C. A. J., Farhoudian, A., Ebrahimi, M., Rafei, P., Vahidi, M., Yunesian, M., Kouimtsidis, C., Arunogiri, S., Massah, O., Deylamizadeh, A., Brady, K. T., Busse, A., ISAM-PPIG Global Survey Consortium, Potenza, M. N., Ekhtiari, H., & Baldacchino, A. M. (2021). Reorganization of substance use treatment and harm reduction services during the COVID-19 pandemic: A global survey. *Frontiers in Psychiatry*, 12, 639393. [CrossRef]
- Riva, G., Mantovani, F., & Wiederhold, B. K. (2020). Positive technology and COVID-19. *Cyberpsychology, Behavior and Social Networking*, 23(9), 581 – 587. [CrossRef]
- Sánchez-Sánchez, E., Ramírez-Vargas, G., Avellaneda-López, Y., Orellana-Pecino, J. L., García-Marín, E., & Díaz-Jimenez, J. (2020). Eating habits and physical activity of the Spanish population during the Covid-19 pandemic period. *Nutrients*, 12(9), 2826. [CrossRef]
- Stata-Corp. (2021). *Stata statistical* [Software: Release 17].
- Subramaniam, M., Abdin, E., Vaingankar, J. A., Shahwan, S., Picco, L., & Chong, S. A. (2016). Strategic versus nonstrategic gambling: Results from a community survey. *Journal of Addiction Medicine*, 10(3), 174 – 181. [CrossRef]
- Tavormina, M. G. M., & Tavormina, R. (2021). Video games and Covid-19: How do lockdown and addiction interact? *Psychiatria Danubina*, 33(9), 152 – 157. [CrossRef]
- Taylor, M. R., Agho, K. E., Stevens, G. J., & Raphael, B. (2008). Factors influencing psychological distress during a disease epidemic: Data from Australia's first outbreak of equine influenza. *BMC Public Health*, 8, 347. [CrossRef]
- The World Health Organization (WHO) (2020a). #HealthyAtHome – Mental Health. Retrieved from <https://www.who.int/news-room/campaigns/connecting-the-world-to-combat-coronavirus/healthy-at-home/healthyathome—mental-health>
- The World Health Organization (WHO) (2020b). *Mental health and psychosocial considerations during COVID-19 outbreak* (pp. 1 – 6). World Health Organization. Retrieved from <https://www.paho.org/en/documentos/consideraciones-psicosociales-salud-mental-du-rante-brote-covid-19>
- Vanderbruggen, N., Matthys, F., Van Laere, S., Zeeuws, D., Santermans, L., Van den Amele, S., & Crunelle, C. L. (2020). Self-reported alcohol, tobacco, and cannabis use during COVID-19 lockdown measures: Results from a web-based survey. *European Addiction Research*, 26(6), 309 – 315. [CrossRef]
- Wang, C., Pan, R., Wan, X., Tan, Y., Xu, L., Ho, C. S., & Ho, R. C. (2020). Immediate psychological responses and associated factors during the initial stage of the 2019 coronavirus disease (COVID-19) epidemic among the general population in China. *International Journal of Environmental Research and Public Health*, 17(5). [CrossRef]
- Zvolensky, M. J., Garey, L., Rogers, A. H., Schmidt, N. B., Vujanovic, A. A., Storch, E. A., Buckner, J. D., Paulus, D. J., Alfano, C., Smits, J. A. J., & O'Leirigh, C. (2020). Psychological, addictive, and health behavior implications of the COVID-19 pandemic. *Behaviour Research and Therapy*, 134, 103715. [CrossRef]

Supplementary Table 1.*Gambling/gaming activities before the COVID-19 pandemic***Participants with gambling/gaming activity (n = 95)**

Non-strategic	42	44.2%
<i>Lotteries</i>	42	100%
Strategic	8	8.4%
<i>Football (soccer)-betting</i>	1	12.5%
<i>Stock market</i>	3	37.5%
<i>Video Games</i>	5	62.5%
<i>Other</i>	4	50.0%
Mixed	8	8.4%
<i>Lotteries</i>	45	100.0
<i>Video Games</i>	39	86.7
<i>Football (soccer)-betting</i>	13	28.9
<i>Stock market</i>	8	17.8
<i>Bingo</i>	7	15.6
<i>Casino</i>	7	15.6
<i>Sports-betting</i>	7	15.6
<i>Slot machines</i>	6	13.3
<i>Cards</i>	6	13.3
<i>Saloon</i>	6	13.3
<i>Horses-betting</i>	6	13.3
<i>Other</i>	8	17.8