

Self-reported changes in engagement in offline and online gambling during temporary COVID-19 restrictions on access to land-based gambling venues in Poland and their relation to the gambling disorder

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Summary

Aim. This study aimed to trace changes in the participation of Polish gamblers in online and offline (land-based) gambling caused by the temporary restrictions on access to land-based gambling venues imposed during the first national lockdown during the COVID-19 pandemic.

Material and methods. Data from 585 respondents were collected using an online questionnaire. Those who declared they had engaged in land-based gambling before 15 March 2020 were included in the sample. Respondents were asked about their online and offline gambling participation in the period before the first lockdown (before March 2020), during the first lockdown (15 March to 10 May 2020), and six months after the end of the lockdown. The analyses also considered the severity of the participants' gambling disorder symptoms measured with the CPGI and the reasons for reducing or increasing gambling involvement.

Results. The land-based gamblers most often maintained their gambling activity at the same level or reduced it during the lockdown (nearly 95% of gamblers). Motivations for less gambling included financial constraints and limited access to gambling. Increased offline gambling was explained by more free time, the need to relieve stress and to want to win money. Of the 394 people who had gambled only offline before the pandemic, 30 began to gamble online during the pandemic. The initiation of online gambling and increased online or offline gambling during the coronavirus outbreak was associated with greater severity of gambling disorder symptoms.

Conclusions. In our sample, participation in gambling increased only marginally during the pandemic, and the increase was related to problematic gambling patterns.

Key words: gambling, pathological gambling, COVID-19 pandemic

Introduction

The COVID-19 (coronavirus disease 2019) epidemic, which began in Poland in March 2020, has caused rapid changes in many aspects of human life. It has affected people's professional careers (shift to remote working, job loss, reduction of income), their family life (having to spend all the time with family members, no activities outside the home, children's distance learning, having to reconcile work and family life), and their psychological well-being (anxiety regarding one's own and one's family's financial well-being and health, isolation, uncertainty, loss of sense of security). The burdens of the pandemic have been recognised and emphasised by scholars in Poland and around the world [1–5].

This unprecedented situation has guided researchers' interest in the impact of the pandemic on people's mental well-being. For example, one of the first studies conducted in Poland showed that in September 2020, as many as 26% of adult Poles presented with symptoms of severe mental dysfunction, and 10% reported having suicidal thoughts [6]. Additionally, Poles had increased stress levels and were more likely to use non-adaptive coping strategies. It should be added that 10.1% of adult Poles have increased their alcohol consumption during the pandemic, and 10.17% have increased their smoking [7]. An even stronger trend has been observed globally, with 40% of adults reporting drinking alcohol more frequently than before the coronavirus outbreak [8].

During the pandemic, attention has also been paid to gambling, which people use to cope with stress [9–12]. Gambling on the Internet appears to be a threat since online gamblers have more severe gambling disorder symptoms than offline gamblers [13–15]. In the latest edition of the World Health Organisation's International Classification of Diseases (ICD-11), gambling disorder has been included in addictive behaviours [16]. Earlier, in 2013, an analogous change in classification was introduced by the American Psychiatric Association [17]. This means that the mechanisms of development of the disorder and its impact on the patient's life are the same as those of substance dependence [18]. Accordingly, gambling, just like the abuse of psychoactive substances, has become one of the ways of coping with the complex reality of the pandemic.

Gambling disorder has been recognised as a public health problem for more than two decades [19]. Currently undertaken epidemiological studies are aimed at identifying the factors that are associated with the harm caused by gambling and planning interventions to reduce the impact of these factors. In his review article, Abbott [20] draws attention to the factors identified in the research, which include, among others: broadly understood accessibility or expansion of gambling, resulting e.g. with the development of Internet gambling. A number of studies on gambling confirm the validity of the so-called availability hypothesis or the exposure hypothesis that ease of access increases consumption. This, in turn, is related to the total consumption model developed for alcohol, which assumes that there is a strong relationship between the intensity of alcohol consumption and the level of its abuse or harm in the population [20]. The same patterns seem to apply to gambling [21, 22].

It was expected that the number of new gamblers would increase during the lockdowns, and land-based gamblers would move to online gambling. Some studies confirmed these expectations: in Canada, 17% of gamblers migrated to online gambling [23] and in the United States – 15% [24]. The motivations for the migration included the closure of land-based gambling premises, limited access to other offline activities, staying at home, isolation, increased stress, the need to relieve this stress, and financial problems [25, 26]. Growth in online gambling has been observed, among others, in the UK [26] and Spain [27]. Given these increases, restrictions on gambling advertising have been introduced in those countries. The growth forecasts were confirmed by estimates which showed that revenues from online gambling had increased since 2020 (the cumulative annual growth rate in 2021 versus 2020 for this industry was 12.3%, from 64.13 to 72.02 billion US dollars) [28]. In addition, mental health studies showed that increased online gambling was associated with more severe problem gambling symptoms [28–31], anxiety disorder, depression, and reduced quality of life during the pandemic [26, 31, 32].

In contrast to reports on increased gambling, as reviewed by Hodgins and Stevens [33], numerous studies showed an overall reduction in gambling among gamblers during the pandemic. The following motivations for reducing gambling were identified: financial difficulties, limited access to gambling games, reluctance to gamble in front of one's family, a sense that one gambles too much and needs to cut down on gambling, and another person's suggestion that one should limit gambling. Studies conducted in New Zealand and Canada showed that more gamblers had reduced or maintained their gambling level, which applied to all online and land-based gambling [31, 34]. Similar results were obtained among Polish sports bettors [35]. Other authors reported comparable percentages of gamblers who had increased or decreased their participation in gambling [32, 36]. However, according to Hodgins and Stevens [33], the conclusions from the studies which showed that gambling activity has decreased in general but at the same time increased in some groups are not unequivocal and require further, in-depth research.

In Poland, access to land-based gambling was restricted due to the coronavirus outbreak from 15 March to about mid-May 2020 (gambling venues reopened on different days depending on the game operator). The restrictions concerned casinos, slot machines and some betting and lottery shops [37]. Unlike in other countries, in Poland, no research has been conducted on a specific trend in changes in the level of gambling activity during the pandemic. Instead, journalists and addiction psychotherapists have mainly voiced opinions regarding gambling participation [38]. Also, game operators have observed increased spending on gambling in Poland during the pandemic [39].

Aim

The present study aimed to investigate the changes in the participation of Polish gamblers in land-based and online gambling between the period before the first lockdown and six months after the end of the lockdown. Our study covered a period beyond the lockdown itself, which Hodgins and Stevens [33] found lacking in their

reviewed studies. In contrast to existing research, we considered the dynamics of changes in both online and offline gambling modes. The aim of the research was to answer the question whether, due to the restrictions caused by the pandemic, a specific trend regarding changes in gambling appeared among Polish gamblers. The analysis of research on mental functioning, including addictions, during the pandemic led to the following hypotheses:

1. During the lockdown period, there was a decrease in the intensity of land-based gambling and an increase in the intensity of online gambling, or the initiation of online gambling among people practising land-based gambling before the pandemic;
2. There is a positive relationship between the severity of problem gambling and the increase in gambling during the lockdown period.

Material and methods

Procedure and sample

Participants were surveyed via computer-assisted web interviewing using the Nationwide Research Panel Ariadna (*Ogólnopolski Panel Badawczy Ariadna*). This panel is based on voluntary paid cooperation. When the survey was conducted, it had over 110,000 registered users. Respondents were remunerated for taking part. The study was carried out in compliance with the Helsinki Declaration and was approved by the Ethical Committee of the Institute of Psychology of the Catholic University of Lublin (KEBN_36/2020).

The survey was conducted in November 2020. The inclusion criterion was participation in any land-based gambling activity before 15 March 2020 at least once a month. The respondents were asked about their gambling participation during the six months before the initial restrictions, during the restrictions, and after the restrictions had been lifted until the survey date.

There were 661 records in the database sent to us by the panel provider. The data obtained via the Internet were analysed for quality. A total of 76 records were deleted, including 20 responses with a completion time not longer than 5 minutes and 56 responses that did not meet the criterion of having gambled at least once a month before the epidemic. Ultimately, a sample of 585 gamblers who had engaged in land-based gambling prior to the pandemic was obtained. About half (50.6%) of the sample were women ($n = 296$). The age of the respondents ranged from 18 to 64 years ($M = 40.5$, $SD = 13.79$).

Instruments

The results reported in this paper come from a more extensive study. The entire questionnaire consisted of five blocks of items: (1) questions regarding participant eligibility; (2) questions about the characteristics of the respondents' online and land-based gambling activity six months before 15 March 2020; (3) questions about gambling activity and how it changed during the restrictions period (15 March–10 May 2020); (4)

questions about gambling activity and how it changed in the period after the lockdown until the time of the survey; (5) items measuring psychological variables, including the Canadian Problem Gambling Index (CPGI) (40). In the survey, the respondents were asked to evaluate changes in the level of their offline gambling participation in two periods: during the tightest restrictions compared to the pre-pandemic time and after the most severe restrictions had been lifted compared to the lockdown period. Online gamblers were also inquired about changes in their online gambling activity level. Moreover, the participants were asked about the nature and reasons for changes in their gambling activity. The items analysed below are provided in Supplement S1. Answers to the question about changes in the level of gambling, which had originally been given on a 5-point scale, were recoded into three categories: a decrease, no change, and an increase.

Problem gambling severity was measured using the Polish adaptation of the Canadian Problem Gambling Index (CPGI) [40, 41]. The nine CPGI items were rated on a 4-point scale of *never* = 0, *sometimes* = 1, *most of the time* = 2 and *almost always* = 3. The original cut-off points for the total CPGI score were used to distinguish between four subgroups of gamblers [40]: non-problem (CPGI score = 0); low-risk (1–2), moderate-risk (3–7) and problem gambler/probably gambling disorder (≥ 8). Cronbach's α for the CPGI in the present study was 0.94. Data to measure the sensitivity and accuracy of the Polish adaptation of the questionnaire were collected based on a diagnostic interview conducted individually by interviewers-therapists. In the adaptive study, the standardised Cronbach's α was 0.837. The area under the ROC curve was 0.969 (confidence interval 0.951-0.987), which indicates a very high predictive power of the questionnaire [41].

Statistical analysis

The data were analysed statistically using IBM SPSS Statistics v. 27.0 software [42]. Score distributions were expressed as numbers and percentages. Confidence intervals for percentages were calculated for the primary results. The relationships between the variables are shown in contingency tables. The χ^2 test and the McNemar-Bowker χ^2 test were used to compare independent and dependent data percentages, respectively. Table cells were compared using adjusted standardised residual analysis and the z -test of differences for nominal variables with Bonferroni's correction.

Results

Below, we present data on participant-reported changes in the levels of land-based gambling since the beginning of the COVID-19 health crisis, motivations for these changes, and the severity of problem gambling in connection with the trend of changes in gambling. Next, we describe changes in online gambling in the investigated sample and the severity of problem gambling depending on the type of gambling. Finally, we characterise participant-reported changes in the levels of online gambling against the background of changes in land-based gambling activity.

Changes in land-based gambling during the COVID-19 pandemic

In response to the question about changes in the level of offline gambling during the tightest restrictions compared to the pre-pandemic period, 61.5% ($n = 360$; 95% CI[57.5%, 65.4%]) of the respondents declared they had been gambling less, 33.2% ($n = 194$; 95% CI[19.4%, 37.1%]) reported they had been gambling the same amount, and 5.3% ($n = 31$; 95% CI[3.7%, 7.3%]) said they had been gambling more.

To analyse the stability of participant-reported changes in land-based gambling activity during the lockdown, we compared them to participant-declared changes after the restrictions had been lifted. These changes differed significantly from one another ($\chi^2(3) = 117.00$; $p < 0.001$). A contingency table for these data is provided in Supplement S2 (Table S1). The results show that for 30.9% ($n = 181$), the level of gambling had not changed in any of the investigated periods – this number included almost all gamblers who declared their gambling behaviour had not changed during the lockdown (93.3%). The remaining respondents in this group reported they had been gambling less (4.1%; $n = 8$) or more (2.6%; $n = 5$) when the restrictions were eased.

Persons who declared a permanent decrease in the level of gambling in the analysed period represented 18.6% ($n = 109$) of the entire sample. More than half of the gamblers who had been gambling less on land-based activities in the first period declared their participation had not changed after the lockdown (55.6%; $n = 200$), and nearly one-third (30.3%; $n = 109$) reported their activity had decreased even more after the restrictions had been lifted, and 14.2% ($n = 51$) said they had been gambling more. This last response can be interpreted as a return to the initial state.

Gamblers who declared an increase in gambling in the first and second phases of the epidemic accounted for 2.4% ($n = 14$) of the entire sample. Among those gamblers whose engagement in land-based gambling increased in the first period, the largest group (45.2%, $n = 14$) were those whose level of involvement increased after the restrictions had been lifted; 35.5% ($n = 11$) gambled the same amount as in the first period, and 19.4% ($n = 6$) gambled less on offline activities.

Changes in the intensity of offline gambling involvement are presented in Figure 1.

Changes in land-based gambling participation and problem gambling

Another analysis investigated whether the direction of changes in gambling activity during the lockdown was related to the severity of problem gambling, as measured by the CPGI (Table 1). Over half of the respondents did not present with any symptoms of problem gambling, one-fifth were low-risk gamblers, 14% were moderate-risk gamblers, and 11% showed gambling disorder symptoms.

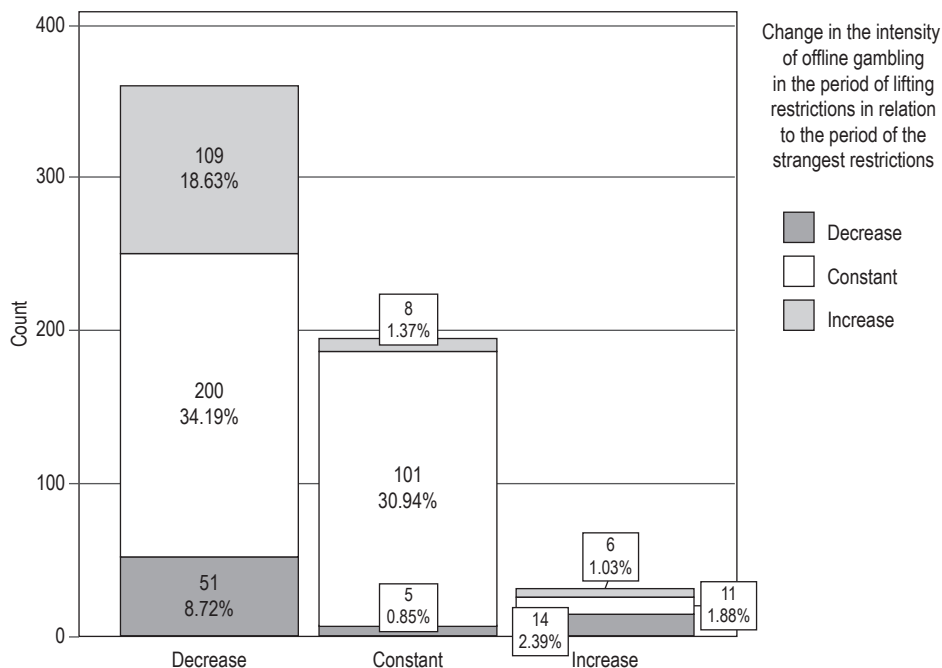


Figure 1. Changes in offline gambling intensity during the pandemic

Table 1. Relationship between changes in land-based gambling participation during the lockdown and the severity of problem gambling in the investigated sample (N = 585)

	Changes in the level of land-based gambling between the lockdown and the pre-pandemic period									Total	
	Decrease			No change			Increase				
CPGI score	n	%	e	n	%	e	n	%	e	n	%
0	196 _a	54.4%	0.68	108 _a	55.7%	0.80	8 _b	25.8%	-3.16	312	53.3%
1–2	77 _a	21.4%	0.53	38 _a	19.6%	-0.46	6 _a	19.4%	-0.19	121	20.7%
3–7	60 _a	16.7%	1.86	24 _a	12.4%	-1.04	1 _a	3.2%	-1.84	85	14.5%
8+	27 _a	7.5%	-3.80	24 _a	12.4%	0.49	16 _b	51.6%	7.22	67	11.5%
Total	360	100.0%		194	100.0%		31	100.0%		585	100.0%

Note: The same letters in the subscript denote the categories of percentage change in the level of land-based gambling in the period of the tightest restrictions compared to the period before the pandemic, whose values in the columns do not differ significantly from each other at 0.05 level. Corrected standardised residues are denoted by e.

The severity of the gambling disorder was related to changes in land-based gambling during the lockdown ($\chi^2(6) = 16.63; p = 0.011$). In the group of those gamblers

who declared their engagement in land-based gambling had increased in the first period, there was a proportionally significantly higher percentage of problem gamblers than in the other groups. Moreover, these respondents had significantly fewer non-problem gamblers than those who had been gambling less during the restrictions.

Participant-reported motivations for changes in land-based gambling participation

The respondents were asked why their engagement in gambling had changed in the study's first and second periods. The results are given in Tables S2 and S3 in the Supplement. Both increases and decreases were most often related to the frequency of gambling, less often to the amount of money spent, and least often to the duration of one gambling session. Among the most frequently mentioned reasons for the increase in land-based gambling during the lockdown, the respondents (26 individuals) indicated having more free time (42.3%), the need to relieve stress (30.8%), the need for money (26.9%), and limited access to other activities (15.4%). On the other hand, reduced engagement in offline gambling in the first period (164 people) was most often motivated by financial constraints (53.0%), limited access to gambling venues (47.0%), and having less free time (13.4%).

Among the reasons for gambling more on land-based activities after the tightest restrictions had been lifted, the respondents (64 people) mentioned: the reopening of land-based gambling venues (62.7%), more free time (22.4%), the need to relieve stress (22.4%), the need for more money (16.4%) and limited access to alternative activities (11.9%). On the other hand, those who gambled less on land-based activities after the lockdown (21 people) said they did so due to financial difficulties (55.7%), having less free time (31.1%), having better access to alternative activities (21.7%), and because they had shifted to gambling online (9.4%).

Online gambling among land-based gamblers during the COVID-19 epidemic

Initiation of online gambling during the epidemic

Respondents' answers to the question 'When was the first time you gambled online?' provided information on the initiation of online gambling among land-based gamblers during the first months of the epidemic. In our sample, 30 (5.1%; 95% CI [3.6%, 7.1%]) gamblers who had previously gambled on land-based activities only started gambling online in the period covered by the study: 23 of them started gambling via the Internet during the lockdown, and seven after the restrictions of the lockdown had been lifted. Individuals who had gambled exclusively on land-based activities before the outbreak of COVID-19 were the dominant group in our sample ($n = 364$; 62.2%; 95% CI [58.2%, 66.1%]); one-third of the participants had gambled on both land-based and online products before the epidemic started ($n = 191$; 32.6%; 95% CI [28.9%, 36.5%]).

Relationship between problem gambling and gambling mode

Three groups of gamblers who differed in the forms of gambling (gambling mode) they engaged in – offline gambling, offline and online gambling, and initiation of online gambling during the pandemic – were compared concerning the severity of problem gambling symptoms. A statistically significant relationship was obtained ($\chi^2(6) = 83.23$; $p < 0.001$).

Table 2. **Relationship between gambling mode and severity of problem gambling in the investigated sample (N = 585)**

	Gambling mode									Total	
	Offline			Offline and online			Online initiation			N	%
CPGI score	n	%	e	n	%	e	n	%	e	N	%
0	238 _a	65.4%	7.50	66 _b	34.6%	-6.34	8 _b	26.7%	-3.01	312	53.3%
1-2	73 _a	20.1%	-0.48	41 _a	21.5%	0.33	7 _a	23.3%	0.37	121	20.7%
3-7	37 _a	10.2%	-3.84	39 _b	20.4%	2.81	9 _b	30.0%	2.47	85	14.5%
8+	16 _a	4.4%	-6.88	45 _b	23.6%	6.40	6 _b	20.0%	1.51	67	11.5%
Total	364	100.0%		191	100.0%		30	100.0%		585	100.0%

Note: The same letters in the subscript denote the categories of percentage change in the level of land-based gambling in the period of the tightest restrictions compared to the period before the pandemic, whose values in the columns do not differ significantly from each other at 0.05 level. Corrected standardised residues are denoted by e.

The group of individuals who only gambled on land-based products differed significantly from the other groups in that it had the largest proportion of non-problem gamblers. Compared to the remaining groups, it had the lowest number of gamblers who showed symptoms of problem gambling (3–7 and 8+). Gamblers who engaged in offline and online activities and those who initiated online gambling during the pandemic differed significantly from the first group in that they had more severe gambling symptoms (3–7 and 8+).

Changes in online gambling participation versus changes in offline gambling participation

Finally, we analysed participant-reported changes in engagement in online gambling activities against the background of changes in offline gambling during the lockdown compared to the pre-pandemic period.

Over half of the gamblers who reported a reduction in land-based gambling were also gambling less online (61.0%). Nearly one-fifth of those who gambled less offline gambled the same amount online as before the lockdown (18.6%), and 20.3% gambled more online. The overwhelming majority of the gamblers who maintained their land-based gambling also engaged in online gambling at the same level as before the

lockdown (76.3%), and 18.8% were gambling less on online products. Among gamblers who reported gambling more on land-based activities during the lockdown, the dominant group were those who also increased their online gambling activity (52.6%), but 26.3% declared their engagement in online gambling had decreased. Similar trends were observed in the changes after the tightest restrictions had been lifted compared to the lockdown (tables with results can be found in the Supplement).

Discussion

Most of the land-based gamblers we surveyed reported their engagement in gambling either had not changed or had decreased during the first lockdown (95% in total), which contradicts intuitive assumptions based on data on the intensification of other problem behaviours (including addictions) [8, 43] but is consistent with reports from around the world about gambling [26, 27]. These trends continued in our sample also after land-based gambling venues had been reopened – almost all offline gamblers spent the same amount of time on gambling, and those who had engaged less in land-based gambling during the lockdown either remained at the same level or limited their engagement even further after the reopening of venues.

Looking at these findings from another perspective, around a third of the sample did not change their engagement in offline gambling in any of the periods considered, which demonstrates that the epidemic and the associated closure of land-based gambling venues had an impact on around 70% of those who had frequented land-based gambling venues before the epidemic. However, in the case of about 55% of the sample, those events caused a stable reduction in gambling. This leads to the conclusion that limited access to gambling games is associated with a lower engagement in gambling, which may be used to prevent gambling disorders.

A consistent increase in gambling intensity during the first stages of the pandemic (the introduction and lifting of the tightest restrictions) was reported by less than 3% of the gamblers. One can add to this number another 1.6% of gamblers who, after increasing their engagement during the lockdown, maintained this higher level of participation after the lockdown. This means that the potential problem of increased involvement in gambling during the first phases of the epidemic concerned about 5% of gamblers. The analysis of changes in gambling concerning the severity of problem gambling sheds an interesting light on our results. It turns out that among the gamblers who gambled more during the lockdown, there were more persons with symptoms of problem gambling and fewer non-problem gamblers. Conversely, there were significantly fewer problem gamblers among those who gambled the same amount or less on land-based activities during the lockdown. These results are in line with the meta-analysis carried out by Brodeur and his team [44]. Thus, increased gambling seems to be related to problematic gambling patterns.

Respondents perceived the changes in their offline gambling behaviour during the first phases of the epidemic as a whole rather than broken down into stages. These phases differed in whether land-based gambling venues were open or closed. Moreover, indeed, 99% of the individuals who had seen an increase in their gambling participa-

tion during the tightest restrictions experienced a further increase or no change after the lockdown; similarly, the vast majority (96%) of those who said their participation had not changed during the lockdown, reported that nothing had changed in their gambling behaviour after the lockdown had been lifted. Also, over 90% of individuals declaring a decrease in gambling in the first phase reported a decrease or no further change in the second phase.

The analysis of participant-reported reasons for changes in offline gambling showed that a reduction in gambling was most often motivated by financial constraints and poorer access to gambling products. Reduced engagement in gambling after the first lockdown was also most often motivated by financial and time constraints and renewed access to alternative activities. These findings suggest a relationship between gambling and access to gambling products or lack of alternative activities, which should be considered in preventing problem gambling.

Persons who gambled more during the lockdown did so because they had more free time, wanted to relieve stress or needed money. Similarly, individuals who gambled more after the lockdown were most often motivated by the reopening of land-based gambling venues, the need to relieve stress and the need for money. Given that the intensity of gambling was associated with greater severity of problem gambling, the motivations of these gamblers are noteworthy, especially the need to relieve stress and make money. These two motives are particularly closely related to the compulsive nature of gambling: the first with the use of gambling as an escapist, non-constructive coping strategy, and the second with cognitive distortions – the belief that one can control the outcome of a gambling game and make money by gambling [11, 45–47].

The analysis of online and land-based gambling behaviour changes in individuals who engaged in both forms of gambling showed that the change trends were relatively independent of the gambling mode. People who gambled less at land-based venues often also spent less or the same amount of time on online gambling. About 14.6% of them increased their online gambling. On the other hand, those increasing their land-based gambling also reported they had increased online gambling. It was assumed that opposite trends would be observed depending on the type of gambling (decreased land-based gambling versus increased online gambling), as demonstrated in a British study [48]. Due to the small size of the subgroup of people who increased their gambling, these results should be interpreted with caution.

The assumption that a considerable number of gamblers would switch to playing online gambling games was not confirmed by our data. Only 5.1% of offline gamblers started gambling online after the pandemic began. This is important because the group of persons who gambled at land-based establishments only included a significantly larger proportion of non-problem gamblers compared to groups of gamblers who had gambled online before the pandemic or initiated this type of gambling during the pandemic. This observation is consistent with numerous reports that online gambling has more addictive potential than traditional gambling [14, 49, 50].

It is worth noting that although the respondents were recruited via a web panel, the sample mainly consisted of individuals who gambled at land-based venues, indicating that land-based gambling is still more popular among Polish gamblers. Additionally, the

results suggest that restricting access to land-based gambling may lead to a decrease in gambling engagement of non-problem gamblers without making them switch to online gambling. This is a very important result in the context of current efforts to introduce coherent policies of states in the field of reducing gambling-related harm. Currently, this issue is treated as a global challenge in the area of public health. The World Health Organisation calls for countries to include gambling in their national action plans in the area of public health, WHO also undertakes initiatives at the international level to develop global solutions. Among these solutions, the following is highlighted: limiting access to games as one of the protective factors [22]. This direction is particularly relevant to online gambling, as it is a rapidly spreading and particularly accessible form.

Limitations

The study's primary limitations include its cross-sectional design and the self-report, retrospective method used for measuring changes in participants' gambling behaviour. These aspects limit the possibility of making causal inferences from the results, particularly regarding the direction of the relationship between problem gambling and changes in gambling participation during the pandemic. To resolve these issues, we plan to conduct a longitudinal study. In addition, the sample's non-representative character does not allow us to generalise our findings to the entire population of Polish gamblers. Another limitation is that the sample size was insufficient to properly represent gamblers who increased their gambling or started to gamble online during the pandemic. This factor limited the possibility of performing high-powered statistical analyses. A significant limitation of the study is the fact that socio-demographic and psychological factors, whose role may be important, are not included in the analyses due to small sample.

Conclusions

The present study revealed trends of change in Polish gamblers' gambling engagement levels in the first two phases of the COVID-19 pandemic, during which temporary restrictions on access to land-based gambling establishments were introduced. Contrary to hypotheses based on data regarding other compulsive behaviours (mainly substance use), our results showed that the dominant trend among the gamblers surveyed was a reduction in online and land-based gambling activity. Moreover, the migration of gamblers from land-based to online gambling services turned out to be a marginal phenomenon. In our sample, the level of engagement in gambling during the pandemic was associated with problematic gambling patterns, as evidenced by the direct indicator – participants' CPGI scores, and the indirect indicators – participants' escapist motivation for gambling, and the cognitive distortions regarding control over gambling and the opportunities it provided for making money.

The crisis caused by the pandemic was a risk factor for an increase in problem gambling behaviours. However, it had the most significant impact on individuals at risk of gambling dependence. Thus, an increase in problem gambling behaviours is

not widespread but mainly concerns at-risk groups, which may require intense supportive interventions in crises. The results suggest, therefore, that during the pandemic, special attention should be paid to activities in the field of selective and indicating prevention in the area of problem gaming. This would mean, for example, increasing the requirements for operators offering online gambling in terms of implementing a responsible gambling policy, including monitoring the activity of online gamblers, sending personalised information on the intensity of involvement in the game during one session, or posting information about the possibility of obtaining support. For patients of addiction treatment centres and specialists working with them, it should be important to maintain or intensify therapeutic contact, especially in times of crisis, as was the case during the pandemic.

There is, however, one more aspect of epidemiological research that should be noted. Research shows that while problem gamblers suffer the most damage, globally, most harms are attributable to at-risk and non-problem gamblers [51, 52]. This suggests the need to change the thinking of decision-makers to a more global one in the context of preventing harm resulting from gambling, including expanding activities in the area of universal prevention.

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Supplement S1. Items of the questionnaire used in the survey

I Block of questions assessing participant eligibility

I am going to ask you a few questions about your gambling habits. Gambling games are games that involve betting or wagering money. Depending on the outcome of the game, money can either be won or lost. The element of chance is always present in gambling, but it plays a greater or a lesser role.

1. Below is a list of gambling games. Please select all the games that you have played, at least once in your life, online or at a land-based venue

1	National lottery (<i>Totalizator Sportowy</i>) games
2	Other lotteries and games of chance
3	Scratch cards
4	Slot machines
5	Poker
6	Other cash card games
7	Other casino games (apart from poker and slot machines)
8	Horse racing betting
9	Sports betting (including 'fantasy sports')
10	Virtual sports or e-sports betting
11	Financial betting (FOREX, Binary options)
12	Other gambling games
13	I'm sure I have never gambled

2. When was the first time you gambled **at a land-based venue**?
 - a. I have never gambled at a land-based venue
 - b. Before coronavirus restrictions were instituted (before 15 March 2020)
 - c. During coronavirus restrictions (15 March 2020 to 10 May 2020)
 - d. After the tightest restrictions had been lifted (after 10 May 2020)

Please, recall the period before the coronavirus epidemic, i.e. before 10 March 2020. The following questions apply to **the 6 months before the outbreak of the epidemic, i.e. early September 2019 to 10 March 2020**.

3. Below is a list of gambling games that people play **at land-based venues** (lottery retailers, betting shops, casinos, horse racing tracks, etc.). Please, indicate how often **in the 6 months prior to the outbreak of the coronavirus epidemic** you played the following money betting games at a land-based venue.

		Daily	Most days of the week	1–3 times a week	1–3 times a month	Less than once a month	Never
1	Land-based national lottery (<i>Totalizator Sportowy</i>) games	5	4	3	2	1	0
2	Other land-based lotteries and games of chance	5	4	3	2	1	0
3	Offline scratch cards	5	4	3	2	1	0
4	Land-based slot machines	5	4	3	2	1	0
5	Land-based poker	5	4	3	2	1	0
6	Other land-based cash card games	5	4	3	2	1	0
7	Other land-based casino games (apart from poker and slot machines)	5	4	3	2	1	0
8	Land-based horse racing betting	5	4	3	2	1	0
9	Land-based sports betting	5	4	3	2	1	0
10	Land-based e-sports betting	5	4	3	2	1	0
11	Land-based financial betting (FOREX, Binary options)	5	4	3	2	1	0
12	Other land-based gambling games	5	4	3	2	1	0

II Block of questions concerning the pre-pandemic period

Please, recall the period before the coronavirus epidemic, i.e. before 10 March 2020. The following questions apply to **the 6 months before the outbreak of the epidemic, i.e. from the beginning of September 2019.**

1. When was the first time you gambled **online**?
 - a. I have never gambled online
 - b. Before coronavirus restrictions were instituted (before 15 March 2020)
 - c. During coronavirus restrictions (15 March 2020 to 10 May 2020)
 - d. After the tightest restrictions had been lifted (after 10 May 2020)

III Block of questions concerning phase I of the pandemic

Please recall **the period of the tightest restrictions between 15 March 2020 and 10 May 2020**. It was the period of the so-called lockdown (the #stayathome action), a restriction policy to stay at home except in justified cases, which people were obliged to demonstrate compliance with in the event of an inspection.

1. What was your level of participation in **land-based** gambling activities during the period of the most severe restrictions (15 March 2020 to 10 May 2020) compared to the period before 15 March 2020?
 - a. Definitely higher
 - b. Higher
 - c. Same
 - d. Lower
 - e. Definitely lower
2. What did the **increase** in your level of **land-based** gambling during this period concern?
 - a. Gambling frequency
 - b. Duration of one gambling session
 - c. Amount of money spent on one gambling session
3. What do you think was your motivation for gambling more at land-based venues during the period of the tightest restrictions?
 - a. More free time
 - b. Limited access to alternative activities
 - c. Need to relieve stress
 - d. Need for more money
 - e. Other (what exactly?)
4. What did the **decrease** in your level of **land-based** gambling during this period concern?
 - a. Gambling frequency
 - b. Duration of one gambling session
 - c. Amount of money spent on one gambling session
5. What do you think was your motivation for gambling less at land-based venues during the period of the tightest restrictions?
 - a. Less free time
 - b. Limited access to gambling
 - c. Financial restrictions
 - d. Other (what exactly?)
6. What was your level of participation in **online** gambling activities during the period of the **most severe restrictions** (15 March 2020 to 10 May 2020) compared to the period before 15 March 2020?
 - a. Definitely higher
 - b. Higher
 - c. Same

- d. Lower
 - e. Definitely lower
7. What did the **increase** in your level of **online** gambling during this period concern?
 - a. Gambling frequency
 - b. Duration of one gambling session
 - c. Amount of money spent on one gambling session
 8. What do you think was your motivation for gambling more online during the period of the tightest restrictions?
 - a. More free time
 - b. Limited access to alternative activities
 - c. Need to relieve stress
 - d. Need for more money
 - e. Other (what exactly?)
 9. What did the **decrease** in your level of **online** gambling during this period concern?
 - a. Gambling frequency
 - b. Duration of one gambling session
 - c. Amount of money spent on one gambling session
 10. What do you think was your motivation for gambling less online during the period of the tightest restrictions?
 - a. Less free time
 - b. Limited access to gambling
 - c. Financial restrictions
 - d. Other (what exactly?)

IV Block of questions concerning phase II of the pandemic

Please recall **the period after the tightest restrictions had been lifted (from 10 May 2020 until now)**. It has been a period in which the lockdown (the obligation to stay at home) has been gradually eased, and retail and service outlets, including casinos and bookmaker shops, have been reopened.

1. What has your level of participation in **land-based** gambling activities been in the period after the tightest restrictions were lifted (since 10 May 2020), compared to the period of the most severe restrictions (15 March 2020 to 10 May 2020)?
 - a. Definitely higher
 - b. Higher
 - c. Same
 - d. Lower
 - e. Definitely lower
2. What has the **increase** in your level of **land-based** gambling during this period concerned?
 - a. Gambling frequency
 - b. Duration of one gambling session
 - c. Amount of money spent on one gambling session

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3. What do you think has made you gamble more at land-based venues during the period after the tightest restrictions were lifted?
 - a. More free time
 - b. Limited access to alternative activities
 - c. Reopening of land-based venues
 - d. Need to relieve stress
 - e. Need for more money
 - f. Other (what exactly?)
 4. What has the **decrease** in your level of **land-based** gambling during this period concerned?
 - a. Gambling frequency
 - b. Duration of one gambling session
 - c. Amount of money spent on one gambling session
 5. What do you think has made you gamble less at land-based venues in the period after the tightest restrictions were lifted?
 - a. Less free time
 - b. Limited access to land-based gambling
 - c. Being used to gambling online
 - d. Financial restrictions
 - e. Other (what exactly?)
 6. What has your level of participation in **online** gambling activities been in the period after the **tightest restrictions** were lifted (after 10 May 2020) compared to the period of the tightest restrictions (15 March 2020 to 10 May 2020)?
 - a. Definitely higher
 - b. Higher
 - c. Same
 - d. Lower
 - e. Definitely lower
 7. What has the **increase** in your level of **online** gambling during this period concerned?
 - a. Gambling frequency
 - b. Duration of one gambling session
 - c. Amount of money spent on one gambling session
 8. What do you think has made you gamble more online in the period after the tightest restrictions were lifted:
 - a. More free time
 - b. Limited access to alternative activities
 - c. Need to relieve stress
 - d. Need for more money
 - e. Being used to gambling online
 - f. Other (what exactly?)

9. What has the **decrease** in your level of **online** gambling during this period concerned?
 - a. Gambling frequency
 - b. Duration of one gambling session
 - c. Amount of money spent on one gambling session
10. What do you think has made you gamble less online in the period after the tightest restrictions were lifted:
 - a. Less free time
 - b. Limited access to gambling
 - c. Financial restrictions
 - d. Return to land-based gambling
 - e. Other (what exactly?)

Supplement S2. Tables

Table S1. Relationship between changes in offline gambling involvement after the introduction of restrictions and changes in offline gambling involvement after lifting the restrictions (N = 585)

Change in the intensity of offline gambling in the period of the strongest restrictions compared to the period before the pandemic	Change in the intensity of offline gambling in the period of lifting restrictions in relation to the period of the strongest restrictions									Total	
	Decrease			Constant			Increase				
	n	%	e	n	%	e	n	%	e	n	%
Decrease	109 _a	88.6%	6.95	200 _b	51.0%	-7.45	51 _c	72.9%	2.07	360	61.5%
Constant	8 _a	6.5%	-7.07	181 _b	46.2%	9.53	5 _a	7.1%	-4.93	194	33.2%
Increase	6 _a	4.9%	-0.23	11 _a	2.8%	-3.84	14 _b	20.0%	5.85	31	5.3%
Total	123	100.0%		392	100.0%		70	100.0%		585	100.0%

Annotation. The same letters in the subscript indicate the categories of changes in the intensity of offline gambling during the period of the strongest restrictions in relation to the period before the pandemic, the percentages in the columns do not differ significantly from each other at the level of 0.05. The corrected standardised residues are denoted by e.

Table S2. Description of the increase in the intensity of offline and online gambling by the respondents during the lockdown and during the lifting of restrictions: the area of change and reasons for the change

	Lockdown				Lifting			
	Offline (n = 26)		Online (n = 27)		Offline (n = 64)		Online (n = 98)	
	n	%	n	%	n	%	n	%
Areas of increased gambling intensity								
gambling frequency	18	69.2%	19	70.4%	52	81.3%	13	61.9%
duration of one gambling session	4	15.4%	8	29.6%	7	10.9%	5	23.8%
amount of money spent on one game session	7	26.9%	10	37.0%	15	23.4%	7	33.3%
The reasons for the increase in gambling								
more free time	11	42.3%	17	63.0%	14	21.9%	4	19.0%
limited access to alternative activities	4	15.4%	12	44.4%	7	10.9%	9	42.9%
the need to relieve stress	8	30.8%	8	29.6%	14	21.9%	7	33.3%

table continued on the next page

need more cash	7	26.9%	9	33.3%	11	17.2%	6	28.6%
re-opening of gambling outlets	-	-	-	-	41	64.1%	-	-
getting used to online gambling	-	-	-	-	-	-	6	28.6%
other	1	3.8%	0	0.0%	2	3.1%	0	0.0%

Table S3. Description of the decrease in the intensity of offline and online gambling by the respondents during the lockdown and during the lifting of restrictions: the area of change and reasons for the change

	Lockdown				Lifting			
	Offline (n = 164)		Online (n = 49)		Offline (n = 21)		Online (n = 39)	
	n	%	n	%	n	%	n	%
Areas of decreased gambling intensity								
gambling frequency	110	67.1%	27	55.1%	57	58.2%	22	56.4%
duration of one gambling session	23	14.0%	7	14.3%	17	17.3%	6	15.4%
amount of money spent on one game session	66	40.2%	25	51.0%	52	53.1%	20	51.3%
The reasons for the decrease in gambling								
less free time	22	13.4%	9	18.4%	30	30.6%	13	33.3%
limited access to gambling	77	47.0%	12	24.5%	-	-	4	10.3%
financial restrictions	87	53.0%	30	61.2%	55	56.1%	22	56.4%
re-access to alternative activities	-	-	-	-	18	18.4%	-	-
getting used to online gambling	-	-	-	-	7	7.1%	-	-
return to gambling in stationary points	-	-	-	-	-	-	9	23.1%
other	9	5.5%	2	4.1%	10	10.2%	3	7.7%

Table S4. Relationship between changes in offline gambling involvement and changes in online gambling involvement after the introduction of restrictions (N = 585)

Change in the intensity of online gambling during the period of the strongest restrictions in relation to the period before the pandemic	Change in the intensity of offline gambling during the period of the strongest restrictions compared to the period before the pandemic									Total	
	Decrease			Constant			Increase				
	n	%	e	n	%	e	n	%	e	n	%
Decrease	72 _a	61.0%	6.06	15 _b	18.8%	-5.39	5 _b	26.3%	-1.48	92	42.4%
Constant	22 _a	18.6%	-7.04	61 _b	76.3%	8.31	4 _a	21.1%	-1.77	87	40.1%
Increase	24 _a	20.3%	1.20	4 _b	5.0%	-3.71	10 _c	52.6%	4.22	38	17.5%
Total	118	100.0%		80	100.0%		19	100.0%		217	100.0%

Annotation. The same letters in the subscript indicate the categories of changes in the intensity of offline gambling during the period of the strongest restrictions in relation to the period before the pandemic, the percentages in the columns do not differ significantly from each other at the level of 0.05. The corrected standardised residues are denoted by e. $\chi^2(3) = 13.77; p = 0.003$

Table S5. Relationship between changes in online gambling involvement after the introduction of restrictions and changes in online gambling involvement after lifting the restrictions (N = 217)

Change in the intensity of online gambling during the period of the strongest restrictions in relation to the period before the pandemic	Change in the intensity of online gambling in the period of lifting restrictions in relation to the period before the pandemic									Total	
	Decrease			Constant			Increase				
	n	%	e	n	%	e	n	%	e	n	%
Decrease	37 _a	69.8%	4.65	47 _b	34.1%	-3.29	8 _b	30.8%	-1.28	92	42.4%
Constant	8 _a	15.1%	-4.27	75 _b	54.3%	5.66	4 _a	15.4%	-2.74	87	40.1%
Increase	8 _a	15.1%	-0.53	16 _a	11.6%	-3.03	14 _b	53.8%	5.20	38	17.5%
Total	53	100.0%		138	100.0%		26	100.0%		217	100.0%

Annotation. The same letters in the subscript indicate the categories of changes in the intensity of offline gambling during the period of the strongest restrictions in relation to the period before the pandemic, the percentages in the columns do not differ significantly from each other at the level of 0.05. The corrected standardised residues are denoted by e. $\chi^2(3) = 34.86; p < 0.001$