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# An analysis of problem gambling among the Finnish working-age population: a population survey

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## Abstract

**Background:** Gambling problems currently affect approximately 100 000 Finns. In order to prevent and reduce gambling-related harms it is crucial for the Finnish public health authorities to gain a stronger understanding of the association between gambling problems and related socio-demographic factors, other commonly co-occurring dependencies (e.g. alcohol and nicotine) and the type of games gambled. In this article the prevalence of problem gambling in Finland and the socio-demographic profiles of problem gamblers are studied.

**Method:** An annual postal survey entitled Health Behaviour and Health among the Finnish Adult Population AVTK was sent to a random sample of Finnish adults (N=5000) aged between 15 and 64. The sample was derived from the Finnish Population Register. The survey was mailed to the participants in April 2010. Gender differences in socio-demographic variables and Problem Gambling Severity Index PGSI were assessed. A multinomial regression model was created in order to explore the association between socio-demographic factors and the severity of gambling.

**Results:** A total of 2826 individuals (1243 males and 1583 females) replied to the survey. Of the respondents, 1.1% (2.1% of males, 0.3% of females) were identified as problem gamblers. Those who were of younger age, gender, had less than twelve years of education, consumed alcohol at risk level and smoked had higher odds of having low or moderate levels of gambling problems. Whereas, unemployment and smoking predicted significantly for problem gambling. Females gambled Lotto and slot machines less frequently than males and had more low level gambling problems. Males gambled more with a higher frequency and had a more severe level of gambling problems. Females were more attracted to scratch card gambling and daily Keno lotteries compared to males. In comparison, males gambled more on internet poker sites than females. Overall, a high frequency of gambling in Lotto, daily lotteries, slot machines, horse race betting and internet gambling was significantly associated with a more severe level of problem gambling.

**Conclusion:** Gambling problems affect tens of thousands of individuals annually, therefore certain vulnerabilities should be noted. Comorbid dependencies, smoking in particular, ought to be screened for and recognised in the public health sector. Regulating the availability of slot machine gambling and enforcement of the age limit should be acknowledged. In establishing new gambling venues, prevalence rates in those particular areas should be actively monitored.

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## Background

Many people gamble as a leisure activity, though for some it turns out not to be a leisure with pleasure. Gambling problems cause severe negative consequences. A DSM-IV (Diagnostic and Statistical Manual of Mental Disorders) diagnosis for pathological gambling (PG) requires 'persistent and maladaptive gambling behaviour', as indicated by at least five of ten symptoms that are similar in content to the symptoms of substance abuse [1]. Problem gambling is a milder form of gambling and is indicated by at least three of the ten DSM-IV-TR diagnostic criteria [2]. Recent analysis by Williams, Volberg and Stevens [3] concluded that the standardized past-year problem gambling [1] prevalence ranged from 0.5% to 7.6% with the average rate across all countries being 2.3%. According to their comprehensive report the lowest prevalence rates for problem gambling are in Europe, intermediate rates in North America and Australia and the highest in Asia. The current problem gambling<sup>1</sup> rate in Finland is 2.7% [4].

To date there have only been three Finnish Gambling Prevalence Surveys [4-6]. The latest survey from 2011 revealed that 78% of the Finns had gambled over the past year, the most popular gambling activity being National Lottery (i.e. Lotto) with more than half of the Finnish population having gambled Lotto (74%). The next most popular game was scratch cards (37%) followed by slot machine gambling. Internet games (national and international) attracted 1% of the Finns.

A vast body of research has found that certain socio-demographic characteristics are associated with the development of gambling problems. Explicitly, younger age, male gender and socio-economic status (e.g. lower level of education, unemployment, marital status) are associated with gambling problems [7-11].

Gambling problems often co-occur with substance abuse and nicotine dependence. Lorains et al. [12] meta-analysis of comorbid disorders in pathological and problem gambling revealed that the weighted mean effect size for substance use disorders was 57%, for alcohol use disorder 17.2% and 60.1% for nicotine dependence.

The availability and acceptability of legalized gambling has increased expansively over the past decades as noted by Lyk-Jensen [13]. This development has the potential to increase the prevalence of gambling problems. In addition to the availability of games, the types of games gambled also influence the development of gambling problems [14]. Globally, the utmost problems are associated with EMG's, known as slot machines [14,15]. The same trend is seen in Finland: Finnish Gambling Clinic's and Finnish Gambling Help Line – Peluuri's annual reports [16] show that slot machine gambling is the most troubling type of game for help-seeking problem gamblers. In Finland there are unique opportunities to gamble, as

slot machines, about 20 000 units, are freely dispersed in kiosks, restaurants, grocery stores, fuel stations and shopping centres. Availability, accessibility and acceptability of gambling is most likely to have a great impact on the overall gambling prevalence of the Finns.

Our aims were to investigate the prevalence of problem gambling in the adult sample in Finland, and to describe socio-demographic characteristics, alcohol consumption and nicotine dependency on different severity levels of gambling, and to also investigate types and frequency of games gambled among the adult population.

## Methods

### Recruitment

During April to June 2010, a total of 2826 individuals (1243 males and 1583 females) replied to the survey. An annual postal survey, entitled Health Behaviour and Health among the Finnish Adult Population (AVTK), was sent to a random sample of Finnish adults (N=5000) aged between 15 and 64. The sample was derived from the Finnish Population Register. The survey was mailed to the participants in April 2010. A total of three reminders were sent until June if the participants did not return the survey. Participants sent their replies by pre-paid mail. The primary purpose of the AVTK survey was to obtain information about current health-related behaviours of working-age Finns, and about long- and short-term changes in health-related behaviours among this population. The survey examined key aspects of health-related behaviours including: smoking, dietary habits, alcohol consumption and physical activity. Two sections of gambling-related questions were included in the survey. (Finnish report: <http://urn.fi/URN:NBN:fi-fe201205085393>).

Note: In 2008, for the first time in the history of the AVTK survey, gambling related-questions were included. Results of the year 2008 were published in Finnish [17]. The 2010 AVTK Health Survey results [18]. Analysis with gambling-related questions in 2010 presented here. The gambling-related questions of the 2011 [19] (in appropriate brackets) have not yet been analysed.

The study received ethics clearance from the Ethics Committee of the National Institute for Health and Welfare, Helsinki. Document number: THL/220/6.02.00/2010:\$151/2010.

### Measures

For this study, we analysed the following sections of the AVTK survey: 1) Socio-demographic data, and 2) Finnish translation of the Problem Gambling Severity Index (PGSI), [20] where the sum of 9 items was computed, maximum points being 27, using a 4-point Likert scale with 0 = never, to 3 = almost always. Cronbach's alpha was 0.79. The scoring of the PGSI is as follows: a) 0 = non-problem gambling, b) 1 or 2 = low level of gambling with few or no

identified negative consequences (here considered to be low level gambling), c) 3 to 7 = moderate level of gambling leading to some negative consequences (here considered to be moderate level gambling) and d) 8 or more = problem gambling with negative consequences and a possible loss of control (here considered to be problem gambling). 3) The type of gambling was assessed by presenting 10 main types of gambling and frequency of gambling. The participants were asked to choose on what type of gambling they gambled. Gambling types were: a) Lotto and Viking lotto, b) daily Keno lotteries, c) slot machines, d) scratch cards, e) sports betting, f) horse race betting and g) internet poker via both PAF (Åland Slot Machine Association) and other international internet gambling sites. Frequency of gambling was measured using a 5-point Likert scale: not at all, less than once a week, 1–2 days per week, 3–5 days per week, 6–7 days per week. For gender and general comparisons responses were classified into two classes with regards to the frequency of gambling: less than once a week, and at least once a week. 4) Two questions of alcohol use: a) overall alcohol consumption: 'During the past 12 months, have you consumed any alcohol?' Yes/No answers, b) risk-level of alcohol consumption: 'How often do you drink six or more units of alcohol?' (One unit: 1/3 litre beer or cider, 12 cl wine, 8 cl strong wine, 4 cl strong alcohol), with a 6-point Likert scale where 1 = daily, 2 = 2–3 times per week, 3 = once a week, 4 = 2–3 times per month, 5 = couple of times per year or less, 6 = never. Risk-level alcohol consumption is defined as at least 6 units once a week. (Only question b) was used in the analyses, being a more accurate variable). 5) Nicotine dependency by asking smoking frequency: 'Do you smoke at the moment (cigarettes, pipe or cigars)?' with a 3-point Likert scale where 1 = yes, daily, 2 = once in a while, 3 = not at all.

### Participants

There were more females (56%) than males in this sample. The mean age of the respondents was 42.9 years (SD = 14.4). 36.6% of respondents were 51–65 years old, 24.2% were 26–40 years old, 22.5% were 41–50 years old and 16.4% were 16–25 years old. With regard to marital status, 65.3% of the respondents were married, 24.5% single, 8.5% divorced or separated and 1.3% widowed. The employment status of respondents was as follows: 62.1% employed, 2.4% partially employed or retired, 0.5% laid off, 5.7% unemployed, 13.7% students, 3.3% homemakers (stay-at-home mother or father), 0.7% on sick leave, 10.5% pensioned and 0.9% unemployed for any other reason. The response rate was 57%.

### Statistics

Gender differences in socio-demographic factors, frequency of gambling and PGSI were assessed using t-tests for continuous data and Chi square tests for categorical

data. A multinomial regression model was created to explore the association between socio-demographic variables and the level of gambling severity (PGSI). Different severity levels of gambling were compared to the non-problem gambling group which served as the reference category. The statistical program SPSS (version 18) was used for the analyses.

## Results

### Socio-demographic characteristics and gender differences of the participants

#### Age and gender

The age difference between females (M = 42.3, SD = 14.4) and males (M = 43.6, SD = 14.32) was small but statistically significant ( $t(2824) = 2.40, p = 0.017$ ). However, because of the large sample size, these kind of small and trivial differences often appear to be significant.

#### Marital status

As many as 60% of the respondents reporting the most severe forms of gambling problems were separated or divorced ( $\chi^2(9, 2727) = 24.1, p = 0.004$ ). The severity of gambling problems was also compared with marital status, with 67.3% of those respondents with no gambling problems being married or cohabiting. Single status respondents had the highest percentage in both the low (17.5%) and moderate levels (6.9%) of gambling problems.

#### Education and employment

Females were significantly more educated than males in this sample ( $\chi^2(1, 2727) = 52.94, p < 0.001$ ) (Table 1). With regards to unemployment there were no significant differences between men and women ( $\chi^2(1, 2821) = 0.87, p = 0.35$ ) (Table 1).

### Comorbid alcohol consumption and nicotine dependency (smoking)

Risk-level alcohol consumption was greater among males compared to females ( $\chi^2(1, 2760) = 138.15, p < 0.001$ ). Gender differences in smoking were also significant, indicating that males smoked more than females ( $\chi^2(1, 2789) = 24.20, p < 0.001$ ) (Table 1).

### Prevalence and gender differences in severity of gambling

Of all respondents, a total of 1.1% were problem gamblers (8 or more points on the PGSI scale), with 5.5% of the respondents experiencing moderate levels of gambling problems. According to our results, males suffered from more severe forms of problem gambling than females. Specifically, gender differences in all three PGSI categories were significant as follows: for low level (males = 88.9%, females = 97%), for moderate level (males = 9.0%, females = 2.6%) and for problem gambling level (males =

**Table 1 Gender differences in education, employment, alcohol consumption and smoking**

Measure	Gender				Chi-square test
	F		M		
	N	(%)	N	(%)	
<b>Education (yrs)</b>					$\chi^2 (1, 2784) = 52.94, p < 0.001$
< 12 yrs	595	(38.2)	639	(52.0)	
> 12 yrs	961	(61.8)	589	(48.0)	
<b>Employment</b>					$\chi^2 (1, 2821) = 0.87, p = 0.35$
Employed	1495	(94.6)	1164	(93.8)	
Unemployed	85	(5.4)	77	(6.2)	
<b>Alcohol consumption<sup>a</sup></b>					$\chi^2 (1, 2760) = 138.15, p < 0.001$
Non-risk level	1426	(92.0)	918	(75.9)	
Risk level	124	(8.0)	292	(24.1)	
<b>Nicotine dependency (smoking)</b>					$\chi^2 (1, 2789) = 24.20, p < 0.001$
Daily	248	(15.9)	288	(23.3)	
Occasionally / not at all	1307	(84.1)	946	(76.7)	

<sup>a</sup> Risk-level alcohol consumption is defined as consuming at least 6 units of alcohol at least once a week.

2.1%, females = 0.3%) ( $\chi^2 (2, 2738) = 73.47, p < 0.001$ ) (Table 2).

#### **Type of games and the frequencies gambled**

The most common form of gambling was lotto, reported to have been played by 56.4% of the respondents. Other popular game types were scratch cards (25.9%) and slot machine gambling (23.8%). Scratch card gambling was the only game type which was more popular among females (27.3%) than males (24.0%). In comparison, males favoured game types such as sports betting (14.1% males, 1.5% females), horse race betting (5.7% males, 1.7% females) and internet poker sites (5.4% males, 0.5% females).

Most of the game types were more frequently gambled by men compared to women. When examining only people who reported at least some degree of gambling activity, differences in the frequency of gambling exist in the following game types: lotto ( $\chi^2 (1576, 1) = 21.5, p < 0.001$ ), slot machines ( $\chi^2 (649, 1) = 11.3, p = 0.001$ ), sports betting ( $\chi^2 (190, 1) = 7.5, p = 0.006$ ) and horse race betting ( $\chi^2 (94, 1) = 5.0, p = 0.03$ ).

#### **Frequency of gambling and the severity level of gambling**

Table 3 shows types of gambling and the frequency of each game type gambled, less than once a week and at

least once a week, within different levels of PGSI. Only subjects who reported at least some amount of gambling are included in the results. Type of games gambled are presented from highest to lowest frequencies.

#### **Lotto and daily lotteries**

Lotto was the most frequently gambled game in this sample with 53.5% of the respondents having gambled lotto less than once a week, and 46.5% gambled at least once a week. Daily lotteries were gambled by 53.7% of respondents less than once a week, and 46.3% gambled at least once a week. The frequency of lotto and daily lotteries betting was associated with gambling severity ( $\chi^2 (2, 1565) = 24.4, p < 0.001$  and ( $\chi^2 (2, 391) = 19.57, p < 0.001$ ). That is, subjects with more severe gambling problems gambled these games more frequently compared to those with only low level problems or no gambling problems.

#### **Slot machine gambling**

Slot machine gambling attracted 26.9% of the respondents to gamble at least once a week and 73.1% gambled it less than once a week. Frequent slot machine gambling was associated with more severe gambling problems ( $\chi^2 (2, 647) = 52.57, p < 0.001$ ).

**Table 2 Gender differences in severity level of gambling**

Gender	PGSI level					Chi-square test
	No problem	Low	Moderate	Problem gambling	Total	
	N (%)	N (%)	N (%)	N (%)	N (%)	
Male	836 (68.6)	248 (20.3)	110 (9.0)	25 (2.1)	1219 (44.5)	$\chi^2 (3, 2738) = 154.24, p < 0.001$
Female	1329 (87.5)	145 (9.5)	40 (2.6)	5 (0.3)	1519 (55.5)	
Total	2165 (79.1)	393 (14.4)	150 (5.5)	30 (1.1)	2738 (100)	

**Table 3 Type of games, frequency of gambling and the severity level of gambling**

Type of game	Frequency	PGSI level <sup>a</sup>			Total N (%)
		Low or no problem N (%)	Moderate N (%)	Problem gambling N (%)	
1. Lotto***	< once a week	795 (55.3)	36 (34.3)	6 (26.1)	837 (53.5)
	≥ once a week	642 (44.7)	69 (65.7)	17 (73.9)	728 (46.5)
	Total	1437 (100)	105 (100)	23 (100)	1565 (100)
2. Daily lotteries***	< once a week	188 (58.9)	18 (32.1)	4 (25.0)	210 (53.7)
	≥ once a week	131 (41.1)	38 (67.9)	12 (75.0)	181 (46.3)
	Total	319 (100)	56 (100)	16 (100)	391 (100)
3. Slot machine***	< once a week	412 (79.4)	50 (47.6)	11 (47.8)	473 (73.1)
	≥ once a week	107 (20.6)	55 (52.4)	12 (52.2)	174 (26.9)
	Total	519 (100)	105 (100)	23 (100)	647 (100)
4. Scratch cards#	< once a week	581 (92.7)	58 (87.9)	10 (83.3)	649 (92.1)
	≥ once a week	46 (7.3)	8 (12.1)	2 (16.7)	56 (7.9)
	Total	627 (100)	66 (100)	12 (100)	705 (100)
5. Sports Betting#	< once a week	103 (74.1)	24 (72.2)	9 (50)	136 (71.6)
	≥ once a week	36 (25.9)	9 (27.3)	9 (50)	54 (28.4)
	Total	139 (100)	33 (100)	18 (100)	190 (100)
6. Horse race Betting*	< once a week	49 (75.4)	10 (52.6)	4 (40.0)	63 (67.0)
	≥ once a week	16 (24.6)	9 (47.4)	6 (60.0)	31 (33.0)
	Total	65 (100)	19 (100)	10 (100)	94 (100)
7. Internet gambling**	< once a week	35 (81.4)	10 (47.6)	3 (37.5)	48 (66.7)
	≥ once a week	8 (16.8)	11 (52.4)	5 (62.5)	24 (33.3)
	Total	43 (100)	21 (100)	8 (100)	72 (100)

Note: Not Significant: #; Significant: \* $<0.05$ , \*\* $<0.01$ , \*\*\* $<0.001$ .

<sup>a</sup> No problem gambling included in low level of gambling problems.

Only subjects who reported at least some amount of gambling were included in the table.

#### Scratch cards

Scratch cards attracted 7.9% of respondents at least once a week and 92.1% gambled it less than once a week. The frequency of scratch card gambling was not associated with gambling severity ( $\chi^2(2, 705) = 3.14, p = 0.24$ ).

#### Sports betting

Of the respondents, 28% bet on sports at least once a week. The frequency of sports betting was not associated with gambling severity groups ( $\chi^2(2, 190) = 4.58, p = 0.10$ ).

#### Horse race betting

Horse race betting was gambled by 33.0% of respondents with at least once a week frequency. Frequent horse race betting was associated with more severe gambling problems ( $\chi^2(2, 94) = 7.14, p = 0.03$ ).

#### Internet gambling

Internet gambling was gambled by 33.3% of respondents with at least once a week frequency. Frequent internet betting was associated with more severe gambling problems ( $\chi^2(2, 72) = 10.7, p = 0.005$ ).

#### Association between socio-demographic characteristics and levels of gambling severity

The multinomial regression model (Table 4) shows the association between socio-demographic variables and levels of gambling severity. Covariates in the model were age, gender, years of education, unemployment, risk-level alcohol consumption and daily smoking. Younger age was significantly associated with all levels of problematic gambling. Male gender was similarly recognized to be strongly associated with all problem gambling levels. Education (less than twelve years) was also found to be significantly associated with both a low level of problem gambling and even more strongly with a moderate level of problem gambling. Unemployment was most strongly associated with problem gambling. Risk-level alcohol consumption (at least 6 units at least once a week) was significantly associated with low and moderate gambling problems. Smoking had a strong and significant association with all levels of gambling problems (daily smoking was compared with occasional- and non-smoking).

In summary, the significant associations for problem gambling were younger age, male gender, unemployment



**Table 4 Multinomial regression analysis of variables associated with problem gambling severity**

Measures	Low level of problems		Moderate level of problems		Problem gambling	
	OR	95% CI	OR	95% CI	OR	95% CI
Age <sup>a</sup>	0.98***	(0.97-0.99)	0.98**	(0.97-0.99)	0.97*	(0.94-0.99)
Male gender	2.46***	(1.94-3.12)	3.91***	(2.62-5.83)	7.51***	(2.78-20.29)
Education (<12yrs)	1.28*	(1.02-1.61)	1.95***	(1.36-2.81)	1.23	(0.56-2.69)
Unemployed	1.15	(0.72-1.83)	1.25	(0.64-2.44)	4.78**	(1.89-12.07)
Risk-level alcohol consumption <sup>b</sup>	1.62**	(1.21-2.16)	1.96**	(1.3-2.95)	0.74	(0.28-1.95)
Smoking (daily)	1.78***	(1.35-2.33)	1.80**	(1.21-2.68)	6.08***	(2.71-13.61)

Note. \* p < .01 \*\* p < .001 \*\*\* p < .000.

Problem Gambling severity ( Reference group: non-problem gambling).

<sup>a</sup>Analysed as a continuous variable.

<sup>b</sup> Risk-level alcohol consumption is defined as consuming at least 6 units at least once a week.

and daily smoking. Alcohol consumption, especially risk-level consumption, and lower years of education were significantly associated with both low and moderate gambling problems. According to the likelihood ratio test, the fit of the multinomial regression model was good ( $\chi^2$  (18, 2826) = 275.9, p < 0.001). Correct classification rate was 79.2%.

## Discussion

### Socio-demographic characteristics

The analysis of socio-demographic characteristics shows that males were more vulnerable than females to develop gambling-related problems. This finding is in line with earlier studies both nationally [5-7,21] and internationally [22-24]. Additionally, young age was strongly associated with all levels of gambling. However, this association needs to be interpreted with caution, since even though the odds ratio was significant in the model, the strength of association was quite low. Divorced or separated individuals were also found to have more severe gambling problems compared to those married. Low level of education was associated with low and moderate levels of gambling problems and unemployment was associated with more severe gambling problems. These results resemble previous findings concerning socio-demographic characteristics of problem and pathological gamblers [7-11]. A vast body of evidence suggests that overall low socio-economic status is a risk factor for gambling, as also stated by Jimenez-Mucia et al. [25].

### Prevalence

The results from this study show that the prevalence of problem gambling is in line with the findings of Williams, Volberg and Stevens [3]. The prevalence rate in Finland falls in the average rates category among other European countries such as Sweden, Switzerland, Estonia and Italy. The findings of this study are also in line with previous studies from Finland indicating that the trend of problem gambling has been more or less unchanged during the past few years. There appears to be a declining trend based on

Finnish Gambling Population Surveys [4-6] but it is not statistically significant according to the recent analysis by Raisamo and Salonen [26]. A unique finding of this study was that the moderate level of gambling was 5.5% in this sample. This is important to acknowledge, since moderate level gamblers may be at risk of developing gambling problems and so suffer from an increasing amount of negative consequences caused by gambling. Thus moderate levels of gambling need to be monitored closely in the future.

### Types of gambling

According to our results, Lotto was the most popular type of gambling, which has also been the case with previous population surveys in Finland [4]. Males bet on Lotto more frequently than females. On the other hand, females were more attracted to less risky gambling types such as lotto and scratch card gambling as compared to males also found by Hraba and Lee [27]. Frequent gambling in Lotto, daily lotteries, horse race betting and slot machine gambling were found to be associated with a more severe level of gambling.

In this study, slot machine gambling attracted the respondents gambling on a weekly basis. Slot machine gambling is classified as being addictive by nature [28] and has been reported to be the most trouble causing type of gambling among Finnish treatment-seeking gamblers [16]. The same trend was reported by Turja et al. [4] in a population sample where those who scored 5 or higher in SOGS reported their preferred game being slot machines. The rather high level of involvement in slot machine gambling, especially in Finland, could be explained by easy access and abundant availability. In Finland, slot machine gambling is easily and conveniently available in restaurants, grocery stores, shopping centres, kiosks and fuel stations around the country. A recent study in Finland by Warpenius et al. [29] investigated the enforcement of legal age limits on purchases of alcohol, tobacco and gambling slot machines. Their study showed that the enforcement of legal age limits for gambling slot machines was the weakest (4%)

compared to purchases of alcohol (49%) and cigarette (43%). One of the reasons for the insufficient enforcement of the law is, at least in kiosks, shopping centres and fuel stations, that the locations of slot machines are often out of reach of the shop keepers' desks, gambling time can be rather short and the gambler does not need to confront the shop keeper directly.

Availability, proximity and convenience of gambling venues have been found as being clear risk factors for gambling problems [30-32]. As a whole, males seem to choose riskier and faster game types, such as games like internet poker, which could partially explain why males tend to have more severe levels of gambling problems. Our results show that frequent involvement in internet gambling is associated with more severe levels of gambling problems. Our results also show that female moderate level of gambling was 2.6%, which is nearly three times lower compared to males. Females have been found to gamble often because of boredom, loneliness and isolation and thus maximize their gambling time with slower games [33,34]. Nevertheless, females have a growing risk in developing gambling problems, because progression in gambling problems is reported to be more rapid with females [35] and is known as telescoping phenomenon [36].

#### **Comorbid alcohol and nicotine dependency**

In this sample, males consumed remarkably more alcohol than females. Risk-level alcohol consumption and male gender were strongly associated with low and moderate levels of gambling problems. Comorbidity with substance use, especially alcohol, has been frequently reported in earlier gambling studies. The rate of pathological gambling among substance abusers has been reported to be four to ten times greater when compared to the general population [37,38]. Similarly, the study by Hakkarainen et al. [21] from Finland stated that especially heavy episodic drinking increased the risk of problem gambling. Petry has reported that the odds ratio for any alcohol use disorder and alcohol dependence as well as drug use and smoking are significantly related to pathological gambling [39].

In fact, nicotine dependence "accounts for some elevated risks for psychopathology with subsyndromal and problem/pathological levels of gambling" and subsyndromal level of gambling are associated with more severe psychopathology, as stated by Grant, Desai and Potenza [40]. In our study, nicotine dependence was significantly associated with all levels of gambling severity. This is consistent with previous findings [37-39,41]. Nicotine dependence is the second most frequent addiction after alcohol use disorder. Moreover, Petry, Stinson and Grant [41] reported that nicotine dependent individuals had a seven times higher odds ratio to be pathological gamblers when compared to non-

smokers. Additionally, women with nicotine dependence were 14 times more likely to be pathological gamblers when compared to non-smoking women. In contrast, the likelihood for nicotine dependent males being pathological gamblers was five times higher when compared to non-smokers. Petry and Oncken [42] found that daily smokers were less able to control their gambling and had more severe gambling problems when compared to non-smokers. The association between gambling problems and nicotine dependence is evident, and one dependence may serve as a prime for another, as suggested by McGrath and Barrett [43].

#### **Associations of socio-demographic characteristics, alcohol consumption, smoking and gambling severity**

The results from this study revealed that younger age, male gender and daily smoking were associated with all levels of gambling problems. The notable likeness between low level and moderate level of gambling problems were less than twelve years of education and risk-level alcohol consumption. In contrast, unemployment was associated with problem gambling. These findings are soundly in line with previous findings and confirms that there appears to be certain groups of individuals that are more vulnerable to developing gambling problems.

#### **Limitations**

Despite the large sample size and good representation of the Finnish population, there are a number of limitations with the data, possibly the self-administered survey being the most important. A self-administered survey is not as candid and honest as a face-to-face interview, and future studies would benefit from face-to-face interviews or correction weights (1.00) as suggested by Williams et al. [3]. Two previous studies have found a post-questionnaire to produce higher rates of prevalence compared to telephone interviews [3]. Another aspect to mention is the response rate of 57%, which is low compared to face-to-face interviews or telephone interviews, but still adequate [3].

Another limitation is that this study reflects its results with previous prevalence studies from Finland. Previous prevalence studies from Finland [4-6] have used the South Oaks Gambling Screen (SOGS) as a measure of gambling. This study uses Problem Gambling Severity Index (PGSI) which is more conservative than SOGS, because it uses 8 as a cut-off point as compared to SOGS that uses 5. This study's gambling-related questions were part of a larger health survey. This means that this study's prevalence rate ought to be more realistic compared to specific gambling surveys, because specific gambling surveys may attract gamblers more than health surveys and produce higher prevalence rates [3].

This study used PGSI which has not been validated in a Finnish cultural context. So far, there are no validated gambling scales available in Finland.

## Conclusions

To conclude, there is clear evidence that males seem to be more at risk of developing severe gambling problems. However, females should not be ignored because of two underlying factors: a) nicotine-dependent females are more vulnerable to developing gambling problems, b) development of gambling problems in females is faster as compared to males due to the telescoping phenomenon. Moreover, low socio-economic status, like low level of education and unemployment, can be seen as a risk factor for severe gambling problems.

The problem gambling prevalence in Finland has been more or less unchanged during past years. However, based on our findings it is as important to pay attention to the groups of low level and moderate level gamblers as their socio-demographic characteristics, and comorbid alcohol use and nicotine dependence all greatly resemble those of problem gamblers. These underlying factors linked with growing opportunities to gamble, especially in Finland, are only worsening the situation for those specific groups of individuals that may be at risk of shifting from one severity level to another.

From a public health perspective, these recognized associations should be taken into account by public health policy makers. Cox et al. [44] found that a high concentration of slot machines and the presence of a permanent casino were associated with an increased prevalence of gambling. This notion is important in the Finnish context with a visibly abundant amount of slot machines available, and a new casino complex emerging in the eastern part of Finland in the near future. Limitation of access to slot machines in Finland should be considered. The enforcement of the legal age limit on gambling should be made easier by limiting slot machines to the dedicated gambling area, where the enforcement of law is easier. The prevalence rate of gambling, in the eastern part of Finland, where the new casino complex emerges, should be closely monitored in the future. Gambling is a potential health issue, and there is a growing need to intensify awareness in the medical and health professions about gambling problems and related conditions. Awareness that three dependencies may co-occur, and should be screened for consistently in common health checks, especially within a vulnerable population.

## Endnote

<sup>1</sup>Problem gambling includes also Pathological Gambling.

## Competing interests

The authors declare that they have no competing interests.

## Authors' contributions

SC, SB, MP, J-ER, SH, AU, HA, TL have contributed to the design of the study and interpretation of data. SC, SB, MP, SH, AU, HA, TL have been involved in drafting the manuscript or revising it critically for intellectual content. All authors read and approved the final manuscript.

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