

Gender differences in gambling preferences and problem gambling: a network-level analysis

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Abstract

Most gambling studies have a gender-blind research approach, although a large body of scientific evidence suggests that gambling in females is on the rise and that males and females have different gambling behaviors and experience specific gambling-related harm. The present study is the first to address these gender differences using a network analysis, an innovative approach considering disorders/concepts as dynamic systems of interacting symptoms/items. Data on gambling activities, problem gambling (using the Problem Gambling Severity Index), and health issues (substance use and mental health) were collected in a representative sample of French adult gamblers (n=8,805). We capitalized on the network analysis directly to compare associations of specific gambling activities with gambling disorder symptoms separately for both genders. The network analysis revealed that problem gambling was strongly associated with gambling machines among females, whereas it was related to sports betting, poker, and casino games among males. The networks including health issues showed that substance use is related to specific gambling activities. These findings confirm the links between various gender-specific gambling patterns and problem gambling and suggest a need to consider these gender differences to improve prevention efforts. More broadly, the present study further supports the importance of gender differences for gambling research and policy.

Keywords: gambling severity; gender; network approach; sex.

Gender differences in gambling preferences and problem gambling: a network-level analysis

Gambling has for long been considered a predominately male problem and as a consequence, many studies of gambling were conducted in male samples (Khanbhai, Smith, & Battersby, 2017). However, accumulating evidence suggests that problem gambling is prevalent among females (Merkouris et al., 2016) and that female gambling is on the rise (Abbott, Romild, & Volberg, 2018; Holdsworth, Hing, & Breen, 2012). Therefore, gender-specific preventive actions are required, and gender should be systematically included as an important variable instead of being considered a confounding factor in gambling studies. This shift is in line with the recent call to overcome a gender-blind research approach (Clark, Zuccala, & Horton, 2017). Male gamblers are known to have more gambling-related problems in comparison with their female counterparts: problem gambling is more prevalent, develops earlier, and lasts longer in males (Merkouris, et al., 2016). Risk factors are also different in males and females (Hing, Russell, Tolchard, & Nower, 2016). Numerous studies have also demonstrated important differences in gambling preferences between genders. Males tend to report a preference for games that include (perceived or actual) elements of skills, such as horse racing and sports betting or playing poker, whereas females tend to engage preferentially in chance-based games, especially gambling machines (Hing, et al., 2016; Holdsworth, et al., 2012; Husky, Michel, Richard, Guignard, & Beck, 2015; Merkouris, et al., 2016; Romild, Svensson, & Volberg, 2016; Stark, Zahlan, Albanese, & Tepperman, 2012). Noteworthy, these findings have been replicated in treatment-seeking gamblers (Kim, Hodgins, Bellringer, & Abbott, 2016; Rodda, Hing, & Lubman, 2014). These preferences are important, also because specific gambling activities have different associations with problem gambling. For example, chance-based games are associated with an increased prevalence of problem gambling (Stark, et al., 2012),

and using gambling machines and sports betting are associated with a more frequent drop-out from treatment programs (Ronzitti et al., 2018).

An innovative data-analytic approach that has recently been applied to epidemiology and psychiatry examines constructs at a network level (Borsboom, 2017). The network perspective considers disorders as dynamic systems of symptoms directly related to each other. Studying constructs at the network level allows a direct exploration of the patterns of co-occurrence between disorders (Baggio, Gainsbury, Berchtold, & Iglesias, 2016; Cramer, Waldorp, van der Maas, & Borsboom, 2010). To our knowledge, only one study relied on the network analysis to investigate problem gambling (Baggio, Gainsbury, Berchtold, & Iglesias, 2016), but it did not focus on gender differences.

The aim of the present study was to explore the network-level associations between gambling preferences and problem gambling separately for males and females. Our goal was to expand our knowledge about gender differences in the patterns of gambling and their relationships with problem gambling capitalizing on this innovative approach. Furthermore, we also considered the relationships between gambling activities and gambling problem while simultaneously taking into account substance use and other mental health issues in order to provide a better overview of gender differences in gambling patterns.

Methods

Participants and procedure

Data were extracted from the 2014 Health Barometer, a large-scale French cross-sectional survey. Data collection took place between December 2013 and May 2014 in a representative sample of people living in France. The sample was obtained using a random generation of telephone numbers (landlines and cell phones) among participants aged 15 to 75 who spoke French. A computer-assisted telephone survey system was used to collect data. The response

rate was 61% for landlines and 52% for cell phones (n=15,635). This study focused on people who gambled at least one time in the previous twelve months (n=8,805, 56.3% of the whole sample: 54.1% of females and 59.0% of males). Ethical approval was obtained from the French commission on data privacy and public liberties. Information on the study design, method, and questionnaire is available elsewhere (Richard et al., 2016).

Measures

Problem gambling. Problem gambling was assessed using the Problem Gambling Severity Index (PGSI), which is a part of the Canadian Problem Gambling Index (Ferris and Wynne, 2001). This instrument consists of nine items that are assessed on a four-point scale: “never”, “sometimes”, “most of the time”, and “almost always”. The items were considered to represent gambling features and were included in the network analysis. A score ≥ 3 on the whole scale, with scores ranging from 0 to 24, indicated at-risk and problem gambling (Ferris and Wynne, 2001).

Gambling preferences. Eight types of gambling activities were assessed: lotteries, scratch off games, horse racing betting, sports betting, poker, gambling machines, casino table games, and other skill games with bets (e.g., pool, darts, cards). Involvement in each gambling activity was rated on a five-point scale, as follows: “no use”, “use less than once a month”, “use once a month”, “use more than once a month”, “use once a week”, and “use more than once a week”.

Substance use. Previous 12 months use of alcohol, tobacco, cannabis, and other illicit substances (i.e., magic mushrooms, poppers, inhalants, ecstasy, LSD, MDMA, amphetamines, crack, cocaine, heroin, and GHB/GBL) was assessed on a binary scale (“used” versus “not used”).

Mental health. Mental health status was assessed for the previous four weeks using the MH-5, a subscale of the mental health subscales of the SF-36. It includes five questions focusing on

nervousness, discouragement, calm/relaxation, sadness, and happiness (Leplège, Ecosse, Verdier, & Perneger, 1998).

Covariates. In addition to gender, we assessed age and socio-economic level (“farm/manual worker”, “employee”, “middle-level occupation”, “executive/senior-level professional”, and “unknown/unwilling to respond”).

Statistical analyses

We first computed descriptive statistics and bivariate associations for gambling-related variables and gender (z tests to compare proportions and t-tests to compare means). Then, we estimated the network of problem gambling features and gambling activities. We computed two networks: one for females, and one for males. Each gambling variable was represented as a node, while edges represented conditional pairwise relationships. The network was estimated using a pairwise Markov Random Field model with a nonparanormal transformation (Liu, Han, Yuan, Lafferty, & Wasserman, 2012), designed for non-normally distributed and ordinal variables. The model also applied a penalty parameter based on sample size to shrink small edges to zero (Epskamp, Borsboom, & Fried, 2016; Kossakowski and Cramer, 2017). In addition, we computed indices of nodes’ centrality, which provides an estimation of the importance of nodes in the network (i.e., their strength). The strength corresponds to the sum of absolute values of the edges connecting a node to all the other nodes and indicates whether a node is central in the network. Significant differences between nodes’ strength were investigated using bootstrapped difference tests (Epskamp, et al., 2016). We checked our model’s accuracy, as recommended in the literature on network estimation (Epskamp, et al., 2016). We interpreted our results according to the findings of the model’s accuracy check (data available on request). Although two other centrality indices (betweenness and closeness) were also available, the test of model accuracy did not find them reliable, prompting us to exclude

them from the analyses. We compared the overall strength of the networks for females and males using permutation tests (van Borkulo et al., 2016). These comparisons included 1) problem gambling features, 2) gambling activities, and 3) both problem gambling features and gambling activities. We applied a Bonferroni-Holms correction to keep a 5% error rate. Finally, we computed two additional networks (one for females and one for males) including substance use and mental health-related questions.

We used R 3.3.2 for all analyses, with the package Bootnet 1.0.0 for network estimations (default = “huge”) and bootstrap estimations, and the package NetworkComparisonTest 2.0.1 for permutations tests.

Results

There were 4,565 (51.8%) females and 4,240 (48.2%) males in the sample. Descriptive statistics are summarized in Table 1. Based on the PHSI, 103 (2.3%) females and 216 (5.1%) males were classified as at risk for problem gambling or as problem gamblers.

Table 1 shows that the most common games played by females were lotteries (72.5%), scratch games (65.6%), and gambling machines (10.7%). The most common games played by males were lotteries (75.1%), scratch games (51.6%), horse race betting (14.9%), and sports betting (13.5%). Significant gender differences were found for all gambling activities except for playing gambling machines. Males gambled more proportionately in all cases, with playing scratch games being the only exception.

Females reported lower levels of substance use for all substances ($p < .001$) and a poorer mental health. In the current sample, women reported higher levels of nervousness, discouragement, and sadness, and lower levels of calm/relaxation and happiness than males ($p < .001$).

Network analysis for females

The network of gambling variables for females is depicted in Figure 1. Problem gambling features were related with several edges, whereas relationships between gambling activities were less frequent. Of the 72 possible relationships between problem gambling features and gambling activities, 36% were positive. Playing gambling machines was the gambling activity that was most related to problem gambling features. This activity appeared to be the most central variable in the network, with a significantly greater strength compared to most other gambling activities (Supplementary Figure 1).

Network analysis for males

The network of gambling variables for males is depicted in Figure 2. Problem gambling features were related with several edges, more so than among females. Gambling activities were also related with several positive edges. Of the 72 possible relationships between problem gambling features and gambling activities, 60% were positive. Sports betting, playing poker, and casino games were the gambling activities that were most related to problem gambling features. Their strength was significantly greater compared to all other gambling activities (Supplementary Figure 2).

Comparisons between female and male networks

Results of the network comparison tests are reported in Table 2. The strength of the network of problem gambling features and gambling activities was stronger among males than among females ($p=.012$), whereas strengths of networks for females and males did not differ significantly when considering problem gambling features and gambling activities separately. These findings are a result of stronger relationships between gambling activities and problem gambling features among males.

Networks including mental health issues

The networks including substance use and mental health are depicted in Figure 3 for females and Figure 4 for males. For females, mental health appeared quite disconnected from gambling problems and gambling activities, with some weak associations with gambling problems (worse mental health associated with increased gambling problems). Substance use displayed some weak relationships with sports betting, poker, and casino games. For males, substance use had a larger number of associations with gambling variables, and especially with scratch games, poker, and sports betting. Mental health displayed some weak associations with gambling problems (again, a worse mental health was associated with increased gambling problems).

Discussion

Capitalizing on an innovative data-analytic strategy, the present study expands our knowledge of gender-specific gambling preferences, their relationships with problem gambling, and also with health issues. Our findings are broadly consistent with those of previous research about gender differences (Hing, et al., 2016; Holdsworth, et al., 2012; Husky, et al., 2015; Merkouris, et al., 2016; Romild, et al., 2016; Stark, et al., 2012). Although chance games (e.g., lottery, scratch games and gambling machines) were common gambling activities for both genders (Husky, et al., 2015), only scratch games were significantly more often played by females. In contrast, significantly more often males played games involving an element of perceived or actual skill, such as horse race betting, sports betting and poker.

Preliminary statistics first showed that males and females have different profiles. Males were more engaged in gambling activities and reported more gambling-related problems and use substances more often than females. On the contrary, females reported a lower level of mental health in comparison with males. Therefore, these findings confirmed that gender may be a

social determinant of gambling-related harms and more broadly, a social determinant of health issues. These initial results strengthened the need to consider gender in public health research. Yet, and crucially, further research on should also consider that gender itself is an evolving construct as more and more world citizens neither definite themselves as woman nor as man (Schilt and Lagos, 2017). This important evolution cannot be ignored and will for sure impact upon gender studies as a field.

The network analysis of gambling problems and gambling activities provided further insight into gender-based associations between gambling preferences and problem gambling. Among females, gambling machine use was the only gambling activity strongly related to problem gambling. Among males, sports betting, poker, and casino games were all strongly related to problem gambling. This implies that gender preferences for some gambling activities may also account for differences in the development of problem gambling. Importantly, some of the gambling activities associated with problem gambling, namely gambling machines and sports betting, were linked with worse treatment outcomes in a previous study that did not take into account the effect of gender (Ronzitti, et al., 2018). It is possible that these findings could to some extent be attributed to gender differences.

Gambling machines have long been described as having an important addictive power (Dowling, Smith, & Thomas, 2004). Indeed, they have specific structural characteristics that have been shown to increase severity of problem gambling, including fast and continuous gambling experience, losses disguised as wins, and near misses (e.g., Barton et al., 2017; Harrigan, Brown, & MacLaren, 2015). Therefore, gambling machines constitute a high-intensity form of gambling susceptible to promote hope of imminent reward and to potentiate distorted cognitions (Harrigan, et al., 2015). As a consequence, a specific focus on the risks associated with gambling machine is needed. Indeed, women are not more prone to be involved

in this specific gambling activity, but also, as evidenced by our network analysis, this very gambling activity presented a clear and strong association with gambling problem.

Furthermore, the association between gambling machines and gambling problems among females may also be related to higher rates of psychological distress, depression and anxiety in females (Kuehner, 2017). Use of gambling machines may serve the purpose of avoiding negative emotions and social isolation (Blaszczynski & Nower, 2002; Holdsworth, et al., 2012), leading to problem gambling in females. This function of gambling machines may explain the lack of association between gambling machines and problem gambling in males, although there was no difference between genders in terms of the frequency with which they used gambling machines. Also, a recent study has found that treatment-seeking males who gamble on wagering and casino games were motivated by a desire to appear smart, skillful or more masculine (Hunt & Gonsalkorale, 2018). This highlights the potential role of social factors in gambling activities and development of gambling problems.

Another important gender difference found in the present study was that males displayed stronger relationships between gambling activities and problem gambling in comparison with females. This suggests that gambling involvement was more likely to be associated with problem gambling among males. A previous systematic review concluded that gender plays an indirect role in the development of problem gambling (Merkouris, et al., 2016). Indeed, the review suggested that, even if males were more likely to be problem gamblers, these results may be an artefact of others characteristics, including preferred gambling activities. Our study strengthened that gender influenced gambling preferences, themselves being differently related to problem gambling.

For both genders, lottery, scratch games, horse race betting, and skill games were less related to problem gambling. This finding accords with a report that the addictive power of these gambling activities may be quite limited (Meyer, Fiebig, Häfeli, & Mörsen, 2011).

In the additional set of analyses, we emphasized that some gambling activities may be related to substance use. It was the case for sports betting and poker for both gender (and especially for males). Mental health was weakly associated with gambling problems, but not directly with specific gambling activities. Therefore, and in line with previous studies (Lorains, Cowlishaw, & Thomas), it is possible that specific gambling activities may enhance/be enhanced by substance use, which should be taken into account in both prevention and intervention strategies. On the contrary, it seems that gambling activities may interfere on mental health only when problematic gambling patterns are displayed. Yet, additional studies with more comprehensive mental health and substance use assessment is required to confirm the current findings.

Prevention and treatment of gambling problems would benefit from taking into consideration gender differences, using targeted approaches to improve effectiveness, as previously recommended (Holdsworth, et al., 2012). For example, the role of chance should be emphasized for all gambling activities. This is particularly important for those activities that are perceived to have a skill component, with the aim of reducing risk-taking behavior based on an illusion of control. Public education campaigns need to encourage women to identify behaviors that can replace gambling and to be involved in less risky forms of gambling (e.g., lotteries instead of gambling machines). Also, prevention and education strategies should also focus on developing adaptive coping strategies, as playing gambling machine is known to be displayed to cope with adverse emotional states or negative life event (Blaszczynski & Nower, 2002; Holdsworth, et al., 2012). Advertising that normalizes gambling, particularly when targeting men, should be discouraged. Treatment approaches need to focus on motivations for gambling and develop appropriate strategies to address gambling as an unhelpful coping strategy and to identify alternative approaches. Public education efforts should feature both genders when encouraging treatment-seeking and emphasize the importance of treatment.

In addition to using a novel approach to investigate direct associations between gambling preferences, gambling problems, and health issues, another strength of our study was assessment of the frequency of use of each type of gambling activity. Previous studies have reported that gambling involvement is a key variable in understanding gambling-related problems and that it should be considered in conjunction with game-specific engagement (Baggio et al., 2017; LaPlante, Nelson, LaBrie, & Shaffer, 2011).

The present study has several limitations. First, it was conducted in a population-based sample in gambling may not be very frequent. Studies in large samples of problem gamblers and individuals at risk for problem gambling should be conducted to replicate or refute present findings. However, data from community-based samples are still needed, because clinical samples are non-representative of the whole population of problem gamblers, with only a minority of problem gamblers seeking treatment (Braun, Ludwig, Slecza, Bühringer, & Kraus, 2014). In addition, it is worth noting that our findings applied to the jurisdictional regime of France and results may have been different in other regimes where gambling machines are more available (e.g., Australia). Further studies are thus needed in such contexts in order to propose more insights on the relationships between gambling activities and problem gambling. Second, gambling behaviors and problem gambling were assessed using self-reported questionnaires, which are prone to various biases (e.g., recall bias, social desirability bias) (Productivity Commission, 2013; Doughney, 2007). Finally, the study was cross-sectional, which did not allow us to ascertain any causal relationships between gambling activities and problem gambling.

In conclusion, this study contributes to a better understanding of gender differences in gambling by demonstrating the relationships between various gender-specific gambling behaviors and problem gambling, and their interplay with health issues (substance use and

mental health). These findings have important implications for prevention and treatment of problem gambling and further research in this area.

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Table 1. Descriptive statistics for gambling patterns and demographics

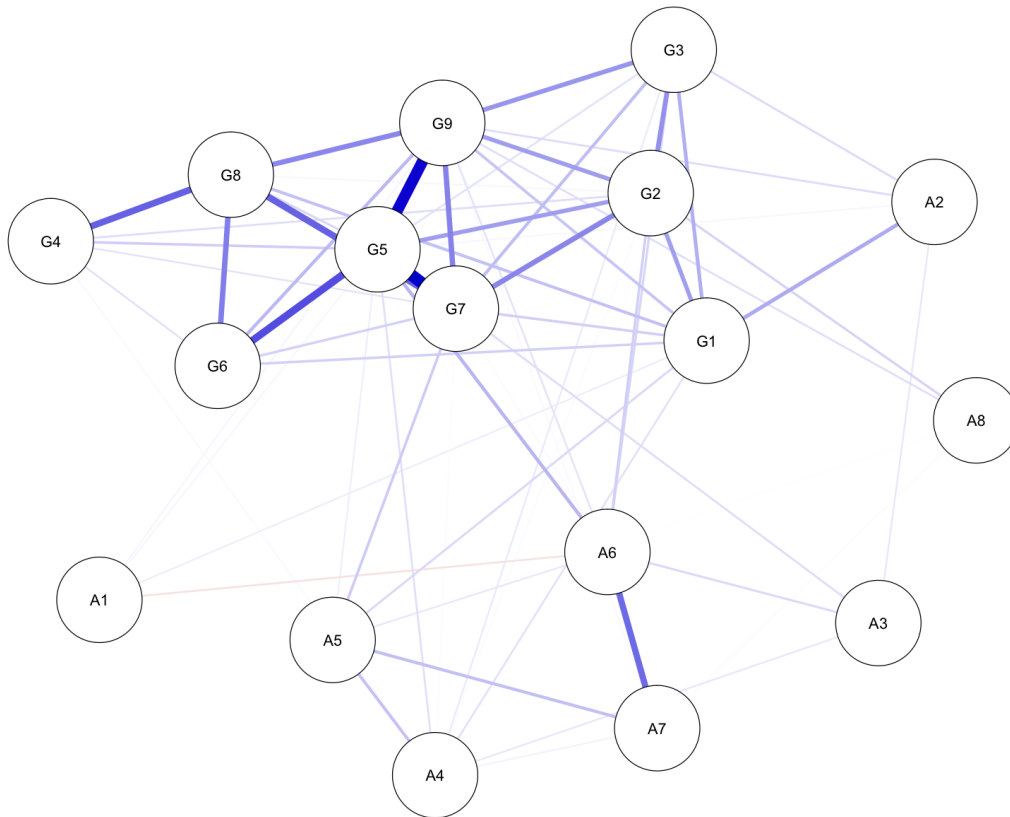
	Females (n=4,565)	Males (n=4,240)	p-value ¹
Age (mean, standard deviation)	45.22 (0.22)	43.23 (0.23)	<.001
Socio-economic level (%)			
Workers	7.7	14.5	<.001
Employees	13.6	17.6	<.001
Middle-level occupation	13.2	15.0	.015
Executive/senior-level occupation	12.6	15.6	<.001
Unknown/unwilling to respond	52.9	37.3	<.001
Problem gambling severity index (% of individuals with the gambling feature)			
G1. Bet more than could afford to lose	3.0	5.4	<.001
G2. Gamble larger amounts to get the same feeling	1.5	3.4	<.001
G3. Go back after losing to win back the money lost	4.2	7.5	<.001
G4. Borrowed money or sold anything to get money to gamble	0.1	0.7	<.001
G5. Felt as having a problem with gambling	1.6	3.6	<.001
G6. Gambling caused health problems	1.2	2.0	.003
G7. People criticized betting/spoke of problem gambling	1.0	3.2	<.001
G8. Gambling caused financial problems	0.4	1.3	<.001
G9. Felt guilty about gambling	2.0	4.5	<.001
Gambling activities (% of individuals with the activity)			
A1. Lottery	72.5	75.1	.006
A2. Scratch games	65.5	51.6	<.001
A3. Horse race betting	6.4	14.9	<.001
A4. Sports betting	1.3	13.5	<.001
A5. Poker	1.5	7.7	<.001
A6. Gambling machines	10.7	11.1	.547
A7. Casino games	3.2	6.2	<.001
A8. Skills games	0.1	2.7	<.001
Substance use			
Alcohol	90.6	93.3	<.001
Tobacco	31.7	39.8	<.001
Cannabis	6.6	14.6	<.001
Other illicit substances	1.4	3.1	<.001
Mental health (1-5)			
Nervousness	2.77	2.36	<.001
Discouragement	1.95	1.61	<.001
Calm/relaxation	3.47	3.70	<.001
Sadness	2.17	1.79	<.001
Happiness	3.72	3.81	<.001

¹ z tests to compare two proportions were performed for each line, except for age and mental health (t-tests).

Table 2. Network comparison tests for the overall strength of networks in females and males

Network	Strength for females	Strength for males	p-value
Problem gambling features	2.78	3.24	.092
Gambling activities	1.05	1.41	.215
Problem gambling features and gambling activities	4.25	5.63	.012

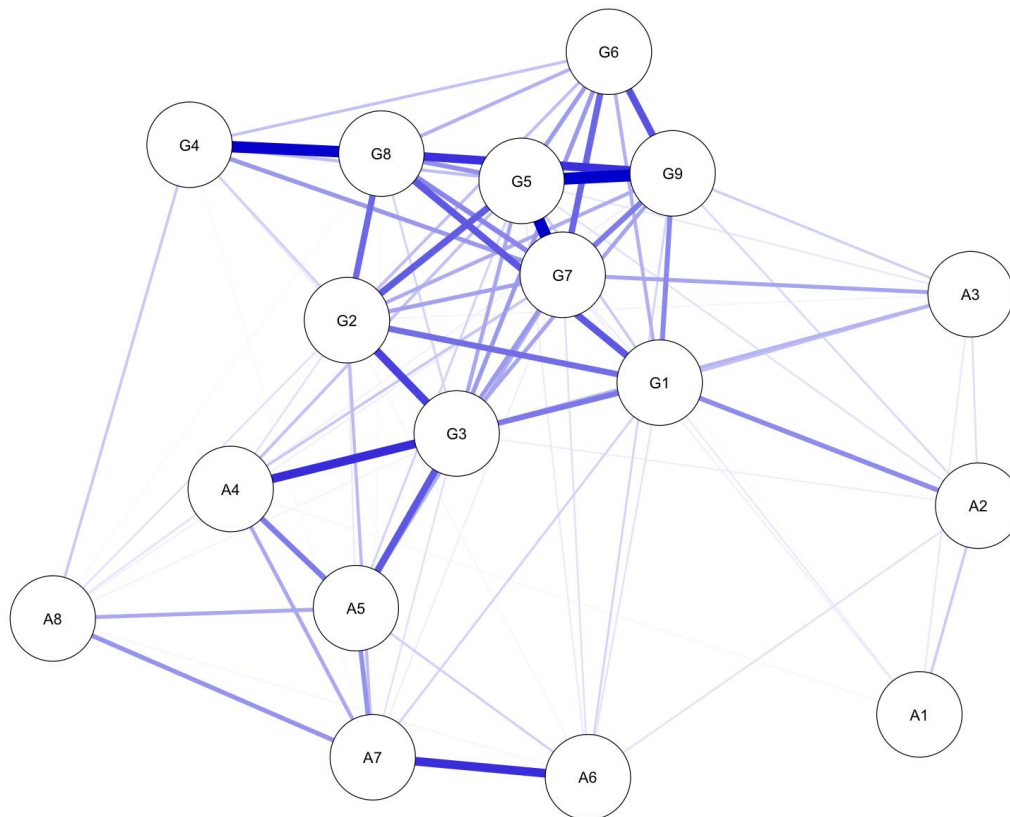
Figure 1. The network of gambling features and gambling activities in females (n = 4,565)



G1-G9: gambling features, A1-A8: gambling activities (see Table 1 for labels).

Blue paths are positive relationships; red paths are negative relationships. Thicker edges indicate a stronger relationship between items.

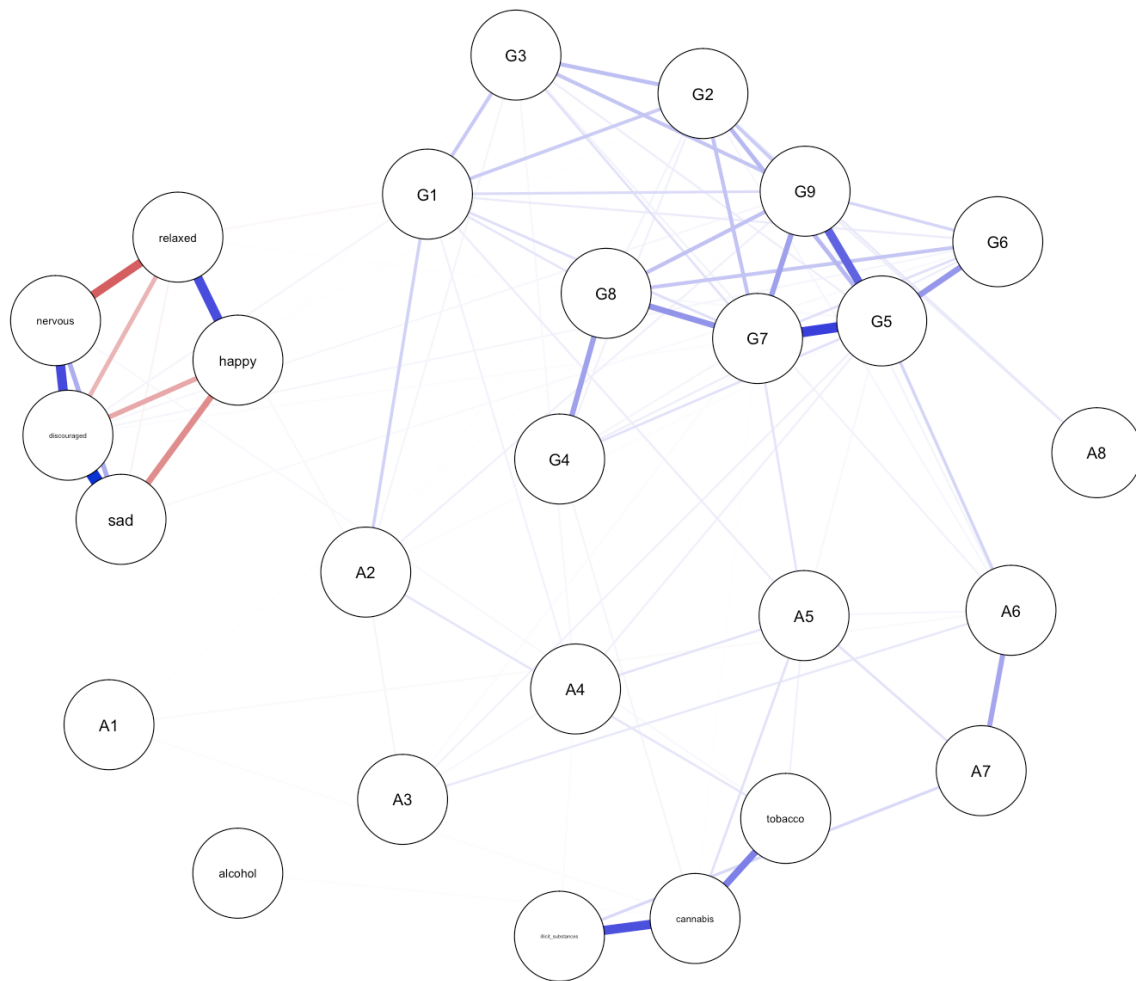
Figure 2. The network of gambling features and gambling activities in males (n = 4,240)



G1-G9: gambling features, A1-A8: gambling activities (see Table 1 for labels).

Blue paths are positive relationships; red paths are negative relationships. Thicker edges indicate a stronger relationship between items.

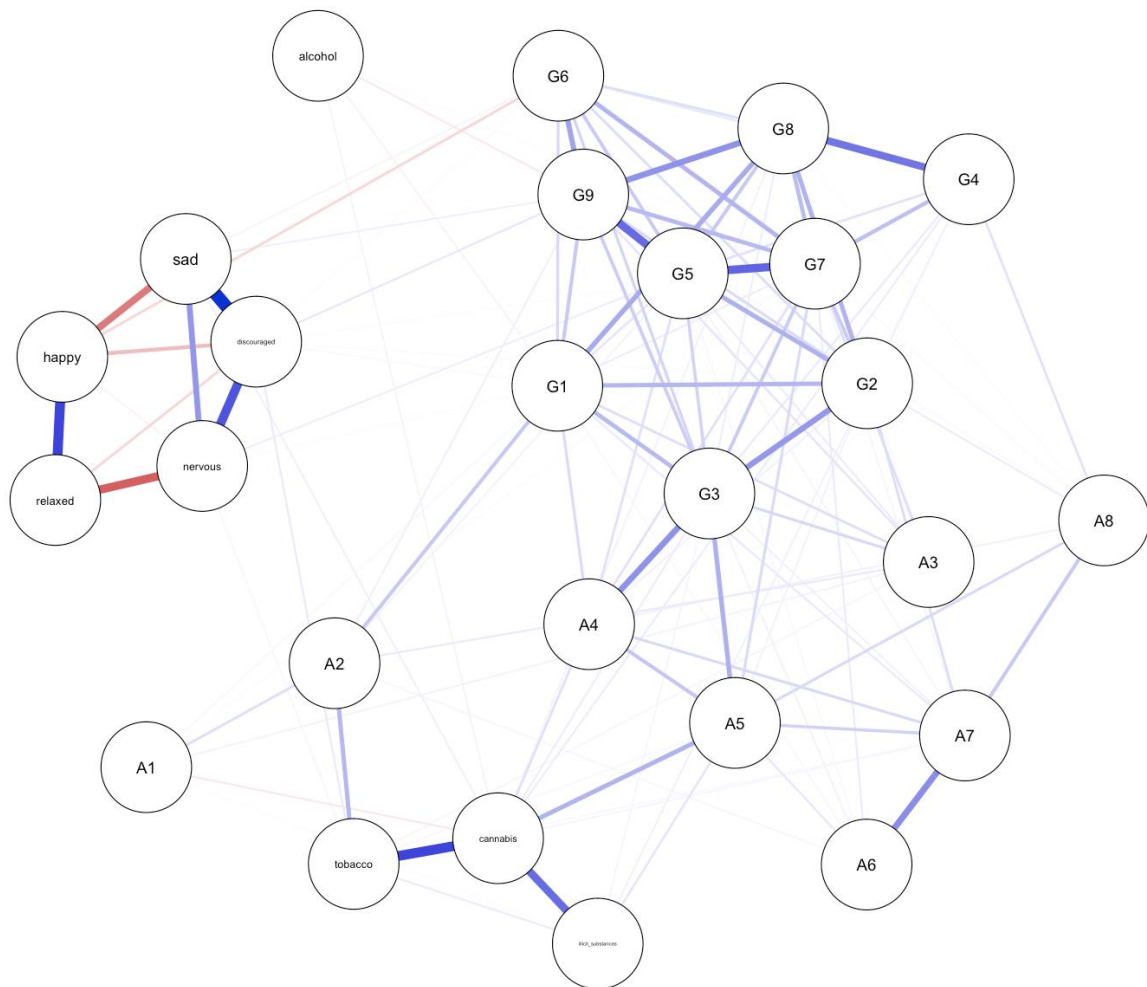
Figure 3. The network of gambling features, gambling activities, and health issues in females (n = 4,565)



G1-G9: gambling features, A1-A8: gambling activities (see Table 1 for labels).

Blue paths are positive relationships; red paths are negative relationships. Thicker edges indicate a stronger relationship between items.

Figure 4. The network of gambling features, gambling activities, and health issues in males (n = 4,240)

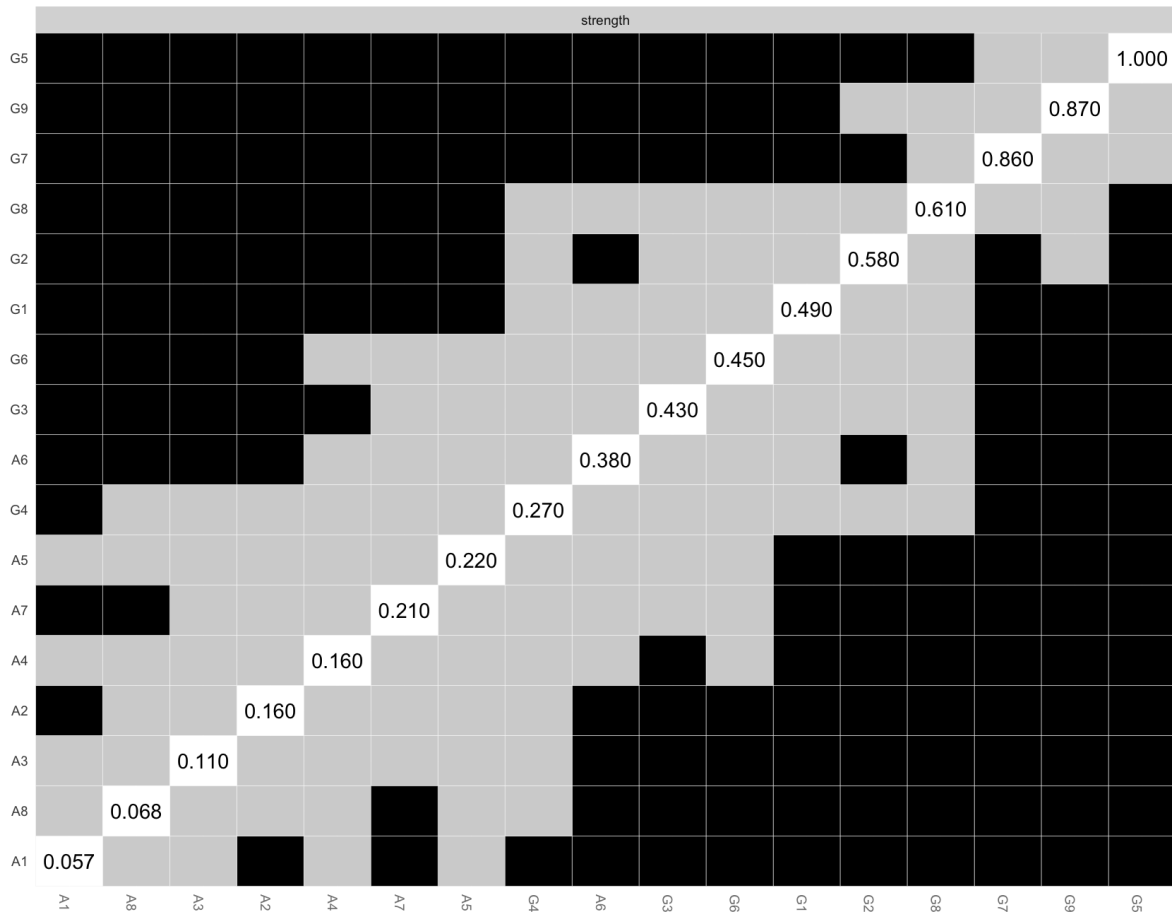


G1-G9: gambling features, A1-A8: gambling activities (see Table 1 for labels).

Blue paths are positive relationships; red paths are negative relationships. Thicker edges indicate a stronger relationship between items.

Supplementary material

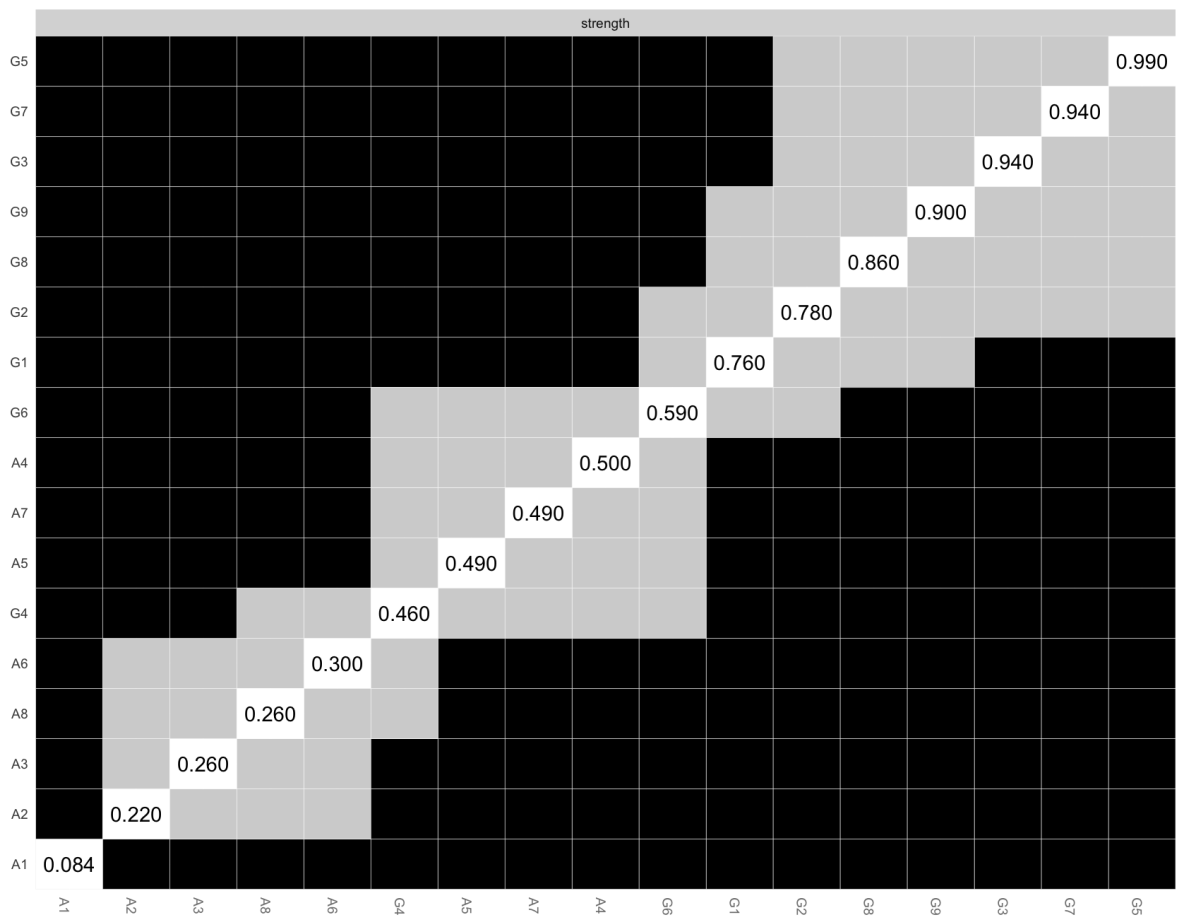
Supplementary figure 1. Bootstrapped difference tests for nodes' strength in the female network



G1-G9: gambling features, A1-A8: gambling activities (see Table 1 for labels).

Bootstrapped estimates are given on the second diagonal. Dark cases mean significant differences at the .05 level.

Supplementary figure 2. Bootstrapped difference tests for nodes' strength in the male network



G1-G9: gambling features, A1-A8: gambling activities (see Table 1 for labels).

Bootstrapped estimates are given on the second diagonal. Dark cases mean significant differences at the .05 level.