Youth and Gambling Disorder: What about Criminal Behavior?

Gemma Mestre-Bach[a,b,c], Roser Granero[d], Cristina Vintró-Alcaraz[a,b], Gerard Juvé-Segura[a], Mario Marimon-Escudero[a], Sandra Rivas-Pérez[a], Eduardo Valenciano-Mendoza[a], Bernat Mora-Maltas[a], Amparo del Pino-Gutierrez[a,b,e], Mónica Gómez-Peña[a], Laura Moragas[a], Fernando Fernández-Aranda[a,b,f], Ester Codina[a], Teresa Mena-Moreno[a], Susana Valero-Solís[a], Elías Guillén-Guzmán[g], José M. Menchón[a,f,h], Susana Jiménez-Murcia[a,b,f]

[a]*Department of Psychiatry. Bellvitge University Hospital-IDIBELL, Barcelona, Spain*

[b]*Ciber Fisiopatología Obesidad y Nutrición (CIBERObn), Instituto de Salud Carlos III, Madrid, Spain*

[c]*Universidad Internacional de La Rioja, Logroño, La Rioja, Spain*

[d]*Departament de Psicobiologia i Metodologia de les Ciències de la Salut, Universitat Autònoma de Barcelona, Barcelona, Spain*

[e]*Department of Public Health, Mental Health and Mother-Infant Nursing, University School of Nursing, University of Barcelona, Barcelona, Spain*

[f]*Department of Clinical Sciences, School of Medicine, University of Barcelona, Barcelona, Spain*

[g]*Departament of Child and Adolescent Psychiatry and Psychology, Institute of Neurosciences, Hospital Clinic Barcelona, Spain*

[h]*CIBER Salud Mental (CIBERSAM), Instituto de Salud Carlos III, Madrid, Spain*

ABSTRACT

Background and Aims: The commission of illegal acts has been associated with gambling disorder (GD). However, little is known about young adults with GD who commit GD-related crimes. Therefore, the main aim of this study was to compare sociodemographic, clinical, personality and psychopathological features among young adults with GD with and without a history of illegal behaviors. Our second aim was to analyze the specific associations between these factors through a path analysis.
Methods: A total of 808 treatment-seeking young adults who met criteria for GD were assessed at a public hospital unit specialized in behavioral addictions. Participants completed self-reported questionnaires to explore GD, personality traits, and psychopathological symptomatology.
Results: Of the total sample, 291 patients (36.0%) had committed GD-related offences. Illegal acts were related to younger age and unemployment status. Greater levels of psychopathology, as well as earlier GD onset, longer GD duration and greater GD severity were also associated with the presence of criminal behaviors. Differences in personality traits were also found between these two groups.
Discussion and Conclusions: The GD group with a history of illegal acts showed dysfunctional personality traits and higher levels of psychopathology. Therefore, specific GD treatments and harm reduction interventions should be designed for these patients.

Keywords: gambling disorder, criminal behavior, young adults, illegal acts, psychopathology, personality.

1. INTRODUCTION

1.1 Gambling disorder (GD) and GD-related crimes

The literature has shown a complex association between GD and the presence of criminogenic behaviors, especially the commission of income-producing illegal acts and property related offences, such as fraud, forgery, robbery and theft (Adolphe et al., 2019; Kryszajtys et al., 2018). These criminal offences often derive from a financial interest and are perpetrated to sustain or recover the investment lost due to the gambling behavior, or to overcome the lack or economic decline of losses suffered during the gambling episode (Abbott & McKenna, 2005). The illegal act is, therefore, only instrumental in most cases, reflecting the desperation related to this disorder (Petry et al., 2014; Rosenthal & Lorenz, 1992).

The commission of these gambling-related crimes seldom takes place in the absence of other GD criteria and, consequently, it has been considered an indicator of GD severity (Petry et al., 2013; Stinchfield, 2002; Weinstock et al., 2013). However, the causal association between both factors has yet to be unraveled, as some authors suggest that GD precipitates criminal offences (Laursen et al., 2016), while others consider that illegal acts are a precursor to GD (Abbott & McKenna, 2005; Turner et al., 2009).

When the Spanish criminal justice system evaluates the legal consequences of these GD-related crimes, the State provides for the possibility of reducing the burden of the penalty for those subjects who, although capable of understanding the offence, were unable to resist it. The Spanish State also considers the possibility that individuals may not be liable in the eyes of the law due to the GD severity, which prevented them from both resisting and understanding the magnitude of the criminal offence committed (Blum & Grant, 2017; Echeburua, 2000).

1.2 Criminological theories and GD-related crimes

Gamblers' motivations for committing gambling-related crimes could be explained through different criminological theories. The rational choice theory considers crime as a rational choice in which profits are maximized and costs are minimized (Cornish & Clarke, 1986; Pratt, 2008). In the specific case of GD, individuals who commit illegal acts understand them as a solution to their problem, which is usually financial hardships. Therefore, the positive consequences gain more significance than the negative ones in their rational balance sheet. In this vein, taking the general strain theory as a framework, gamblers who face

negative events or negative emotional states, such as extreme financial difficulties, may be more prone to engage in unlawful conduct to support their habit (Agnew, 2001; Agnew, 1992). Finally, Chicago School's ecological model, reaffirmed by Shaw & McKay (1969), states that crime is committed in situations of extreme need (Wong, 2002). The Chicago School affirms that society and the subject's socioeconomic status determine the criminal behavior. Therefore, crime, from this ecological perspective, is seen as a general failure of the community that has not been able to neutralize the different exposures to crime that the subject may have experienced (Kubrin & Mioduszewski, 2019). Shaw & McKay (1942) suggest, however, that what determines the crime is the subjects' situation of need and the characteristics of their society. From this perspective of criminological theories, therefore, in the case of individuals with GD, they might commit illegal acts in situations of mainly financial need where (1) there is no supportive social network that could act as a protective factor; (2) there has been an early acquisition of deviant or pro-criminal values; and (3) the individual is in a society unable to control this type of deviant activity.

1.3 Young adulthood and GD-related crimes

Despite the fact that the number of studies focused on describing the profile of individuals with GD who end up committing illegal acts is increasing, the literature in reference to adolescents and young adults remains scarce and with heterogeneous results (Kryszajtys et al., 2018). However, it is well known that the relationship between crime and age follows a bell-shaped pattern, the age-of-crime curve, explaining greater illegal acts in adolescence and young adulthood (Farrington, 1986; Piquero et al., 2007). Moreover, these are development stages at which most subjects start the gambling behavior (Johansson et al., 2009), and it has been suggested that younger age may be associated with the commission of illegal acts (Susana Jiménez-Murcia et al., 2019), which would justify the need to investigate these age groups in depth.

Previous literature suggests a key factor of common variance "the generality of deviance" in gamblers, where shared personality traits, such as higher risk taking, may be a driver of deviant behavior (Mishra et al., 2011). Other GD features such as short term orientation, high impulsivity levels, low self-control and the presence of criminogenic cognitions, especially the desire for power and privilege and insensitivity to the impact of the crime, have been suggested to be related with the engagement of illegal acts in this population (Fatima et al., 2019; Mishra et al., 2011). Finally, it has been shown that other factors influence the gambling-crime association, such as earlier delinquency and substance use (Dennison et al., 2020; Vitaro et

al., 2001). However, there is a lack of studies evaluating the weight of sociodemographic aspects, such as sex, gender, socioeconomic status and ethnicity in this association and in this age range (Kryszajtys et al., 2018).

Our main aim in the present study was, therefore, to examine the sociodemographic, clinical, personality and psychopathological differences between treatment-seeking young adults with GD, with and without history of criminal behavior. Our second aim was to analyze the specific associations between these factors through a path analysis.

As stated above, financial problems derived from gambling behavior and lower educational levels are usually indicated as factors associated with the commission of illegal acts (Arum & LaFree, 2008; Ledgerwood et al., 2007). Therefore, we hypothesized that the youth with a history of criminal record would show lower educational levels than those without a criminal behavior. We also hypothesized that a history of illegal acts would be associated with higher levels of debt, greater GD severity, increased psychopathology, and a more dysfunctional personality traits.

2. METHODS

2.1 Sample and procedure

The sample consisted of 808 young adult consecutive treatment-seeking patients (18-30 years old), recruited between January-2005 and August-2019, with a diagnosis of GD at the Behavioral Addictions Unit within the Department of Psychiatry, at Bellvitge University Hospital (Barcelona, Spain). Patients were derived through general practitioners or *via* another healthcare professional. Moreover, although the treatment was not compulsory, some patients were derived from prison health services. Only in a few cases, a judge may have dictated the need for GD treatment at our hospital. All treatment services for GD within the public Spanish healthcare system are provided free of charge.

Experienced psychologists and psychiatrists conducted two face-to-face clinical interviews, before a diagnosis was given, and only patients who sought treatment for GD as their primary mental health concern and who met DSM criteria for GD (APA, 2013) were included in our sample. No other behavioral addictions were reported by the sample of participants in the study. Additional sociodemographic and clinical information was taken, and patients individually completed all the instruments utilized in this study, before

initiating outpatient treatment. Exclusion criteria were: the presence of intellectual disability, an organic mental disorder, a neurodegenerative condition or an active psychotic disorder. Participants were classified in two groups according to presence (*n*=291) or absence (*n*= 517) of criminal behaviors related to GD.

2.2 Instruments

2.2.1 DSM-5 (APA, 2013)

Patients were diagnosed with pathological gambling if they met DSM-IV-TR criteria (APA, 2000). DSM-IV-TR criteria were used due to the fact that it includes the 8th criterion exploring the presence of illegal acts related to GD. It should be noted that with the release of the DSM-5 (APA, 2013), the term pathological gambling was replaced with GD. All patient diagnoses were reassessed and recodified post hoc to avoid the confounding effect of increased GD severity in patients with a criminal history and only patients who met DSM-5 criteria for GD were included in our analysis.

2.2.2 South oaks gambling screen (SOGS) (Lesieur & Blume, 1987)

This diagnostic questionnaire uses 20 items to ascertain gambling disorder severity. This screening tool discriminates between probable pathological, problem and non-problem gamblers. The Spanish validation of this questionnaire shows high reliability and validity (Echeburúa et al., 1994), as well as excellent test-retest reliability ($R=0.98$, $p < 0.01$) and excellent internal consistency (Cronbach's alpha, $\alpha=0.94$). This questionnaire has achieved adequate internal consistency in the sample of the study ($\alpha=0.74$)

2.2.3 Symptom checklist-revised (SCL-90-R) (Derogatis, 1990)

The SCL-90-R evaluates a broad range of psychological problems and psychopathological symptoms. This questionnaire contains 90 items and measures nine primary symptom dimensions: somatization, obsession-compulsion, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation and psychoticism. The global score (Global Severity Index [GSI]) is a widely used index of psychopathological distress and was the only variable from this questionnaire used in this study. The Spanish validation scale obtained good psychometrical indexes, with a mean internal consistency of 0.75 (Cronbach's alpha) (Derogatis, 2002). The internal consistency estimated in the sample of this work for the global scale was excellent ($\alpha=0.98$).

2.2.4 Temperament and character inventory-revised (TCI-R) (Cloninger, 1999)

The TCI-R is a reliable and valid 240-item questionnaire which measures seven personality dimensions: four temperament (novelty seeking, harm avoidance, reward dependence and persistence) and three character dimensions (self-directedness, cooperativeness and self-transcendence). All items are measured on a 5-point Likert-type scale. A validated Spanish version was used (Gutiérrez-Zotes et al., 2004). The scales in the Spanish revised version showed adequate internal consistency (Cronbach's alpha α mean value of 0.87). In the sample of the study, internal consistency was between adequate (α=0.72 for novelty seeking and α=0.75 for reward dependence) to good (α=0.80 for harm avoidance, α=0.82 for self-transcendence, α=0.84 for cooperative, α=0.86 for self-directedness and α=0.87 for persistence).

2.2.5 Other sociodemographic and clinical variables

Additional demographic, clinical, and social/family variables related to gambling were measured using a semi-structured face-to-face clinical interview described elsewhere (S Jiménez-Murcia et al., 2006). Socioeconomic status was obtained using the Hollingshead Factor Index, based on the domains educational attainment and occupational prestige (Hollingshead, 1975).

2.3 Statistical analysis

The statistical analyses were carried out with Stata16 for Windows. Comparison between the groups defined by the presence-absence of illegal behavior was based on chi-square test (χ^2) for categorical variables and T-test for independent samples for quantitative measures.

Effect sizes for the proportion and mean differences were based on the standardized Cohen's-d coefficient, considering poor-low effect size for |d|>0.20, moderate-medium for |d|>0.5 and large-high for |d|>0.80 (Kelley & Preacher, 2012).

The underlying mechanisms of illegal acts in the study were assessed through path analyses defined as a case of structural equation modeling (SEM). The maximum-likelihood estimation method of parameter estimation was used, and adequate goodness-of-fit was considered for (Barrett, 2007): root mean square error of approximation RMSEA<0.08, Bentler's Comparative Fit Index CFI>0.90, Tucker-Lewis Index TLI>0.90, and standardized root mean square residual SRMR<0.10.

Type-I increase due to the multiple statistical comparison was controlled with Finner correction, a familywise error rate stepwise procedure which offers more powerful test than the classical Bonferroni correction (Finner, 1993).

2.4 Ethics

The present study was carried out in accordance with the latest version of the Declaration of Helsinki. The University Hospital Clinical Research Ethics Committee approved the study, and signed informed consent was obtained from all participants.

3. RESULTS

3.1 Characteristics of the sample

The sociodemographic variables and the description of the gambling profile is displayed in Table 1. Most participants were men (97.5%), single (74.8%), with low levels of education (53.2% achieved only primary or less education), social position indexes within the mean-low and low levels (82.9%) and employed (64.4%). The mean age was 25.7 years-old (SD=3.4), mean age of onset was 21.6 years-old (SD=3.6) and mean duration of the problematic gambling 3.4 years (SD=3.01). Regarding the gambling profile, most patients reported only non-strategic gambling (53.3%), while only strategic was reported for 23.4% and both (non-strategic plus strategic) was reported for 23.3%.

Sociodemographics		*n*	*%*
Sex	Women	20	2.5
	Men	788	97.5
Marital status	Single	604	74.8
	Married – partner	183	22.6
	Divorced – separated	21	2.6
Education	Primary or less	430	53.2
	Secondary	328	40.6
	University	50	6.2
Social index	High or mean-high	48	5.9
	Mean	90	11.1
	Mean-low	292	36.1
	Low	378	46.8

Gambling profile	*Mean*	*SD*
Onset of GD (years-old)	21.63	3.61
Duration of GD (years)	3.44	3.01
Gambling preference	*n*	*%*
Non-strategic	431	53.3
Strategic	189	23.4
Both	188	23.3
Illegal behavior	*n*	*%*
Absent	517	64.0
Present	291	36.0

Employment status	Unemployed	288	35.6
	Employed	520	64.4
Chronological age		*Mean*	*SD*
Age (years-old)		25.70	3.39

Note. SD: standard deviation.

Table 1. Descriptive for the sample (*n*=808)

3.2 Illegal behavior correlates

The prevalence of illegal acts was 36.0% [95% confidence interval (95%CI): 32.7% to 39.3%]. Illegal behavior was related to unemployed working status (p=.013), but it was not associated to the participants' sex, marital status, education levels and social position indexes (Table 2).

		Illegal acts = No *(n=517)*		Illegal acts = Yes *(n=291)*			
Sociodemographics		*n*	*%*	*n*	*%*	*p*	|*d*|
Sex	Women	13	2.5%	7	2.4%	.924	0.01
	Men	504	97.5%	284	97.6%		
Marital status	Single	376	72.7%	228	78.4%	.204	0.13
	Married – partner	127	24.6%	56	19.2%		0.13
	Divorced – separated	14	2.7%	7	2.4%		0.02
Education	Primary or less	287	55.5%	143	49.1%	.198	0.13
	Secondary	201	38.9%	127	43.6%		0.10
	University	29	5.6%	21	7.2%		0.07
Social index	High or mean-high	35	6.8%	13	4.4%	.271	0.10
	Mean	51	9.9%	39	13.4%		0.11
	Mean-low	190	36.8%	102	35.1%		0.04
	Low	241	46.6%	137	47.1%		0.01
Employment status	Unemployed	168	32.5%	120	41.2%	**.013***	0.18
	Employed	349	67.5%	171	58.8%		

Note. [1]Obtained for the subsample of patients with accumulated debts due to gambling. SD: standard deviation.

*Bold: significant comparison (.05 level).

[†]Bold: effect size into the mild-moderate (|*d*|>0.50) to high-large range (|*d*|>0.80).

Table 2. Comparison between patients with and without illegal behavior for sociodemographics

Illegal acts were also related to younger age, earlier onset of the gambling problems, longer duration of the gambling activity, higher severity of the gambling activity (worse symptom level, maximum bets per gambling episode and more debts due to the gambling), strategic or both gambling preference, casino and gaming rooms activities, worse psychopathological state (higher mean scores in the SCL-90-R scales), higher level in the novelty seeking trait and lower level in reward dependence, persistence, self-directedness and cooperativeness (Table 3 and Figure 1).

	Illegal acts= No *(n=517)*		Illegal acts = Yes *(n=291)*			
Age, onset and duration of GD	*Mean*	*SD*	*Mean*	*SD*	*p*	|*d*|
Age (years-old)	25.95	3.29	25.25	3.51	**.005***	0.21
Onset of GD (years-old)	22.02	3.49	20.95	3.71	**.001***	0.29
Duration of GD (years)	3.19	2.87	3.88	3.39	**.002***	0.22
Severity of the GD	*Mean*	*SD*	*Mean*	*SD*	*p*	|*d*|
DSM-5 total criteria	6.78	2.01	7.66	1.51	**.001***	**0.52†**
Bets (max-episode; euros)	945	1868	1850	3981	**.001***	0.29
Bets (mean-episode; euros)	107	207	104	238	.816	0.22
Debts due to GD; n - %	229	44.3%	155	53.3%	**.014***	0.18
[1]Cumulate debts (euros)	8365	11296	9804	13742	**.001***	0.11
Gambling preference	*n*	*%*	*n*	*%*	*p*	|*d*|
Gambling subtype-group						
Non-strategic	294	56.9%	137	47.1%	**.028***	0.20
Strategic	112	21.7%	77	26.5%		0.11
Both	111	21.5%	77	26.5%		0.12
Gambling activities (prevalences)						
Slot machines	367	71.0%	196	67.4%	.281	0.08
Bingo	46	8.9%	26	8.9%	.986	0.00
Lotteries	55	10.6%	34	11.7%	.649	0.03
Casino	90	17.4%	66	22.7%	**.048***	0.13
Gaming rooms	30	5.8%	27	9.3%	**.045***	0.13
Cards	37	7.2%	18	6.2%	.599	0.04
Bets on horses	33	6.4%	15	5.2%	.478	0.05
Bets on sports	91	17.6%	64	22.0%	.128	0.11
Psychopathology (SCL-90R)	*Mean*	*SD*	*Mean*	*SD*	*p*	|*d*|
Somatic	0.75	0.67	0.99	0.82	**.001***	0.32
Obsessive-compulsive	1.01	0.73	1.28	0.76	**.001***	0.36
Interpersonal sensitivity	0.89	0.77	1.11	0.79	**.001***	0.28
Depressive	1.25	0.82	1.56	0.85	**.001***	0.36
Anxiety	0.86	0.72	1.17	0.81	**.001***	0.40
Hostility	0.87	0.80	1.20	0.95	**.001***	0.38
Phobic anxiety	0.40	0.62	0.53	0.63	**.005***	0.20
Paranoid ideation	0.82	0.71	1.05	0.80	**.001***	0.31
Psychosis ideation	0.74	0.67	1.02	0.75	**.001***	0.40
GSI	0.90	0.63	1.16	0.68	**.001***	0.40
PST	42.21	21.16	49.32	20.43	**.001***	0.34
PST	1.74	0.53	1.98	0.57	**.001***	0.43
Personality (TCI-R)	*Mean*	*SD*	*Mean*	*SD*	*p*	|*d*|
Novelty seeking	111.08	12.53	118.74	13.79	**.001***	**0.58†**
Harm avoidance	97.22	15.89	97.90	14.88	.551	0.04

Reward dependence	98.69	13.56	95.56	11.95	**.001***	0.24
Persistence	112.92	17.97	107.59	17.68	**.001***	0.30
Self-directedness	130.04	19.85	120.57	19.07	**.001***	**0.52†**
Cooperative	129.89	15.86	122.07	17.26	**.001***	**0.50†**
Self-transcendence	61.35	13.46	62.33	13.33	.320	0.07

Note. [1]Obtained for the subsample of patients with accumulated debts due to gambling. SD: standard deviation. df: degress of freedom. *Bold: significant comparison (.05 level).

†Bold: effect size into the mild-moderate (|*d*|>0.50) to high-large range (|*d*|>0.80).

Table 3. Comparison between patients with and without illegal behavior for clinical variables

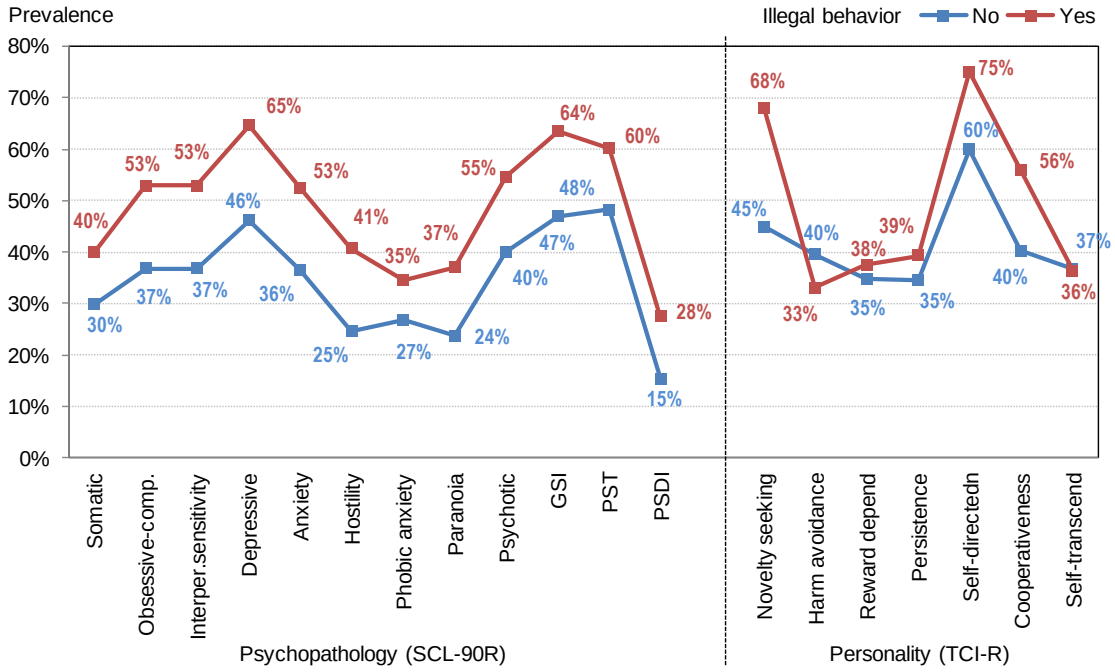

Figure 1. Prevalence of patients outside the normative range

3.3 Path analysis

Figure 2 shows the path-diagram with the standardized coefficients obtained in the SEM. A latent variable was used to define the personality profile in the study based on the TCI-R scores (the self-transcendence was not considered in the model since it did not achieve a significant coefficient). Only significant coefficients were retained in the final model, and it was adjusted by the covariate duration of the GD. Adequate fitting was achieved: RMSEA=0.066 (95% confidence interval: 0.056 to 0.076), CFI=0.926, TLI=0.901 and SRMR=0.047. Presence of illegal acts was directly related with the higher GD severity, presence of cumulate debts due to the gambling activity, worse personality profile scores and younger age. In addition, different mediational links were also found explaining illegal behavior: a) worse personality profile and older age

increased GD severity level, which increased risk of illegal acts; and b) being unemployed and older age also increased the likelihood of cumulate debts, which contributed to a higher probability of illegal acts. Regarding psychopathological state, higher gambling severity, worse personality profile and older age were related to higher SCL-90R GSI score, but this variable did not contributed on the likelihood of illegal behavior in the multivariate model containing the other direct and indirect links.

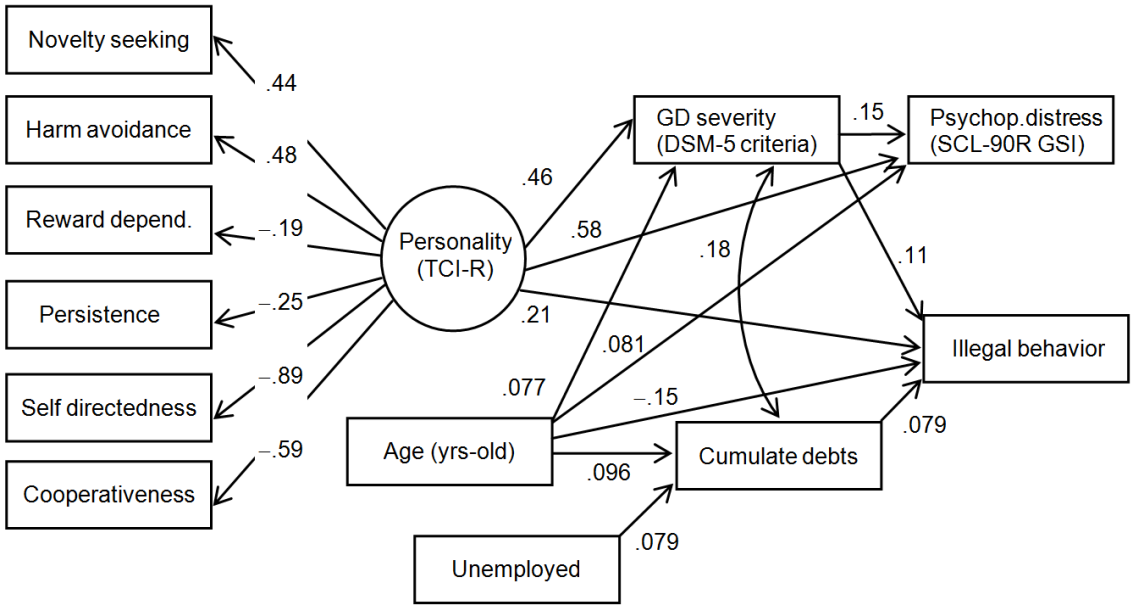

Figure 2. Path-diagram. Standardized coefficients obtained in the SEM

4. DISCUSSION

Our study analyzed the sociodemographic, clinical, personality and psychopathological differences between treatment-seeking young adults with GD who reported committing GD-related crimes and to those who did not. It also analyzed the specific associations between these factors through a path analysis.

In the present study, the prevalence of youth who committed GD-related criminal offences was 36%. This prevalence dovetails with other studies, which reported prevalence rates between 21% and 85% of diagnosed pathological gamblers who committed illegal acts (Adolphe et al., 2019).

Contrary to our first hypothesis, this study did not find a significant association between educational level and illegal behavior. Although some studies did not find it either (Mestre-Bach, Steward, Granero, Fernández-Aranda, Talón-Navarro, Cuquerella, Baño, et al., 2018), on a theoretical level it has been suggested that education could counteract the risk of committing offences, with those individuals with higher

education levels having greater expectations regarding the amount of income they can derive from legal activities (Swisher & Dennison, 2016). Moreover, previous studies found a negative association between education level and the presence of criminogenic cognitions (Fatima et al., 2019). Furthermore, it has been suggested that education promotes the development of moral and cognitive schemes that allow individuals to orient their goals in a more adaptive manner (Fatima et al., 2019; Gómez-Pérez & Ostrosky-Solís, 2006). However, our results may partly be explained by the fact that both groups included in the comparison were composed of patients with GD, and one of the sociodemographic factors that has been most associated with this disorder is low education (Castrén et al., 2018; Worthington et al., 2003), compared to the general population.

The findings of this study also showed that the commission of illegal acts was related to unemployed working status. This is consistent with other studies highlighting an association between unemployment and criminal behavior, specifically in those gamblers who reported arrest or incarceration (Potenza et al., 2000). Furthermore, based on the rational choice theories of social action, criminologists have suggested that unemployment could alter individual perceptions of the costs and benefits associated with illegal acts, considering offences as a possible method of acquiring wealth (Chamlin & Cochran, 2000).

Another finding to emerge from the present study is the lack of association between crime and sex, marital status, and socioeconomic status. In reviewing the literature on adolescents and crime, Kryszajtys et al. (2018) noted that none of the studies examined the association of sex, crime and GD. Moreover, only one study took socioeconomic status into account, reporting that theft was more associated with GD severity among youth with low socioeconomic status (Wanner et al., 2009). Therefore, due to the lack of empirical evidence focused on these features, these results need to be interpreted with caution.

The results also reported an association between crime and age. Although our sample was composed of young adults, aged between 18 and 30, the younger ones would therefore have a higher tendency to commit GD-related crimes. This result is consistent with previous studies (Jiménez-Murcia et al., 2019). Some authors suggest that as individuals evolve into adulthood, their independence and responsibilities increase, which would lead them to show more respect for authority and internalize values and more adaptative behaviors (Fatima et al., 2019).

Keeping with our second hypothesis, illegal acts were related with higher GD severity, greater maximum bets per gambling episode and more debts. Other research has suggested that when GD is consolidated, and especially in those cases where debts are increased and there are more severe gambling symptoms, individuals with GD may have problems to regulate their behavior following moral principles (Ledgerwood et al., 2007; Potenza et al., 2000; Turner et al., 2009). Usually, patients with GD report high anxiety levels and concern about accumulated debt, pretending to settle the debts immediately. In this context, some desperate patients may consider committing illegal acts, only taking the short-term consequences into account (Mestre-Bach, Steward, Granero, Fernández-Aranda, Talón-Navarro, Cuquerella, Baño, et al., 2018; Turner et al., 2009). This situation is common in patients with gambling preferences which require large investments of money and, therefore, accumulate important debts quickly, such as day trading and Forex (Grall-Bronnec et al., 2017; Granero et al., 2012). Most of them have important legal consequences, such as prison sentences. There is, therefore, a relevant association between the need of money to finance gambling (Abbott & McKenna, 2005; Lahn, 2005), debts and criminal behaviors (Widinghoff & Håkansson, 2018).

Regarding gambling preferences, the presence of criminal offences was associated with casino and gaming rooms activities. This result dovetails with previous studies highlighting a greater prevalence of cards and casino in those patients who reported GD-related criminal behavior (Granero et al., 2014). The preference for strategic gambling may be partially explained by the fact that this group of patients with GD who committed offences showed greater GD severity and higher novelty seeking levels, fulfilling the profile of the strategic gambler explained by Jiménez-Murcia et al. (2020).

The presence of GD-related criminal behaviors was related to more severe psychopathological outcomes, as other studies suggest (Ledgerwood et al., 2007; Mestre-Bach, Steward, Granero, Fernández-Aranda, Talón-Navarro, Cuquerella, del Pino-Gutiérrez, et al., 2018). Regarding young populations, especially externalizing psychopathology has been found to be associated with antisocial behavior and psychopathic traits (Spice et al., 2015).

Regarding their personality profile, high novelty seeking levels and low reward dependence, cooperativeness, persistence and self-directedness were found in those patients who committed GD-related offences. These results are in line with previous studies that found an association between impulsivity and crime (Mestre-Bach, Steward, Granero, Fernández-Aranda, Talón-Navarro, Cuquerella, Baño, et al., 2018;

Mestre-Bach, Steward, Granero, Fernández-Aranda, Talón-Navarro, Cuquerella, del Pino-Gutiérrez, et al., 2018). Especially cognitive impulsivity has been related with a more rapid acceleration into unlawful behavior during adolescence (Loeber et al., 2012). Moreover, low levels of reward dependence, motivation to adapt one's behavior to social norms (Cloninger, 1999), along with low levels of cooperation, may suggest antisocial tendencies in these patients, as other studies highlight (Mestre-Bach, Steward, Granero, Fernández-Aranda, Talón-Navarro, Cuquerella, del Pino-Gutiérrez, et al., 2018; Widinghoff & Håkansson, 2018; Williams et al., 2005). Low self-directedness and persistence may be associated with difficulties in decision-making and planning (Cloninger, 1999).

Finally, our study sought to assess the association between personality traits, age, unemployment, cumulate debts, GD severity and criminal behavior via path analyses. Our analyses point to a direct association between the presence of illegal acts and higher GD severity levels, the presence of cumulate debts due to the gambling activity, worse personality profile scores and younger age. Moreover, mediational links were also found explaining GD-related crimes: worse personality profile and older age increased GD severity level, which increased the risk of illegal acts. Finally, older age and unemployment age increased the likelihood of cumulate debts, which increased the probability of committing illegal acts. These findings show, for the first time in the literature, a specific profile that could predispose the subjects to commit crimes. Those individuals with GD, who are younger, have relevant financial difficulties and a specific personality configuration (high novelty seeking and low harm avoidance, reward dependence, cooperativeness, persistence and self-directedness) may present a high risk of ending up committing GD-related crimes. This observation dovetails with other researchers who have studied some of these factors separately (Ledgerwood et al., 2007; Mestre-Bach, Steward, Granero, Fernández-Aranda, Talón-Navarro, Cuquerella, Baño, et al., 2018; Mestre-Bach, Steward, Granero, Fernández-Aranda, Talón-Navarro, Cuquerella, del Pino-Gutiérrez, et al., 2018; Potenza et al., 2000).

Limitations and future research

The results of the present study should be considered in light of its limitations. First, one of the more relevant limitations is the paucity of information related to the criminal typology and recidivism risk, since it has been explored exclusively using the eighth DSM-IV-TR criterion. Future research should evaluate in depth, therefore, the typology of the GD-related crimes. Second, we only assessed criminal behaviors related with

GD, to finance debts derived from gambling or ensure the continuity of gambling behavior. Future studies should also include also those illegal acts not directly related to gambling in young adulthood. Third, the study is focused on a treatment-seeking population, and future studies could also include non-treatment seeking gamblers and a non-clinical group composed of individuals who have committed illegal acts, in order to explore exhaustively the different existing phenotypes. Finally, the present research examined personality traits, but did not assess personality disorders, especially antisocial personality disorder, whose association with illegal acts has been found in previous studies (Riser & Kosson, 2013).

5. CONCLUSIONS

Taken together, one of the most significant findings to emerge from this research is the deepening in the study of the socio-demographic, psychopathological and personality profile of young adults with GD who have committed gambling-related crimes. Given that the study at hand indicated that this clinical group shows dysfunctional personality traits and higher levels of psychopathology, specific GD treatments and harm reduction interventions should be designed for this clinical group.

Funding sources
Financial support was received through the Ministerio de Ciencia, Innovación y Universidades (grant RTI2018-101837-B-100). FIS PI14/00290, FIS PI17/01167 received aid from the Ministerio de Sanidad, Servicios Sociales e Igualdad. The research was also funded by the Delegación del Gobierno para el Plan Nacional sobre Drogas (2017I067 and 2019I47), CIBER Fisiología Obesidad y Nutrición (CIBERobn) and CIBER Salud Mental (CIBERSAM), both of which are initiatives of ISCIII. We thank CERCA Programme / Generalitat de Catalunya for institutional support. Fondo Europeo de Desarrollo Regional (FEDER) "Una manera de hacer Europa" / "a way to build Europe". Investigación subvencionada por la Delegación del Gobierno para el Plan Nacional sobre Drogas (2017I067). GMB is supported by a postdoctoral grant of the Fundación Ciudadanía y Valores. TMM and CVA are supported by a predoctoral grant awarded by the Ministerio de Educación, Cultura y Deporte (FPU16/02087; FPU16/01453).

Conflict of interest
The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Supplementary data
Supplementary data to this article can be found online at https://doi. org/10.1016/j.addbeh.2020.106684.

REFERENCES

Abbott, M. W., & McKenna, B. G. (2005). Gambling and problem gambling among recently sentenced women in New Zealand prisons. *Journal of Gambling Studies*, *21*(4), 559–581. https://doi.org/10.1007/s10899-005-5563-5

Adolphe, A., Khatib, L., van Golde, C., Gainsbury, S. M., & Blaszczynski, A. (2019). Crime and Gambling Disorders: A Systematic Review. *Journal of Gambling Studies*, *35*(2), 395–414. https://doi.org/10.1007/s10899-018-9794-7

Agnew, R. (1992). FOUNDATION FOR A GENERAL STRAIN THEORY OF CRIME AND DELINQUENCY. *Criminology*, *30*(1), 47–88. https://doi.org/10.1111/j.1745-9125.1992.tb01093.x

Agnew, R. (2001). Building on the foundation of general strain theory: Specifying the types of strain most likely to lead to crime ands delinquency. In *Journal of Research in Crime and Delinquency* (Vol. 38, Issue 4, pp. 319–361). https://doi.org/10.1177/0022427801038004001

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders (5th ed.)*. American Psychiatric Association.

Apa. (2000). Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision (DSM-IV-TR). In *Text* (Vol. 1). https://doi.org/10.1176/appi.books.9780890423349

Arum, R., & LaFree, G. (2008). Educational attainment, teacher-student ratios, and the risk of adult incarceration among U.S. birth cohorts since 1910. *Sociology of Education*, *81*(4), 397–421. https://doi.org/10.1177/003804070808100404

Barrett, P. (2007). Structural equation modelling: Adjudging model fit. *Personality and Individual Differences*, *42*(5), 815–824. https://doi.org/10.1016/j.paid.2006.09.018

Blum, A. W., & Grant, J. E. (2017). Behavioral addictions and criminal responsibility. *Journal of the American Academy of Psychiatry and the Law*, *45*(4), 464–471.

Castrén, S., Kontto, J., Alho, H., & Salonen, A. H. (2018). The relationship between gambling expenditure, socio-demographics, health-related correlates and gambling behaviour—a cross-sectional population-based survey in Finland. *Addiction*, *113*(1), 91–106. https://doi.org/10.1111/add.13929

Chamlin, M. B., & Cochran, J. K. (2000). Unemployment, Economic Theory, and Property Crime: A Note on Measurement. *Journal of Quantitative Criminology*, *16*(4), 443–455. https://doi.org/10.1023/A:1007599232183

Cloninger, C. (1999). *The Temperament and Character Inventory-Revised*.

Cornish, D. B., & Clarke, R. V. (1986). *The Reasoning Criminal: Rational Choice Perspectives on Offending*. Transaction Publishers.

Dennison, C. R., Finkeldey, J. G., & Rocheleau, G. C. (2020). Confounding Bias in the Relationship Between Problem Gambling and Crime. *Journal of Gambling Studies*. https://doi.org/10.1007/s10899-020-09939-0

Derogatis, L. (1990). *SCL-90-R. Administration, scoring and procedures manual* (Clinical P).

Derogatis, L. (2002). *SCL-90-R. Cuestionario de 90 síntomas-Manual* (TEA Editor).

Echeburúa, E., Báez, C., Fernández, J., & Páez, D. (1994). Cuestionario de juego patológico de South Oaks (SOGS): Validación española (South Oaks Gambling Screen (SOGS): Spanish validation). *Análisis de Modificación de Conducta*, *20*, 769–791.

Echeburua Odriozola Amor Andrés, P. J., E. (2000). Atenuación de la responsabilidad penal en la ludopatía: Bases Psicopatológicas. *Psicopatología Clinica Legal Y Forense*, *1*(0), 61–77.

Farrington, D. (1986). Age and crime. *Crime and Justice*. http://www.journals.uchicago.edu/doi/abs/10.1086/449114

Fatima, S., Jamil, M., & Ardila, A. (2019). Cognitive control and criminogenic cognitions in south asian gamblers. *Journal of Gambling Studies*, *35*(2), 501–516. https://doi.org/10.1007/s10899-018-9805-8

Finner, H. (1993). On a monotonicity problem in step-down multiple test procedures. *Journal of the American Statistical Association*, *88*(423), 920–923. https://doi.org/10.1080/01621459.1993.10476358

Gómez-Pérez, E., & Ostrosky-Solís, F. (2006). Attention and memory evaluation across the life span: Heterogeneous effects of age and education. *Journal of Clinical and Experimental Neuropsychology*, *28*(4), 477–494. https://doi.org/10.1080/13803390590949296

Grall-Bronnec, M., Sauvaget, A., Boutin, C., Bulteau, S., Jiménez-Murcia, S., Fernández-Aranda, F., Challet-Bouju, G., & Caillon, J. (2017). Excessive trading, a gambling disorder in its own right? A case study on a French disordered gamblers cohort. *Addictive Behaviors*, *64*, 340–348. https://doi.org/10.1016/j.addbeh.2015.12.006

Granero, R., Penelo, E., Stinchfield, R., Fernández-Aranda, F., Aymamí, N., Gómez-Peña, M., Fagundo, A. B., Sauchelli, S., Islam, M. A., Menchón, J. M., & Jiménez-Murcia, S. (2014). Contribution of illegal acts to pathological gambling diagnosis: DSM-5 implications. *Journal of Addictive Diseases*, *33*(1), 41–52. https://doi.org/10.1080/10550887.2014.882730

Granero, R., Tárrega, S., Fernández-Aranda, F., Aymamí, N., Gómez-Peña, M., Moragas, L., Custal, N., Orekhova, L., Savvidou, L. G., Menchón, J. M., & Jiménez-Murcia, S. (2012). Gambling on the stock market: An unexplored issue. *Comprehensive Psychiatry*, *53*(6), 666–673. https://doi.org/10.1016/j.comppsych.2011.12.004

Gutiérrez-Zotes, J. a, Bayón, C., Montserrat, J., Valero, J., Labad, a, Cloninger, C. R., & Fernández-Aranda, F. (2004). Inventario del Temperamento y el Carácter-Revisado (TCI-R). Baremación y datos normativos en una muestra de población general. *Actas Españolas de Psiquiatría*, *32*(1), 8–15.

Hollingshead, A. (1975). *Four factor index of social status*. http://www.academia.edu/download/30754699/yjs_fall_2011.pdf#page=21

Jiménez-Murcia, S., Aymamí-Sanromà, M., Gómez-Peña, M., Álvarez-Moya, E., & Vallejo, J. (2006). *Protocols de tractament cognitivoconductual pel joc patològic i d'altres addiccions no tòxiques.* (Hospital U).

Jiménez-Murcia, S., Granero, R., Fernández-Aranda, F., & Menchón, J. M. (2020). Comparison of gambling profiles based on strategic versus non-strategic preferences. *Current Opinion in Behavioral Sciences*, *31*, 13–20. https://doi.org/10.1016/j.cobeha.2019.09.001

Jiménez-Murcia, S., Granero, R., Fernandez-Aranda, F., Sauvaget, A., Fransson, A., Hakansson, A., Mestre-Bach, G., Steward, T., Stinchfield, R., Moragas, L., Aymamí, N., Gómez-Peña, M., Pino-Gutierrez, A. Del, Aguera, Z., Alcazar, M. B., Talón-Navarro, M. T., Fuentes, À. C., Codina, E., & Menchon, J. M. (2019). A comparison of DSM-IV-TR and DSM-5 diagnostic criteria for gambling disorder in a large clinical sample. *Frontiers in Psychology*, *10*(APR). https://doi.org/10.3389/fpsyg.2019.00931

Johansson, A., Grant, Æ. J. E., & Won, Æ. S. (2009). *Risk Factors for Problematic Gambling : A Critical Literature Review*. 67–92. https://doi.org/10.1007/s10899-008-9088-6

Kelley, K., & Preacher, K. J. (2012). On effect size. *Psychological Methods*, *17*(2), 137–152. https://doi.org/10.1037/a0028086

Kryszajtys, D. T., Hahmann, T. E., Schuler, A., Hamilton-Wright, S., Ziegler, C. P., & Matheson, F. I. (2018). Problem gambling and delinquent behaviours among adolescents: A scoping review. *Journal of Gambling Studies*, *34*(3). https://doi.org/10.1007/s10899-018-9754-2

Kubrin, C. E., & Mioduszewski, M. D. (2019). *Social Disorganization Theory: Past, Present and Future* (pp. 197–211). https://doi.org/10.1007/978-3-030-20779-3_11

Lahn, J. (2005). Gambling among offenders: Results from an Australian survey. In *International Journal of Offender Therapy and Comparative Criminology* (Vol. 49, Issue 3, pp. 343–355). https://doi.org/10.1177/0306624X04270790

Laursen, B., Plauborg, R., Ekholm, O., Larsen, C. V. L., & Juel, K. (2016). Problem Gambling Associated with Violent and Criminal Behaviour: A Danish Population-Based Survey and Register Study. *Journal of Gambling Studies*, *32*(1), 25–34. https://doi.org/10.1007/s10899-015-9536-z

Ledgerwood, D. M., Weinstock, J., Morasco, B. J., & Petry, N. M. (2007). Clinical features and treatment prognosis of pathological gamblers with and without recent gambling-related illegal behavior. *Journal of the American Academy of Psychiatry and the Law*, *35*(3), 294–301.

Lesieur, H. R., & Blume, S. B. (1987). The South Oaks Gambling Screen (SOGS): a new instrument for the identification of pathological gamblers. *The American Journal of Psychiatry*, *144*(9), 1184–1188. http://www.ncbi.nlm.nih.gov/pubmed/3631315

Loeber, R., Menting, B., Lynam, D. R., Moffitt, T. E., Stouthamer-Loeber, M., Stallings, R., Farrington, D. P., & Pardini, D. (2012). Findings from the Pittsburgh youth study: Cognitive impulsivity and intelligence as predictors of the age-crime curve. *Journal of the American Academy of Child and Adolescent Psychiatry*, *51*(11), 1136–1149. https://doi.org/10.1016/j.jaac.2012.08.019

Mestre-Bach, G., Steward, T., Granero, R., Fernández-Aranda, F., Talón-Navarro, M. T., Cuquerella, À., Baño, M., Moragas, L., del Pino-Gutiérrez, A., Aymamí, N., Gómez-Peña, M., Mallorquí-Bagué, N., Vintró-Alcaraz, C., Magaña, P., Menchón, J. M., & Jiménez-Murcia, S. (2018). Gambling and Impulsivity Traits: A Recipe for Criminal Behavior? *Frontiers in Psychiatry*, *9*, 6. https://doi.org/10.3389/fpsyt.2018.00006

Mestre-Bach, G., Steward, T., Granero, R., Fernández-Aranda, F., Talón-Navarro, M. T., Cuquerella, À., del Pino-Gutiérrez, A., Aymamí, N., Gómez-Peña, M., Mallorquí-Bagué, N., Mena-Moreno, T., Vintró-Alcaraz, C., Baño, M., Moragas, L., Magaña, P., Menchón, J. M., & Jiménez-Murcia, S. (2018). Sociodemographic and psychopathological predictors of criminal behavior in women with gambling disorder. *Addictive Behaviors*, *80*(November 2017), 124–129. https://doi.org/10.1016/j.addbeh.2018.01.022

Mishra, S., Lalumière, M. L., Morgan, M., & Williams, R. J. (2011). An Examination of the Relationship Between Gambling and Antisocial Behavior. *Journal of Gambling Studies*, *27*(3), 409–426. https://doi.org/10.1007/s10899-010-9217-x

Petry, N. M., Blanco, C., Auriacombe, M., Borges, G., Bucholz, K., Crowley, T. J., Grant, B. F., Hasin, D. S., & O'Brien, C. (2014). An Overview of and Rationale for Changes Proposed for Pathological Gambling in DSM-5. *Journal of Gambling Studies*, *30*(2), 493–502. https://doi.org/10.1007/s10899-013-9370-0

Petry, N. M., Blanco, C., Stinchfield, R., & Volberg, R. (2013). An empirical evaluation of proposed changes for gambling diagnosis in the DSM-5. *Addiction*, *108*(3), 575–581. https://doi.org/10.1111/j.1360-0443.2012.04087.x

Piquero, A., Farrington, D., & Blumstein, A. (2007). *Key issues in criminal career research: New analyses of the Cambridge Study in Delinquent Development*. https://books.google.es/books?hl=es&lr=&id=OPnXXkrmJA0C&oi=fnd&pg=PR9&dq=Piquero,+A.+R.,+Farrington,+D.+P.,+%26+Blumstein,+A.+(2007).+Key+issues+in+criminal+career+research:+New+analyses+of+the+Cambridge+Study+in+Delinquent+Development.+Cambridge,+UK:+Cam

Potenza, M. N., Steinberg, M. A., McLaughlin, S. D., Wu, R., Rounsaville, B. J., & O'Malley, S. S. (2000). Illegal behaviors in problem gambling: Analysis of data from a gambling helpline. *Journal of the American Academy of Psychiatry and the Law*, *28*(4), 389–403.

PRATT, T. C. (2008). RATIONAL CHOICE THEORY, CRIME CONTROL POLICY, AND CRIMINOLOGICAL RELEVANCE. *Criminology & Public Policy*, *7*(1), 43–52. https://doi.org/10.1111/j.1745-9133.2008.00489.x

Riser, R. E., & Kosson, D. S. (2013). Criminal behavior and cognitive processing in male offenders with antisocial personality disorder with and without comorbid psychopathy. *Personality Disorders: Theory, Research, and Treatment*, *4*(4), 332–340. https://doi.org/10.1037/a0033303

Rosenthal, R. J., & Lorenz, V. C. (1992). The pathological gambler as criminal offender: Comments on

evaluation and treatment. In *Psychiatric Clinics of North America* (Vol. 15, Issue 3, pp. 647–660). https://doi.org/10.1016/s0193-953x(18)30229-6

Shaw, C. R., & McKay, H. D. (1942). *Juvenile Delinquency and Urban Areas*. The University of Chicago Press.

Spice, A., Viljoen, J. L., Douglas, K. S., & Hart, S. D. (2015). Remorse, Psychopathology, and Psychopathy among Adolescent Offenders. *Law and Human Behavior*, *39*(5), 451–462. https://doi.org/10.1037/lhb0000137

Stinchfield, R. (2002). Reliability, validity, and classification accuracy of the South Oaks Gambling Screen (SOGS). *Addictive Behaviors*, *27*(1), 1–19. https://doi.org/10.1016/S0306-4603(00)00158-1

Swisher, R. R., & Dennison, C. R. (2016). Educational Pathways and Change in Crime Between Adolescence and Early Adulthood. *Journal of Research in Crime and Delinquency*, *53*(6), 840–871. https://doi.org/10.1177/0022427816645380

Turner, N. E., Preston, D. L., Saunders, C., McAvoy, S., & Jain, U. (2009). The relationship of problem gambling to criminal behavior in a sample of Canadian male federal offenders. *Journal of Gambling Studies*, *25*(2), 153–169. https://doi.org/10.1007/s10899-009-9124-1

Vitaro, F., Brendgen, M., Ladouceur, R., & Tremblay, R. E. (2001). Gambling, Delinquency, and Drug Use during Adolescence: Mutual Influences and Common Risk Factors. *Journal of Gambling Studies*, *17*(3), 171–190. https://doi.org/10.1023/A:1012201221601

Wanner, B., Vitaro, F., Carbonneau, R., & Tremblay, R. E. (2009). Cross-Lagged Links Among Gambling, Substance Use, and Delinquency From Midadolescence to Young Adulthood: Additive and Moderating Effects of Common Risk Factors. *Psychology of Addictive Behaviors*, *23*(1), 91–104. https://doi.org/10.1037/a0013182

Weinstock, J., Rash, C., Burton, S., Moran, S., Biller, W., O'Neil, K., & Kruedelbach, N. (2013). Examination of proposed DSM-5 changes to pathological gambling in a helpline sample. *Journal of Clinical Psychology*, *69*(12), 1305–1314. https://doi.org/10.1002/jclp.22003

Widinghoff, C., & Håkansson, A. (2018). Gambling disorder – A current issue in Sweden. *Lakartidningen*, *115*(46).

Williams, R. J., Royston, J., & Hagen, B. F. (2005). Gambling and problem gambling within forensic populations: A review of the literature. In *Criminal Justice and Behavior* (Vol. 32, Issue 6, pp. 665–689). https://doi.org/10.1177/0093854805279947

Wong, C. (2002). *Clifford R. Shaw and Henry D. McKay: The Social Disorganization Theory*. CSISS Classics. UC Santa Barbara: Center for Spatially Integrated Social Science.

Worthington, A., Brown, K., Crawford, M., & Pickernell, D. (2003). Socioeconomic and demographic determinants of household gambling in Australia. *Discussion Paper No. 156. School of Economics and Finance. Brisbane, Qld: Queensland University of Technology*.